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3G INTERNET AND CONFIDENCE IN GOVERNMENT

Sergeï Guriev, Nikita Melnikov, and Ekaterina Zhuravskaya

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3G Internet and Confidence in Government*

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Abstract

How does the internet affect government approval? Using surveys of 840,537 individuals from 2,232 subnational regions in 116 countries in 2008-2017 from the Gallup World Poll and the global expansion of 3G networks, we show that an increase in internet access reduces government approval and increases the perception of corruption in government. This effect is present only when the internet is not censored and is stronger when traditional media is censored. Actual incidents of corruption translate into higher corruption perception only in places covered by 3G. In Europe, the expansion of mobile internet increased vote shares of anti-establishment populist parties.

Keywords: Government approval, 3G, Mobile, Internet, Corruption, Populism

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1 Introduction

How does the internet affect individuals' perceptions of government corruption and confidence in the country's leadership and institutions? Optimists argue that improved access to information promotes public awareness of government performance, helping opposition activists to fight corruption and to resist non-democratic governments. For instance, in the wake of the Arab Spring of 2010-2012, the internet was branded a "liberation technology" (Diamond and Plattner, 2010). Pessimists, in contrast, point out that the internet facilitates the dissemination of fake news (Allcott and Gentzkow, 2017; Vosoughi, Roy and Aral, 2018), empowers non-democratic regimes in spreading propaganda and surveilling the population (Mitchell et al., 2019; Morozov, 2011), and helps populists in and out of power to connect to voters through social media (Tufekci, 2018).

These conjectures found empirical support in a number of rigorous quantitative studies (for a recent survey of this literature, see Zhuravskaya, Petrova and Enikolopov, 2019). With the important exception of Manacorda and Tesei (2016), who show that the 3G mobile internet facilitates political protests using data for all of the African continent over 15 years, previous literature has analyzed the political implications of the internet in a single-country setting. Our paper, in contrast, studies the political effects of gaining internet access in a global setting. Using Gallup World Poll (GWP) data on the attitudes and beliefs of approximately 840,000 individuals living in 2,232 subnational regions of 116 countries across all continents during the period from 2008 to 2017, we show that, on average, the expansion of 3G mobile internet infrastructure leads to an increase in internet use, causing the public to become more aware of corruption and less confident in the country's government. Furthermore, we show that both the optimists and the pessimists are partly right in their assessment of the internet's impact on political outcomes. First, mobile internet decreases confidence in government only when the internet is not censored, suggesting that internet censorship is a rational strategy for autocrats. Second, the effect of the internet on confidence in government is particularly large when traditional media is censored while the internet is free, implying that the public uses the internet to get political news when there are no other sources of political information. Third, the internet helps to inform the public about corruption: we show that actual incidents of government corruption are associated with higher perceptions of corruption only when there is access to mobile internet. Taken together, these results suggest that uncensored internet can, indeed, be a powerful tool of political accountability. However, we also find that mobile internet empowers anti-establishment politicians, increasing the vote shares of right-wing and left-wing populists. We demonstrate this using data for 87 elections that took place

between 2007 and 2018 in 30 European democracies, for which there is a classification of political parties into populist and non-populist. Thus, in addition to being a source of political information for the population about their incumbent government, the internet helps anti-establishment politicians connect to voters, whatever their political agenda is.

Our empirical strategy relies on a difference-in-differences analysis. We use the variation in the timing of the expansion of 3G mobile networks across different subnational regions within countries controlling for subnational region fixed effects, year fixed effects, and a large set of potential confounds, including measures of economic development, unemployment, democracy, as well as individual socio-demographic characteristics. We show that our results are robust to including country-by-year fixed effects and document the absence of pre-trends. To address a potential concern that information and communications technologies may affect individual attitudes though channels other than internet access, we use the expansion of 2G mobile networks as a placebo treatment—3G was the first generation that allowed users to browse the web freely from their smartphones. We show that 2G is, if anything, *positively* correlated with government approval and that controlling for the availability of a 2G signal does not affect our results. We also present results for a number of placebo outcomes to show that the relationship between the internet and satisfaction with government is not driven by the link between the internet and general life satisfaction. Finally, we use the techniques developed by Altonji, Elder and Taber (2005) and Oster (2017) to show that our results are unlikely to be driven by variation in unobservables.

This paper contributes to the growing literature on the political effects of the internet. Several studies have shown that access to the internet hurts the incumbents' political position. For example, the expansion of high-speed internet in Malaysia was shown to have helped end the corrupt ruling coalition's 40-year monopoly on power (Miner, 2015). In South Africa, the spread of the mobile internet also has shifted votes away from the ruling political party (Donati, 2017). Social media helped coordinating protest activity across Africa (Manacorda and Tesei, 2016) and in Russia (Enikolopov, Makarin and Petrova, 2018). The evidence from Germany (Falck, Gold and Heblich, 2014), the UK (Gavazza, Nardotto and Valletti, 2018), and Italy (Campante, Durante and Sobbrio, 2018) suggests that in Europe, initially, the internet had crowded out political awareness with entertainment content, reducing electoral participation. Yet, Campante, Durante and Sobbrio (2018) show that this effect was temporary and that, at the time of the introduction of social networks, broadband internet contributed to the rise of the populist Five Star Movement in Italy. This result was confirmed by Schaub and Morisi (2019) using survey data on the support for populists in Italy in 2013 and in Germany in 2017.

Our contribution to this literature is three-fold. First, we document the political effects of the internet for a large set of countries around the world over the last decade. Second, the global setting allows us to perform a comparative analysis. In particular, we document that the internet decreases confidence in incumbents only when it is uncensored; and that this effect is particularly large when traditional media is censored. We also show that the internet helps expose corruption using a unique measure of incidence of corruption in a global setting from Furceri, Papageorgiou and Ahir (2019).[1] Third, we use election data for 30 European countries over a decade to show that populists both on the right and on the left of the political spectrum have benefited politically from the expansion of 3G mobile internet.

In what follows, Section 2 presents the data and the empirical strategy; Section 3 presents the results; and Section 4 concludes.

2 Data and empirical strategy

2.1 The main variables

In this section, we briefly describe the main variables of interest, relegating details about these measures as well as the description of all the control variables to the Online Appendix Section A.1.

The data on government approval come from the GWP and cover the period from 2008 to 2017. The exact questions about government performance in the GWP are: *"Do you have confidence in each of the following, or not: How about the national government? How about the judicial system and courts? How about the honesty of elections? Is corruption widespread throughout the government in (country), or not?"* The respondents could answer "*Yes*" or "*No*." We use the responses to these four questions as well as their first principal component and the average share of positive attitudes to the government along these four dimensions. The GWP also includes a question on individuals' internet access: *"Does your home have access to the internet?"*

We are interested in estimating the effect of the internet on attitudes and beliefs. Yet, individual beliefs may affect the decision to connect to the internet, and other factors, such as the level of development, may impact both government approval and internet availability. To overcome these endogeneity problems, we exploit the plausibly exogenous variation in the timing of the expansion of the third-generation—3G—mobile networks. (We address the plausibility of the identification assumptions below.)

3G was the first generation of mobile networks that allowed users to actively browse

[1] Donati (2017) makes a related point in the context of South Africa. Enikolopov, Petrova and Sonin (2018) show that an anti-corruption blog had a significant effect on corporate governance of state-controlled firms in Russia.

the web from their phones, making the internet more accessible and convenient to use. The technology was first introduced to the public in 2001, but it took several years for most countries to adopt it. According to the International Telecommunication Union (ITU), only 4% of the world's population had mobile broadband subscriptions in 2007. The following years witnessed significant growth in mobile internet users, reaching 69.3% of the global population by 2018.

We use annual maps of global 3G network coverage from 2007 to 2018 provided by Collins Bartholomew's Mobile Coverage Explorer. The data consist of 1km×1km binary grid cells. Figure 1 illustrates the expansion of 3G networks over the entire period of observation. It presents the maps of 3G coverage in 2007 and 2018 by grid cells and the corresponding increase in the share of the subnational regions' territory covered by 3G mobile internet for countries in the GWP sample. Subnational regions are defined by the level of geolocalization provided in the GWP data.

To understand the drivers and consequences of the internet's effect on government approval, we use independent measures of corruption, censorship of the internet, censorship of the traditional press, and populist parties' performance in national parliamentary elections. In particular, we use the International Monetary Fund's (IMF's) Global Incidents of Corruption Index from Furceri, Papageorgiou and Ahir (2019), which is based on text analysis of country reports by the Economist Intelligence Unit available for 97 countries in our sample. This index quantifies the intensity of actual corruption incidence within countries researched by external experts and is distinct from the corruption perceptions of the public.

We measure censorship of the internet using Freedom House's Limits on Content score, a component of the Freedom on the Net (FOTN) index. It is available for 46 countries in our sample and ranges from 0 to 35 with higher values implying higher censorship. In addition to a continuous measure of internet censorship, we also create a dummy for censored internet which equals one if the Limits on Content score is 22 or above and zero if the score is below 22. In order to expand the sample, we also set the dummy for censored internet to zero if a country does not have FOTN data but in that year the country is a democracy according to the Policy IV dataset (i.e., if the Polity2 score is 6 or above). In the sample with non-missing FOTN data, a dummy for democracy predicts the Limits on Content score to be below 22 with 99.5% probability.

The measure of censorship of traditional media comes from the Freedom House's Freedom of the Press (FOTP) index. It is available for all 116 countries in our sample and ranges from 0 to 100 with higher values representing higher censorship.

Finally, to analyze the effect of 3G on the electoral performance of populist parties, we extend the panel dataset on the vote shares of populist parties in Europe from Algan et al. (2017). The classification of parties into populist and non-populist is based on

the Chapel Hill Expert Survey and on text analysis of online sources.[2] The data cover 87 elections in 30 European countries in 2007-2018 at the level of 409 subnational districts.[3]

The details about the exact measures used in the analysis, summary statistics, and sources of all data are presented in the Online Appendix Section A.1.

2.2 The main specifications

We estimate the effect of internet access on individuals' beliefs. We gauge 3G mobile networks availability ($3G$) in each subnational region (defined by GWP localization) of each country in each year by calculating the share of the region's territory covered by 3G networks in that region and year, weighted by population density at each point on the map. Then, we both directly relate attitudes toward government to the 3G mobile networks availability in a reduced form regression (Specification 1) and run a two-stage estimation, in which we relate attitudes toward government to the individual's internet access, predicted by the 3G mobile networks availability in the subnational region of the respondent's residence (Specifications 2 and 3):

$$Gov_approval_{irt} = \gamma_1 3G_{rt} + \gamma_2 Development_{rt} + X'_{irt}\lambda + \varphi_r + \tau_t + \epsilon_{irt}; \quad (1)$$

$$Internet_{irt} = \alpha_1 3G_{rt} + \alpha_2 Development_{rt} + X'_{irt}\lambda + \varphi_r + \tau_t + \epsilon_{irt}; \quad (2)$$

$$Gov_approval_{irt} = \beta_1 \widehat{Internet}_{irt} + \beta_2 Development_{rt} + X'_{irt}\lambda + \varphi_r + \tau_t + \epsilon_{irt}. \quad (3)$$

i, r, and t index individuals, regions, and years, respectively. *Gov_ approval* is a dummy indicating whether the survey respondent has confidence in government. $3G$ represents the share of population in the subnational region with potential access to 3G, our main explanatory and instrumental variable. *Internet* is a dummy variable for self-reported access to the internet. As each dependent variable is a dummy, the three equations are linear probability models. φ_r and τ_t are region and year fixed effects, which control for all regional time-invariant characteristics and global time-specific shocks. *Development* represents a measure of regional economic development—an important control as the expansion of 3G networks was potentially faster in regions with high economic growth. In the baseline specification, we proxy regional economic development with the log of mean household income among GWP respondents in the region and establish robustness to using nighttime light density as an alternative measure (following

[2]We present the classification of parties and describe the methodology used to classify them in the Online Appendix.

[3]Figure A1 in the Online Appendix presents maps illustrating the growth in 3G networks coverage between 2007 and 2018 in Europe and the boundaries of the districts, i.e., the spatial unit of observation in European elections data. The figure is organized similarly to Figure 1.

Henderson, Storeygard and Weil, 2011, 2012).[4] X is a vector of additional controls: age, age squared, gender, education, marital status, employment status, indicator for urban/rural place of residence, the log of the country's GDP per capita, the country's unemployment rate, and dummies for democracy and for advanced democracy.[5] In the baseline specification, standard errors are corrected for two-way clustering at the region level (to account for correlation over time) and at the country level in each year (to account for within-country-year correlation). We establish robustness of the results to using alternative assumptions about the variance covariance matrix: in particular, the results are robust to correcting for spatial and over-time correlation following Conley (1999), Hsiang (2010), and Collela et al. (2018), and for clustering at the country level.

The two main identification assumptions for interpreting this estimation as causal are as follows: 1) the timing of the expansion of 3G mobile networks affects individuals' attitudes toward government only through its effect on individuals' access to the internet and 2) the expansion of 3G mobile networks is not itself driven by the expectation of changes in government approval or by any unobserved factor that can generate a spurious correlation between government approval and 3G network coverage. These assumptions are not directly testable. However, below, in Section 3.2, we present a number of robustness and placebo exercises as well as tests in the spirit of Altonji, Elder and Taber (2005) and Oster (2017) which do suggest that our results can be interpreted as causal.

Column 1 of Table 1 presents the results of the first stage (Specification 2). The expansion of 3G networks within the respondent's region of residence strongly predicts individual internet access. Conditional on all covariates, on average, moving from zero 3G availability in a region to full 3G coverage increases the probability of an individual being connected to the internet by 8.0 percentage points when considering the entire sample (Panel A) and by 8.3 percentage points when focusing on rural areas (Panel B). The F-statistics for the excluded instrument ($3G$) are 23 and 25, respectively.

3 Results

3.1 3G and government approval

Columns 2 to 7 of Table 1 present the results of estimating the relationship between internet access and government approval. Panel A presents the results for the full

[4] In the few region-years where the GWP income data are not available (less than 7% of the sample), we use nighttime light density and the country's GDP per capita to predict regional income. As discussed in the Online Appendix, the results are robust to controlling for nighttime light density; we do not do it in the baseline specification because this variable is not comparable before and after 2014.

[5] The summary statistics are presented in Table A1 in the Online Appendix.

sample; Panel B—for the subsample of rural residents. In both cases, reduced form and instrumental variable regressions yield the same result: an increase in internet access due to the expansion of 3G networks, on average, causes individuals to become more aware of government corruption and less confident in their country's government and institutions. The results are significant for all four different measures of confidence in government institutions (Columns 2-5) and for the two aggregate measures, i.e., the share of positive answers and the first principal component of the four measures. The magnitude of the effects is sizeable in the full sample; and it is particularly large for residents of rural areas. For example, the results presented in Column 2 imply that a 8 percentage points increase in the probability of individuals' internet access due to the expansion of 3G networks in the region from zero to full coverage decreases the confidence in the government by 6 percentage points in the full sample and by 9 percentage points in rural areas (from the mean level of 51% and 54% in the two samples, respectively). Similarly, as reported in Column 5, it decreases the share of people thinking that the government is not corrupt by 3.6 percentage points in the full sample and 5.4 percentage points in rural areas (from the mean of approximately 22%). The results for the other measures of the attitudes toward government institutions are very similar.

3.2 Addressing identification challenges

Can these results be interpreted as causal? In this section, we present evidence suggesting that the results are not driven by spurious correlations.

Country×year FEs and pre-trends.—First, to make sure that our results are not driven by differential country-level dynamics, we redo the analysis controlling for country×year fixed effects, thus, relying only on the differential expansion of 3G in different subnational regions within countries. This is a very demanding control because it eliminates part of the relevant variation as 3G networks often expanded to all regions of a country at the same time. Nonetheless, the results (presented in Panel A of Table A2 in the Online Appendix) are largely robust. In particular, after partialling out all of the country×year variation, the internet remains an important determinant of attitudes toward government. The effect of 3G remains statistically significant for 5 out of 6 measures of government approval with the results being most precise for the aggregate measures of confidence in government, which are the least noisy among the considered outcomes (Columns 5 and 6). The point estimates are considerably smaller than in Table 1, which could be explained by the fact that part of the relevant variation is not accounted for in this specification. Importantly, with country×year fixed effects, regional 3G coverage remains a strong predictor of individual access to the internet as

reflected by the F-statistics for the effect of 3G from the first stage reported at the bottom of the Panel.

Second, a major potential concern with our difference-in-differences identification strategy is that 3G networks might expand in regions with falling confidence in government. To address this concern, Panel B of Table A2 repeats the analysis presented in Panel A, but for regional 3G coverage next year. We find that 3G coverage next year is not related to government approval this year, suggesting parallel pre-trends. Figure A2 in the Online Appendix extends this analysis and presents the coefficients on several lags and leads of regional 3G coverage in regressions with the first principal component of the government approval variables as the dependent variable: consistent with the parallel pre-trends assumption, future availability of mobile internet networks has no effect on government approval, but past 3G expansions have a significant effect on attitudes toward government.

2G as a placebo treatment.—A potential concern is that 3G availability may affect individuals' beliefs through other mechanisms than providing access to the internet. To address this concern, we consider the effect of the expansion of 2G networks which allow making phone calls and sending text messages but not browsing the internet. If individuals' beliefs were affected not by internet access but by some other aspect of the expansion of ICT, one should expect similar effects of the expansion of 2G and 3G networks. In Table A3 in the Online Appendix, we show that, in sharp contrast to the effect of 3G presented above, the expansion of 2G networks, if anything, is associated with an *increase* in government approval. In addition, we show that 2G coverage is not related to respondents' internet access and that controlling for 2G availability does not affect the estimates of the effect of 3G. These findings suggest that the negative effect of 3G on confidence in government is determined by its effect on internet access rather than by other features of the expansion of mobile networks.

Variation in observables as a proxy for unobserved variation.—We follow the methodologies of Altonji, Elder and Taber (2005) and Oster (2017) to understand how important the effect of unobservables needs to be to explain our results. First, we take the fitted value from a regression of 3G on all controls and regress our outcome variables on this index of observables, which is the best predictor of 3G availability, controlling for region and year fixed effects. The results are reported in Panel A of Table A4 in the Online Appendix. We find that the predicted from observables 3G availability is not significantly related to government approval and the point estimates have the opposite sign of the effect of 3G for 4 out of 6 outcomes, including both aggregate measures of government approval. This suggests that, at least for these outcomes, selection on unobservables is not driving the results under the assumption that the observables are representative of the unobservables. Second, in Panel B of Table A4,

we report Oster δ statistic indicating how much more important unobservables need to be compared to observables to fully explain our results by omitted variable bias. In the two cases, where observables should be positively selected from unobservables to explain our results (Columns 2 and 4), the δs are 5.8 and 1.6. For all other outcomes observables should be negatively selected from unobservables to explain our results; for these outcomes, the δs range between -4 and -1000. Both the magnitude and the sign of these statistics suggest that it is highly unlikely that our results are spuriously driven by unobserved variation.

Life satisfaction and other placebo outcomes.—In Table A5 in the Online Appendix, we show that 3G did not affect attitudes unrelated to the government. In particular, we show that 3G availability is not related to life satisfaction today, the expectation about life satisfaction in 5 years, satisfaction with the current standards of living, and beliefs about whether standards of living are getting better. In addition, we show that 3G penetration has no effect on the confidence in the *local* police, suggesting that internet access affects individuals' opinions about the government only for those government functions that people cannot observe directly through their day-to-day experience.

Robustness.—In Section A.2 of the Online Appendix we present additional results showing robustness to using nighttime light density as an alternative proxy for regional economic development and to alternative assumptions about the variance-covariance matrix, including correcting standard errors for spatial correlation and using clusters at the country level.

Taken together, these pieces of evidence suggest that 3G penetration is plausibly exogenous and meets the exclusion restriction.

3.3 Comparative analysis: censorship of the internet and of the traditional media

The fact that uncensored internet can significantly undermine government popularity has not gone unnoticed by politicians, especially in non-democratic countries. According to Freedom House, many governments have taken steps to limit internet freedom, with policies ranging from the blockage of social media and messaging apps in China, Egypt, Iran, and Russia to temporary shutdowns of mobile networks in India and Sri Lanka.[6] Yet, observers do conjecture that it is harder to censor the internet than to censor the traditional media (e.g., Diamond and Plattner, 2012).

In this section, we study whether and how the effect of 3G networks availability on

[6]See `https://freedomhouse.org/report/freedom-net/freedom-net-2018` (accessed on September 7, 2019). For academic work on internet censorship, see, for instance, King, Pan and Roberts (2013, 2014), Roberts (2018), and Chen and Yang (2019).

individuals' attitudes toward government depends on internet censorship and on censorship of the traditional media, such as TV, radio, and newspapers. We operationalize this by adding interaction terms between 3G coverage and the measures of censorship online and offline to the reduced-form specification (Equation 1), controlling for the direct effects of these two types of censorship.

We start by considering the heterogeneity of the main effect with respect to the censorship of the internet, which we measure using the Limits on Content component of the FOTN index. Panels A and B of Table 2 present the results. In Panel A, internet censorship is measured with a dummy; in Panel B—with a continuous index. The results are the same using both measures: the coefficients on the interaction terms of 3G with the internet censorship measures are positive and statistically significant, so that internet censorship weakens the effect of 3G on government approval. If the internet is free, 3G coverage has a strong and statistically significant negative effect on government approval. In contrast, in countries with internet censorship, the impact of 3G coverage on government approval is zero or even positive. Figure 2 illustrates these findings. Panel A presents the non-parametric relationships between the change in government approval in a region (net of all controls) and the increase in 3G penetration in this region since 2008, separately for countries with free internet and with censored internet. It is evident that in countries with low internet censorship (left-hand-side graph), the expansion of 3G is associated with lower government approval, while in countries where the internet is censored (right-hand-side graph), there is no relationship between these variables. In Panel B, we present the corresponding first stages, i.e., the non-parametric relationships between the increase in 3G penetration since 2008 and internet use in the two groups of countries. Irrespective of whether internet is censored, the presence of 3G networks facilitates internet access for the population. The difference in the effect of 3G on government approval, thus, comes from the content available online rather than from differences in internet use.[7]

In Panel C of Table 2, we include the interactions of 3G with both internet censorship and with censorship of the traditional media (the FOTP index). We find that the coefficients on the interactions of 3G with internet censorship remain positive and statistically significant, whereas the coefficients on the interactions of 3G with censorship of the traditional press are negative (and significant for 5 out of 6 outcomes). Thus, for sufficiently low levels of internet censorship, the effect of 3G penetration on government approval is negative; and it is stronger (i.e., more negative) when traditional media is censored. This suggests that uncensored internet plays an important

[7]Figure A3 in the Online Appendix presents the corresponding non-parametric relationships, in which all controls are partialled out from the explanatory variable in addition to the dependent variable.

role in informing the public about politics, when traditional media does not report independent-of-the-government political information.[8]

Heterogeneity with respect to other country and individual characteristics.—The Online Appendix Section A.3 presents the heterogeneity analysis with respect to a number of country and individual characteristics. Here, we report the main takeaways. In rural areas, the effect of 3G on government approval is consistently larger than in the full sample and it is very robust to slicing the sample into subgroups. Rural residents significantly decrease their confidence in government upon gaining access to the internet on each of the five continents and in the sub-groups of OECD and non-OECD members. In the full sample, the effects remain significant for non-OECD countries taken together, and for Africa, North and Central America, South America, as well as for Asia, but only when one excludes countries with high internet censorship (on average, Asia has the highest level of internet censorship among all continents). For Europe and OECD countries, in contrast, the effects are significant only for the sub-sample of rural residents. The magnitude of the point estimates of the effect is consistently smaller for OECD countries than for non-OECD countries. (This difference is statistically significant only in the full sample.)

There is a substantial heterogeneity with respect to individual characteristics. The effect of 3G decreases with education and income. It is significantly weaker for employed compared to unemployed, and for the young (below 20 years old) compared to the rest of the population.

The fact that effect of the mobile internet is larger in magnitude for rural residents and among less educated respondents highlights the importance of the information channel, which we test formally in the next section: one could argue that education and urban residence are associated with a better access to alternative (offline) sources of political information.

3.4 Does the internet help expose corruption?

In this section, we test the conjecture that the internet helps inform the public about actual corruption cases in government. If so, actual corruption incidents should translate into higher perceptions of corruption more in regions with higher internet availability. In other words, one should expect the link between actual and perceived corruption to be stronger in areas with higher 3G coverage. To test this, one needs to measure the incidence of actual corruption in a global setting. It is challenging as the vast majority of cross-country measures of corruption rely on perceptions. Furceri, Papageorgiou and Ahir (2019) are the first to construct a measure of actual corruption unrelated to

[8]Table A6 in the Online Appendix replicates Table 2 for the subsample of rural residents; the results are similar to those presented in Table 2.

perceptions across the whole world—the IMF's Global Incidents of Corruption Index (GICI). This index quantifies the importance of actual corruption in each country and year by measuring the share of the text of the annual EIU country reports devoted to corruption. We regress the dummy indicating whether the respondents believe that the government is corrupt on this index of corruption incidents and its interaction with regional 3G coverage, controlling for the direct effect of 3G as well as all the baseline controls, including region and year fixed effects. The results of this test are consistent with the hypothesis that the internet helps inform the public about corruption:

$$Perception = \underset{(0.019)}{-0.074}\ 3G - \underset{(0.006)}{0.009}\ log(Incidents) - \underset{(0.011)}{0.034}\ 3G \times log(Incidents) + \mathscr{E},$$

where $Perception$ is the perception of corruption, $log(Incidents)$ is the measure of actual corruption, and $\mathscr{E}$ represents the effect of all the other controls and the error term. The number of observations is 581,944 and R-squared is 0.151. Panel A of Figure 3 illustrates these results by presenting the marginal effect of an increase in the index of actual corruption incidents on corruption perception for different levels of 3G penetration. In regions with no 3G penetration, there is no correlation between the GICI index and the perception that the government is not corrupt. In contrast, if a region has full 3G coverage, there is a strong and statistically significant link between incidence of actual corruption and its perception: in such regions, every 10 percent increase in the measure of intensity of actual corruption decreases the public perception that the government is clean by 0.34 percentage points. A one standard deviation increase in the log intensity of actual corruption (0.65) is associated with a 2.2-percentage-point lower perception that the government is clean (compared to the mean of 18.3%) in places fully covered by 3G networks and has no effect on perception of government corruption in places without mobile internet coverage.

3.5 Electoral consequences of the expansion of 3G networks

The results presented so far suggest that the internet is an important source of political information for voters, particularly, when the traditional media do not provide such information. Does the expansion of internet have electoral implications? The evidence from the previous literature (briefly discussed above) suggests that it does, but previous studies addressed this question in a single-country setting. We use panel data on election results in 30 European countries to examine the electoral effects of the expansion of mobile internet in Europe between 2007 and 2018. We focus on Europe because we are particularly interested in whether the internet facilitates electoral success of populist parties, as was suggested by many observers (e.g., Tufekci, 2018) and by previous research on Italy (Campante, Durante and Sobbrio, 2018). The conventional

classification of political parties into populist and non-populist exists for Europe only.

We relate the share of votes cast for populist parties in 409 subnational districts in 87 parliamentary elections in Europe to the expansion of 3G mobile networks controlling for subnational-district and year fixed effects as well as for log GDP per capita, the rate of unemployment, inflation, and the share of population that is 65 or older. I.e., we estimate the specification that is a direct analogue of Specification (1) but aggregated to the level of subnational districts, the level at which the elections data are available.

Table 3 presents the results. We find that the expansion of 3G networks contributes to a better electoral performance of populist parties both on the right and on the left of the political spectrum. Moving from zero to full 3G coverage, on average, results in 6.9 percentage points higher vote share of right-wing populists and 5.9 percentage points higher vote share of left-wing populists. These are large effects as the mean vote shares for the right-wing and left-wing populists in our sample are 14.8% and 6.0%. Panel B of Figure 3 illustrates this result by showing the non-parametric relationship between the increase in 3G penetration since 2007 and the change in the populist vote share (after subtracting the effect of all controls except the effect of 3G internet).[9]

This effect of 3G on the vote for anti-establishment parties in Europe is partly driven by the disillusionment with political establishment: as shown above, the expansion of mobile internet led to a significant decline in government approval among Europeans in rural areas. It may also have been partly driven by the better ability of anti-establishment parties to reach out to frustrated voters, a conjecture that needs to be tested in future research.

4 Conclusions

This paper documents the political effects of the internet in a global setting. Our analysis yields the following main conclusions. The expansion of mobile internet networks leads to a reduction in the confidence in government when the internet is uncensored. This effect is stronger when the traditional media is not free. The internet does help expose incidents of actual corruption to the public. Populist parties, at least in Europe, have been the political beneficiary of the rising discontent with incumbent governments, driven by political information voters received through the internet. As many populist politicians in Europe have been found spreading mis-information, the results suggest that the internet is a tool that can be used both to inform and to mis-inform the public.

[9] In the Online Appendix, we present similar figures separately for the right-wing and the left-wing populists (Figure A4); show the non-parametric relationship with controls partialled out from the treatment variable (Figure A5), and document robustness to controlling for nighttime light density (Table A8).

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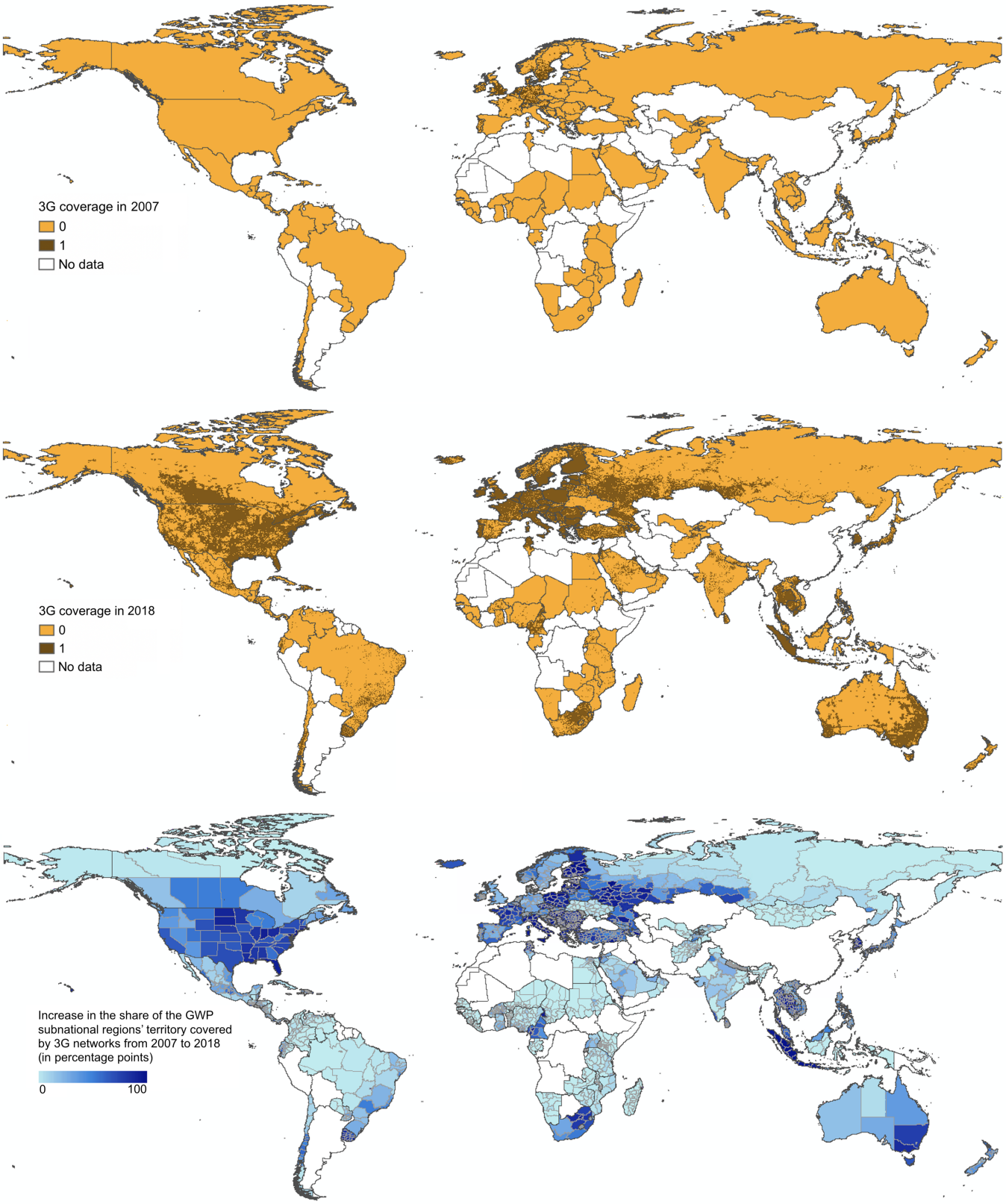
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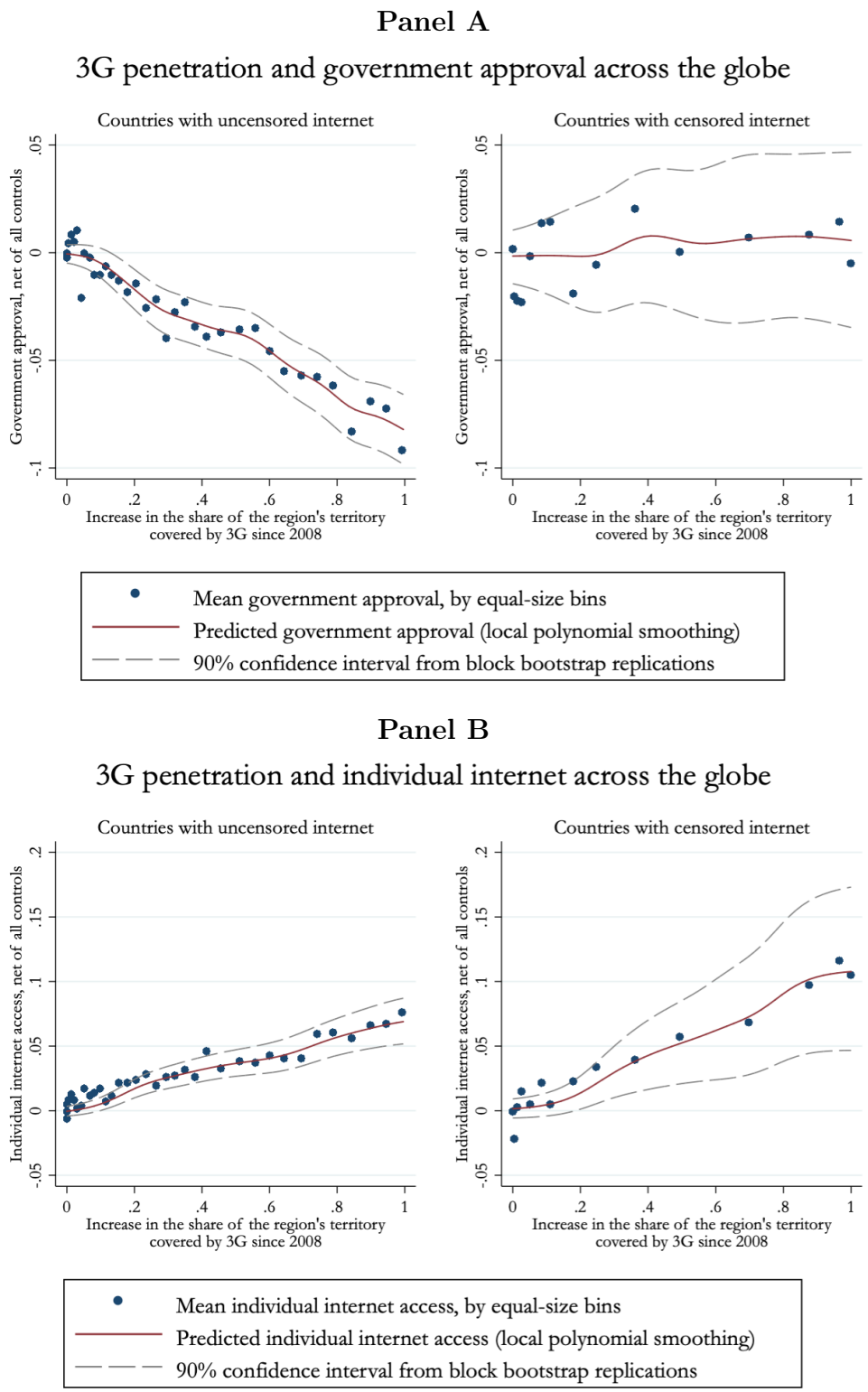
Zhuravskaya, Ekaterina, Maria Petrova, and Ruben Enikolopov. 2019. "Political Effects of the Internet and Social Media." Annual Review of Economics, submitted, https://doi.org/10.1146/annurev-economics-081919-050239.

Figure 1: The growth of 3G network coverage between 2007 and 2018



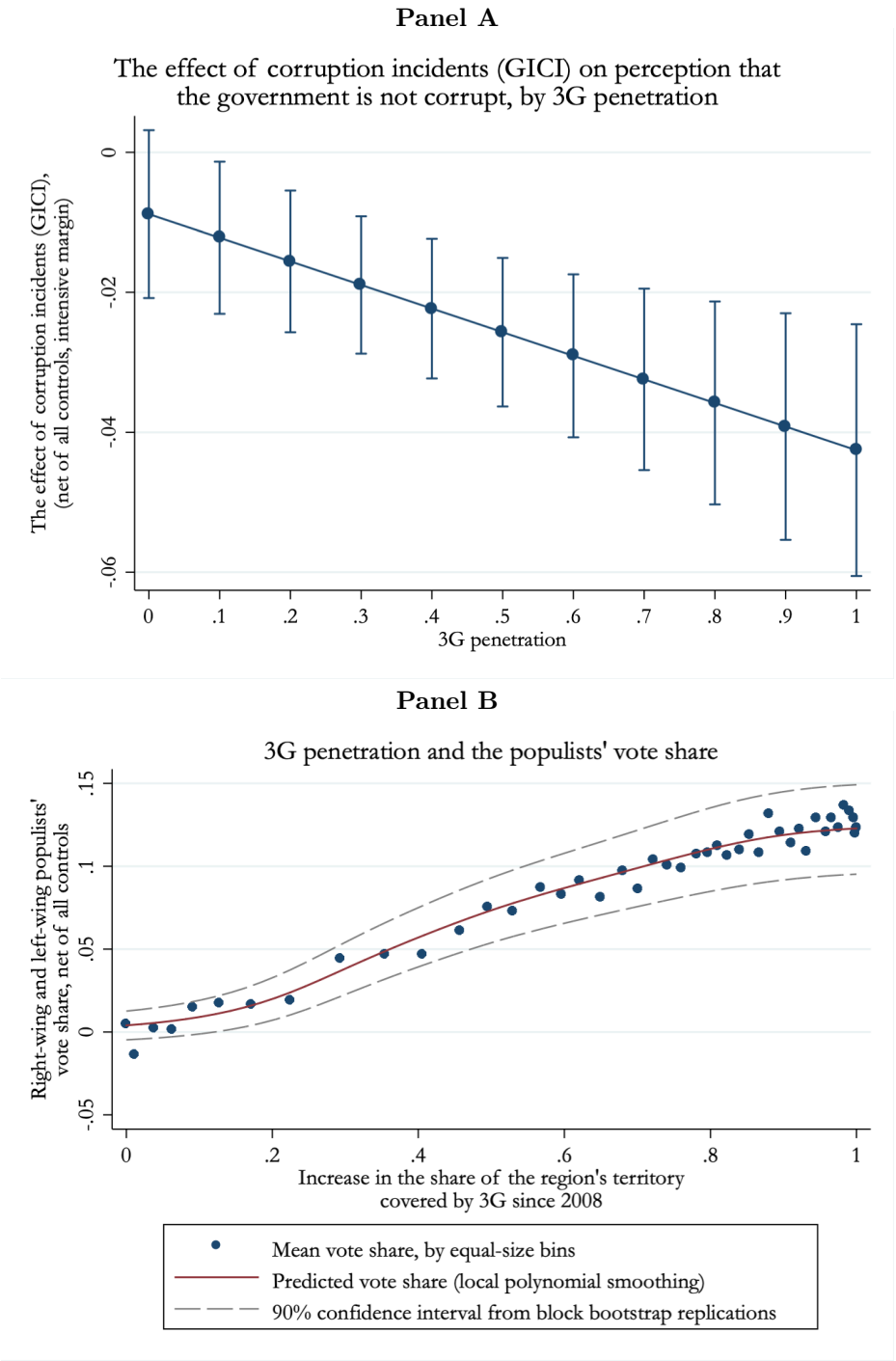
Note: The first two maps present 3G network coverage by grid cell in 2007 and in 2018. The third map presents: 1) the boundaries of subnational regions, the unit of localization in the GWP data and 2) the increase in the share of the subnational region's territory covered by 3G networks from 2007 to 2018. The sample consists of all countries covered by the GWP data. There are 2,232 subnational regions in the sample.

Figure 2: 3G network coverage and confidence in government



Note: Panel A of the figure illustrates the results presented in column 6 of Panel A of Table 2. Panel B of the figure illustrates the first-stage relationship between regional 3G coverage and individual internet access (as in column 1 of Panel A of Table 1) for countries with high and low levels of censorship. The dots show the means of the respective outcome variables net of all the controls by equal-size bins. The lines on the graphs show the predicted outcomes (Gaussian kernel, local polynomial smoothing). The confidence intervals are constructed by performing a block bootstrap at the level of the clusters.

Figure 3: 3G penetration, actual and perceived corruption, and the populists' vote share



Note: In Panel A, the outcome variable is a dummy for perception that there is no corruption in government. The explanatory variables are: 3G penetration, log corruption incidence, their interaction term, as well as all baseline controls, including region and year fixed effects. Corruption incidence are measured by the IMF's Global Incidents of Corruption Index. The graph presents the marginal effect of an increase in actual corruption on the perception of corruption. Confidence intervals are calculated from standard errors, corrected for two-way clusters at the level of the subnational districts (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation). Panel B illustrates the results presented in Column 4 of Table 3. The dots represent the populists' vote share net of all the controls by equal-size bins. The line of the graph shows the predicted vote share (Gaussian kernel, local polynomial smoothing). The confidence interval is constructed by performing a block bootstrap at the level of the clusters.

Table 1: The effect of the internet on confidence in government

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var:	Individual access to the internet	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: All locations							
	1st stage	*Reduced form*					
Regional 3G coverage	0.080***	-0.063***	-0.040***	-0.079***	-0.036**	-0.056***	-0.057***
	(0.017)	(0.021)	(0.015)	(0.021)	(0.014)	(0.015)	(0.015)
R-squared	0.482	0.164	0.163	0.168	0.225	0.242	0.239
		Second stage, 2SLS					
Individual access to the internet		-0.779***	-0.473**	-0.979***	-0.445**	-0.662***	-0.671***
		(0.300)	(0.197)	(0.345)	(0.202)	(0.233)	(0.236)
F-stat, excluded instrument	23.20	22.23	26.28	21.24	22.43	23.40	23.40
Observations	840,537	772,353	748,471	732,856	722,768	617,863	617,863
Mean dep. var	0.440	0.514	0.534	0.505	0.226	0.432	0.439
Number of countries	116	111	116	112	112	110	110
Panel B: Rural locations							
	1st stage	*Reduced form*					
Regional 3G coverage	0.083***	-0.091***	-0.058***	-0.115***	-0.054***	-0.080***	-0.081***
	(0.017)	(0.024)	(0.017)	(0.026)	(0.016)	(0.018)	(0.018)
R-squared	0.502	0.171	0.157	0.161	0.194	0.224	0.222
		Second stage, 2SLS					
Individual access to the internet		-1.147***	-0.687***	-1.403***	-0.640***	-0.952***	-0.963***
		(0.339)	(0.216)	(0.411)	(0.202)	(0.257)	(0.260)
F-stat, excluded instrument	24.96	23.74	26.42	22.63	25.98	25.29	25.29
Observations	501,957	464,831	448,449	440,786	432,460	371,055	371,055
Mean dep. var	0.350	0.539	0.556	0.516	0.215	0.445	0.452
Number of countries	115	110	115	111	111	109	109
Subnational region & year FEs	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. 3G internet reduces government approval. The unit of observation is an individual. Panel A reports the results for the full sample and Panel B for the subsample of respondents from rural areas. Column 1 presents the results of the first stage, and Columns 2–7 present the results of the second stage and of the reduced form. The dependent variables in Columns 2–7 are individuals' perceptions of government and the country's institutions. Controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table 2: The effect of 3G penetration on government approval, depending on the level of censorship of the internet and on the level of censorship of the traditional media

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var:	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: Dummy for high internet censorship						
Regional 3G coverage	-0.100***	-0.057***	-0.117***	-0.054***	-0.081***	-0.082***
	(0.023)	(0.016)	(0.021)	(0.016)	(0.016)	(0.016)
Regional 3G coverage ×	0.105**	0.037	0.173***	0.054*	0.093***	0.094***
Censored internet dummy	(0.041)	(0.029)	(0.043)	(0.029)	(0.034)	(0.035)
Observations	656,015	631,606	618,480	613,737	521,632	521,632
R-squared	0.157	0.166	0.157	0.234	0.238	0.235
Panel B: Continuous measure of internet censorship						
Regional 3G coverage	-0.190***	-0.108***	-0.215***	-0.083**	-0.129***	-0.131***
	(0.059)	(0.035)	(0.055)	(0.037)	(0.042)	(0.043)
Regional 3G coverage ×	0.072**	0.039**	0.106***	0.025	0.047*	0.048*
Censorship of the internet	(0.033)	(0.019)	(0.034)	(0.023)	(0.028)	(0.028)
Observations	338,027	331,304	320,685	322,892	267,141	267,141
R-squared	0.176	0.174	0.159	0.193	0.234	0.233
Panel C: Continuous measure of internet censorship and continuous measure of censorship of the traditional press						
Regional 3G coverage	-0.226***	-0.099**	-0.294***	-0.140***	-0.159***	-0.160***
	(0.056)	(0.042)	(0.065)	(0.039)	(0.045)	(0.045)
Regional 3G coverage ×	0.199***	0.075**	0.223***	0.089***	0.127***	0.129***
Censorship of the internet	(0.047)	(0.035)	(0.055)	(0.031)	(0.038)	(0.038)
Regional 3G coverage ×	-0.064***	-0.020	-0.043**	-0.022*	-0.039***	-0.039***
Censorship of the traditional media	(0.020)	(0.013)	(0.018)	(0.012)	(0.013)	(0.013)
Observations	338,027	331,304	320,685	322,892	267,141	267,141
R-squared	0.190	0.181	0.171	0.202	0.248	0.247
Subnational region & year FEs	✓	✓	✓	✓	✓	✓
Censorship and baseline controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. Censorship of the internet significantly reduces the effect of 3G internet on government approval, while censorship of traditional media significantly increases it. The unit of observation is an individual. The dependent variables are individuals' perceptions of government and the country's institutions. Censorship of the internet is measured using the Limits on Content component of the Freedom on the Net (FOTN) index. In Panel A, it is used as a dummy which is equal to one if the Limits on Content index is 22 or above and zero if the Limits on Content index is below 22 or if a country is a democracy according to Policy IV dataset (i.e., if the Polity2 score is 6 or above). Censorship of the traditional press is measured using Freedom House's Freedom of the Press score. The mean of the latter is subtracted before creating the interaction with 3G coverage. The first principal component of the government approval variables is normalized to vary between zero and one. All regressions include the measure of internet censorship itself (either the dummy, Panel A, or the continuous Limits on Content index, Panel B and Panel C). In Panel C, we also include dummies for all levels of censorship of the traditional media in order to flexibly control for it. Other controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table 3: The effect of 3G penetration on the populists' electoral performance in Europe

Dep. Var:	(1)	(2)	(3)	(4)	(5)
	Vote share of:				
	Right-wing populists	Left-wing populists	Other populists	Right-wing and left-wing populists	All populists
Regional 3G coverage	0.069***	0.059***	-0.012	0.128***	0.116***
	(0.024)	(0.022)	(0.020)	(0.033)	(0.035)
Observations	1,192	1,192	1,192	1,192	1,192
R-squared	0.956	0.895	0.947	0.938	0.932
Mean dep. var	0.148	0.060	0.079	0.208	0.286
Subnational region & year FEs	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The expansion of 3G networks led to an increase in both right-wing and left-wing populists' vote share. The unit of observation is a subnational district within a country. The data cover 87 parliamentary elections in 30 European countries. Controls include the countries' unemployment rate, inflation rate, GDP per capita, and the share of population over 65 years old. Standard errors presented in parentheses are corrected for two-way clusters at the level of subnational regions (to account for over time correlation) and at the level of countries in each year (to account for within-country-year correlation).

A Online Appendix

A.1 Data description

In this section, we present details about the datasets used for the analysis.

The main outcome variables that measure attitudes toward the incumbent government, as well as the individual-level internet access, come from the Gallup World Poll (GWP), annual worldwide surveys conducted by Gallup between 2008 and 2017.[10] These data cover individuals in 160 countries with localization at the subnational region level. The GWP surveys before 2008 cannot be used for our analysis because the data on the localization of respondents were not collected.

As discussed in the main text, the exact questions about government performance in the GWP are: *"Do you have confidence in each of the following, or not: How about the national government? How about the judicial system and courts? How about the honesty of elections? Is corruption widespread throughout the government in (country), or not?"* The respondents could answer "*Yes*" or "*No*". We use the responses to these four questions as well as their first principal component and the average share of positive attitudes to the government along these four dimensions. The question on individuals' internet access is formulated as follows:*"Does your home have access to the internet?"* GWP surveys also inquire about a wide range of individual characteristics, which we use as control variables in the analysis.

The data on the main explanatory variable, namely, 3G mobile networks come from Collins Bartholomew's Mobile Coverage Explorer. As a placebo, we also use 2G mobile networks from the same source.[11] The data on mobile network coverage are available for 159 countries and territories during the years between 2007 and 2018 at the level of 1x1 km binary grid cells. Despite the large number of countries included in the dataset, as shown in Figure 1, mobile-network information on some countries is missing. In particular, this is the case for a number of large countries, such as Algeria, Argentina, Bolivia, China, Pakistan, and Peru.

To combine mobile network coverage data with the GWP surveys, we calculate the share of the subnational region's territory covered by mobile networks at the level of localization of the GWP data, weighted by population density at each point on the map.[12] We perform this procedure separately for each subnational region and year for which both the GWP and mobile coverage data are available. We then merge the share of region's territory covered by 3G and by 2G to the data from the GWP.

[10] These data are described here: https://www.gallup.com/analytics/232838/world-poll.aspx (accessed on May 22, 2019).

[11] These data are described here: https://www.collinsbartholomew.com/map-data-products/vector-map-data/mobile-coverage-explorer/ (accessed on May 22, 2019).

[12] The proxy for population density comes from the NASA dataset. These data are available at: https://neo.sci.gsfc.nasa.gov/view.php?datasetId=SEDAC_POP (accessed on May 22, 2019).

The resulting dataset used in the analysis covers 840,538 individuals in 2,232 subnational regions of 116 countries between 2008 and 2017. The number of countries is below that in the GWP due to the missing data on the mobile network coverage for 38 countries and on the level of democracy—an important control variable discussed below—for 6 countries.

Another source of outcome variables in our analysis is the dataset on the voting results of populist parties in Europe, previously used by Algan et al. (2017). These data cover 87 elections in 409 subnational districts in 30 European countries during the period from 2007 to 2018. We merge these data to data on 3G networks using the same procedure as with the GWP.

To classify the parties' ideologies, we use the Chapel Hill Expert Survey and complement it with text analysis of online sources. In particular, for each of the political parties that participated in parliamentary elections in Europe between 2007 and 2018, we analyze the text of its Wikipedia pages and the sources referenced by Wikipedia. If a party is characterized as "populist" or its policy platform as "populism," the party is classified as populist. Parties are classified as right-wing populists and left-wing populists, when the words "populist" or "populism" are used in one sentence with "right-wing" and "left-wing." In addition, all populist partied with ideology described as "far-right" and "far-left" were coded as "right-wing" and "left-wing," respectively. All populist parties that were not characterized as right-wing or left-wing, were included in the category of "other populists." The list of all populist political parties in Europe according to this classification is presented below in Table A12.

The data on the level of democracy come from the Polity2 score of the Polity IV dataset.[13] These data are available at the country-year level. In all regressions, we control for a dummy indicating that a country in this particular year is a democracy (Polity2 $>$ 5) and a dummy that a country in this particular year is an advanced democracy (Polity2 $>$ 7).

The data on actual corruption incidence come from the IMF's Global Incidents of Corruption Index (GICI) which uses text analysis of the Economist Intelligence Unit's country reports to measure the prevalence of corruption in a particular country in a particular year that the Economist Intelligence Unit considers to be important enough to be described to investors (Furceri, Papageorgiou and Ahir, 2019). These data also cover all countries around the globe for each year since 1996. Note that this measure is distinct from corruption perceptions, as the Economist Intelligence Unit bases these reports on its own country research. In the main text, we use this measure only for the subset of country-years in which the report mentions corruption at least once. Namely, provided that the report mentions corruption, we use the extent to which the report focuses on corruption as a measure of importance of actual corruption. The

[13] It is available at: http://www.systemicpeace.org/inscrdata.html(accessed on May 22, 2019).

results are robust to using the entire sample. The reason for this sample restriction is that corruption may not be a topic of the Economist Intelligence Unit reports in two cases: 1) if corruption is low, and 2) if corruption is very high but widely known, and therefore, is not considered as useful information for investors.

The data on internet censorship come from the Limits on Content Index, which is a component of Freedom House's Freedom on the Net index.[14] These data are available at the country-year level, but cover only 46 counties in our sample during the period from 2009 to 2017. This index varies from 1 to 35 with the mean of 14 and median of 12. In addition to the continuous measure of Limits on Content, we construct a dummy for a high level of online censorship. A country in a particular year is considered to have high censorship on the net if its Limits on Content score is 22 or above. A country is considered to have low internet censorship if it has the Limits on Content score below 22 or, in cases when Freedom House did not calculate the Limits on Content score for that country, if the Polity2 score from the Polity IV dataset is six or above, corresponding to the level of a democracy. The inclusion of democracies as countries with low censorship allows us to increase the size of the sample. Among democracies that have non-missing Limits on Content score, all with the exception of Thailand in 2011 had a score below 22. Thailand in 2011 had a Limits on Content score of 23. In 2015, Thailand's Polity2 score decreased from 7 to -3. The resulting dummy for high/low censorship is defined for 112 countries.

We also use data from Freedom House's Freedom of the Press index.[15] In particular, these data are used to analyze the heterogeneity of the effects of 3G coverage depending on the freedom of the press. As the Freedom of the Press index increases with censorship of the traditional media, we refer to it as the "Censorship of the Press score."

Finally, we use remote sensing techniques to proxy for economic development using high-resolution data on nighttime light density (i.e., luminosity) following Henderson, Storeygard and Weil (2011) and Henderson, Storeygard and Weil (2012). The data on nighttime light density come from DMSP-OLS and VIIRS. The DMSP-OLS data span until 2013.[16] The VIIRS data are available for 2015-2016.[17] We impute luminosity in 2014 by taking an average of VIIRS in 2015 and DMSP-OLS in 2013. We impute luminosity in 2017 (and 2018 in the case of the populists' regressions) by using the value from VIIRS in 2016. The mean level of luminosity, weighted by population density, is calculated for each subnational region and year in our sample. As the nighttime light

[14]The index is described here: https://freedomhouse.org/report/freedom-net-methodology (accessed on May 22, 2019).

[15]These data are available here: https://freedomhouse.org/report-types/freedom-press (accessed on May 22, 2019).

[16]They are described here: https://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html (accessed on May 22, 2019).

[17]They are described here: https://ngdc.noaa.gov/eog/viirs/download_dnb_composites.html (accessed on May 22, 2019).

density data in 2008-2013, 2014, and 2015-2017 come from different sources, and not directly comparable, we allow the effect of luminosity to vary in each of these periods. The incomparability of the nighttime light density data in different sub-periods under study is the reason why we do not include these measures as a baseline control. Below, we establish robustness of the results to adding nighttime light density interacted with pre- and post-2014 dummies to the set of covariates.

Table A1 in this Online Appendix presents summary statistics of all the variables used in the analysis.

A.2 Robustness

In this section, we present the results of additional robustness exercises; they show that the results are robust.

Luminosity as a control for income.—In the baseline specification, we control for the level of economic development with the log of the average income in each of the subnational regions in that year.[18] In several countries and years, the GWP did not collect income data at all. In order to include these countries in the data set, we predict the level of income at the subnational region level for these countries and years using luminosity and GDP per capita data. First, in the sample where all the data are available, we regress the log of the average GWP regional income on log regional luminosity and log GDP per capita, controlling for year and country fixed effects. Both luminosity and per capita GDP have positive and highly significant coefficients. Then, we make an out-of-sample prediction for the log of the average GWP regional income where the GWP income data are missing while the data on luminosity and GDP per capita are available. As data from DMSP-OLS and VIIRS are not directly comparable, we perform this procedure separately for the years in which DMSP-OLS data are available (2008-2013), for the years in which VIIRS data are available (2015-2016), and for 2014, the year for which we impute luminosity by taking an average of VIIRS in 2015 and DMSP-OLS in 2013.

To show that our results are robust to alternative measures of economic development, we re-do the analysis using nighttime light density data as a measure of economic development instead of log average income from the GWP. As data from DMSP-OLS and VIIRS are not directly comparable, we also include an interaction term of luminosity and a dummy for the years for which the data comes from VIIRS and an interaction term of luminosity and a dummy for 2014, the year for which we impute luminosity by taking an average of VIIRS in 2015 and DMSP-OLS in 2013. Table A7 presents the results, in which instead of log average regional income we control for log luminosity.

[18] Income data are available only for a subset of the GWP respondents even when this question was asked, and therefore, controlling for individual income substantially reduces the number of observations.

The results are similar to those presented in Table 1. We also show that the findings for the populists' vote share are robust to the inclusion of log nighttime light density as a control. Table A8 presents the results which are also similar to those presented in Table 3.

Alternative assumptions about the Variance-Covariance Matrix.—Table A9 shows that the results are robust to alternative assumptions about the correlation between the error terms. We take the reduced-form regression presented in column 7 of Panel A of Table 1 as the baseline (also reproduced in row 1 of Table A9) and show in row 2 that the standard errors are only slightly larger with clusters at the country level. We then proceed to testing robustness of the results to correcting standard errors for spatial correlation following Conley (1999), Hsiang (2010), and Collela et al. (2018). In rows 3 to 8, we report the standard errors corrected for spatial correlation of the error terms within 500 and 1000 kilometer radii with autocorrelation up to 10-year temporal lags. In all cases, the estimated effect is statistically significant at the 1% level.

A.3 Heterogeneity of the effect with respect to country- and individual-level characteristics

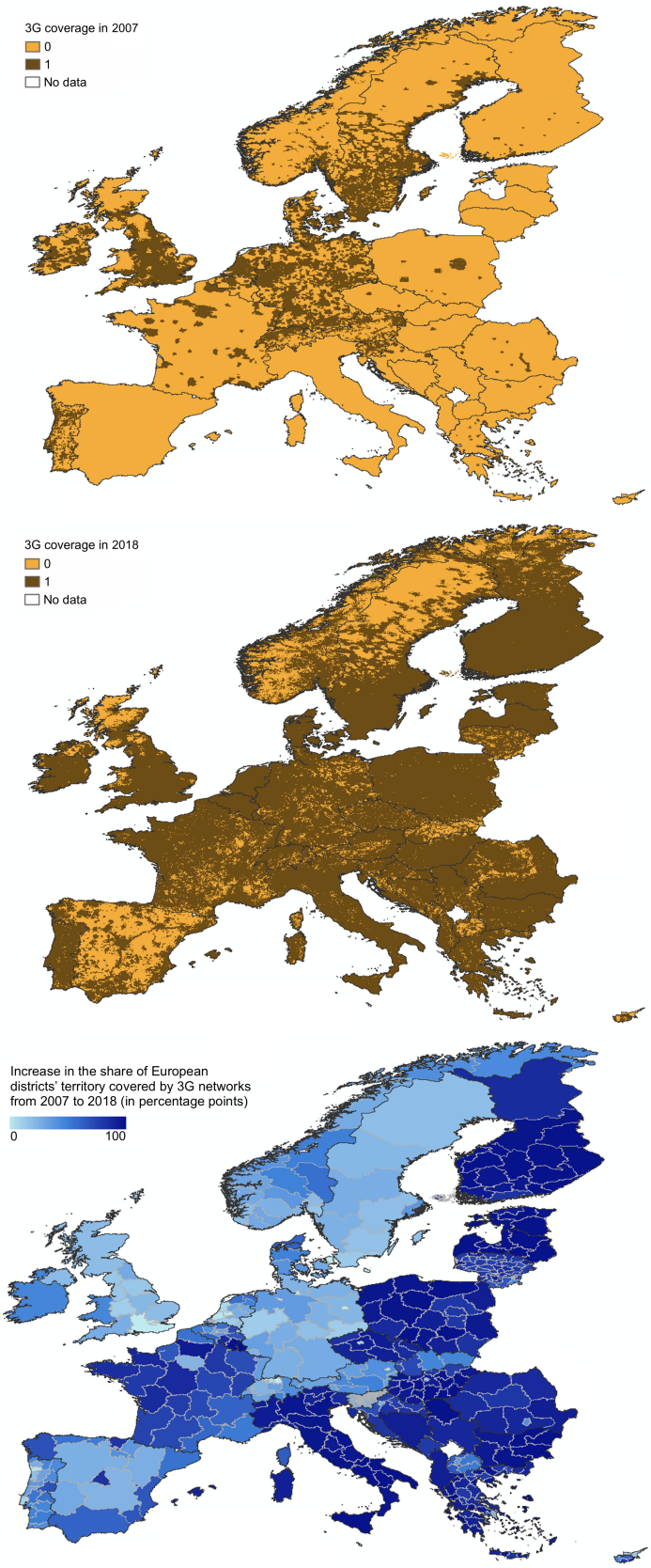
To investigate the heterogeneity of the results with respect to country- and individual-level characteristics, we interact regional 3G coverage with these measures. In addition to the baseline controls, we control flexibly for the censorship of the traditional press (by adding 20 dummies, corresponding to every 5 points in the Censorship of the Press Score), an important variable as demonstrated in Table 2. However, we have to omit the internet censorship measure because it exists only for a subset of countries. Table A10 reports heterogeneity by continents, OECD membership, and the levels of income and democracy. Odd columns present the results for the full sample and even columns for the sub-sample of rural residents. Columns 1 and 2 present the effect of the expansion of 3G separately for each continent. In the pooled sample of urban and rural residents, the effect is significant for the African continent and for each of the Americas. The effect is not significant for Asia and Europe. However, Asia is the continent with the highest number of countries with internet censorship: 11 countries out of 16 with the internet censorship index above 21 are in Asia. In the sub-sample of Asian countries with low internet censorship, the effect is also negative and significant for the total population (the coefficient on *3G* is -0.117 with the standard error of 0.027). In the rural sub-sample, the effect is significant for all continents, including Europe, where the effect is the smallest in magnitude among all continents, but is still sizeable: an expansion of 3G from zero to 100% signal coverage in an average European region is associated with a 4.2 percentage point lower government approval among its rural residents.

Columns 3 and 4 present results separately for OECD and non-OECD countries. The effect is economically and statistically significant in non-OECD countries (we observe 6.8 and 8.5 percentage point decreases in government approval as a result of an increase in 3G availability from zero to the full coverage in the sample of total population and in the sub-sample of rural residents, respectively). Similarly to the results for Europe, the effect for OECD countries is significant only for rural residents. As we discuss in the main text of the paper, the difference between the results for the rural and for the urban areas may be explained by the differences in the availability of offline sources of political information. Columns 5 to 8 of the Table show that there is no significant heterogeneity with respect to per capita GDP or the level of democracy, measured by the Polity2 score.

Table A11 tests for heterogeneity with respect to individual characteristics of the respondents. As in Table A10, odd columns present the results for the full sample and even columns for the sub-sample of rural residents. Columns 1 and 2 show that the effects are significantly stronger for the unemployed than for the employed (-7.1 percentage points vs. -4.8 percentage points, respectively, according to the estimates presented in Column 1). Columns 3 and 4 show that there is no effect of 3G on government approval among respondents with tertiary education, in sharp contrast with the negative and significant effects for respondents with secondary education and for respondents with education below secondary, for whom the magnitude of the effect is the largest. Columns 5 and 6 show that the attitudes of respondents, whose income is above the median country income in that year, are less affected by the expansion of 3G than those of the respondents with below-median income. Finally, Columns 7 and 8 report heterogeneity with respect to age groups. The results indicate that government approval among respondents who are younger than 20 years old is less affected by the expansion of mobile internet than among respondents of other age groups. The effect on the elderly (above 65) is similar in magnitude to the effect on the middle-age group (between 20 and 65).The individual-level heterogeneity results are essentially the same for the total population and for the rural sub-sample, as can be seen from the comparison of the estimates presented in odd and even columns of the Table.

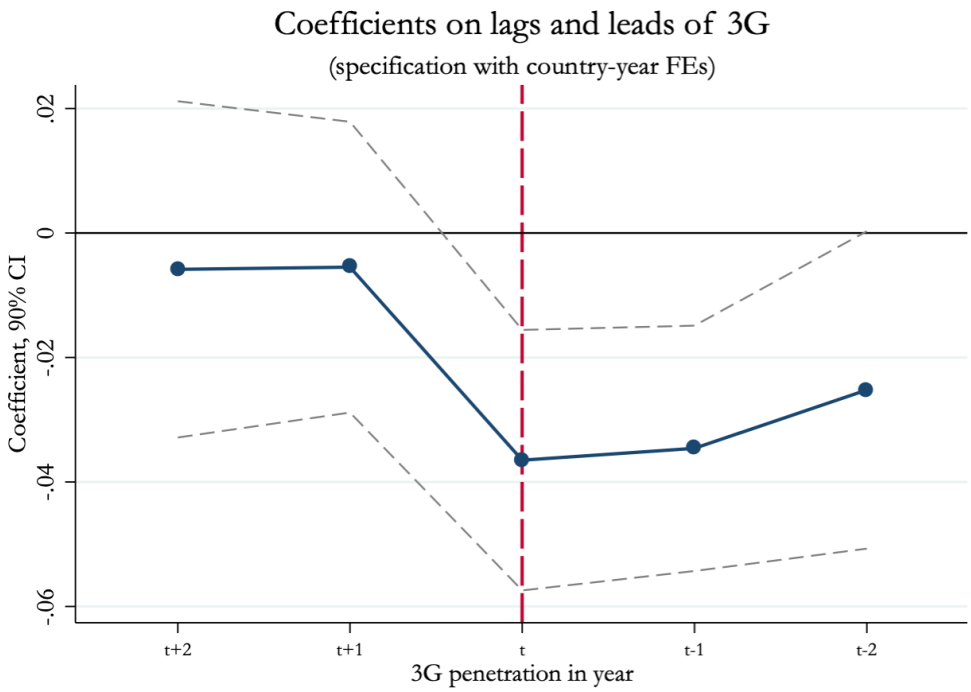
Overall, the results of this heterogeneity analysis are consistent with the hypothesis that the information channel is at least in part driving the political effect of 3G. The attitudes of the more informed (urban and educated) populations in more developed countries are less affected by the expansion of 3G networks.

Figure A1: The growth of 3G network coverage between 2007 and 2018 in Europe



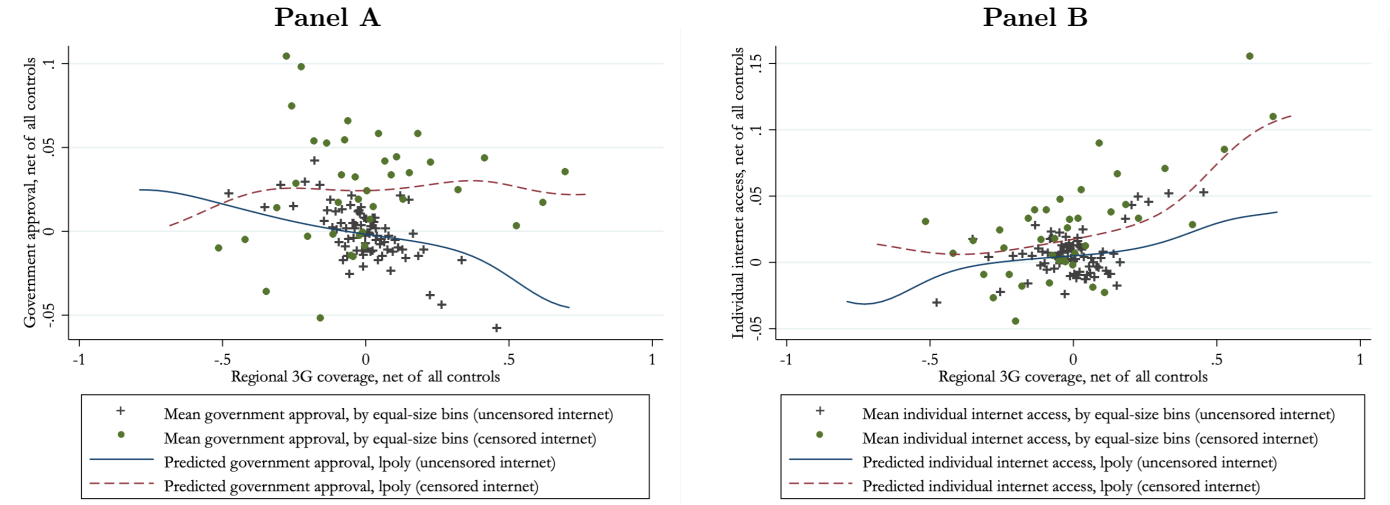
Note: The first two maps present 3G network coverage by grid cell in 2007 and in 2018 for the European countries. The third map presents: 1) the boundaries of districts, which are the spatial unit of observation in the elections data and 2) the increase in the share of the district's territory covered by 3G networks from 2007 to 2018. The sample consists of European countries. There are 409 districts in the sample.

Figure A2: Pre-trend analysis



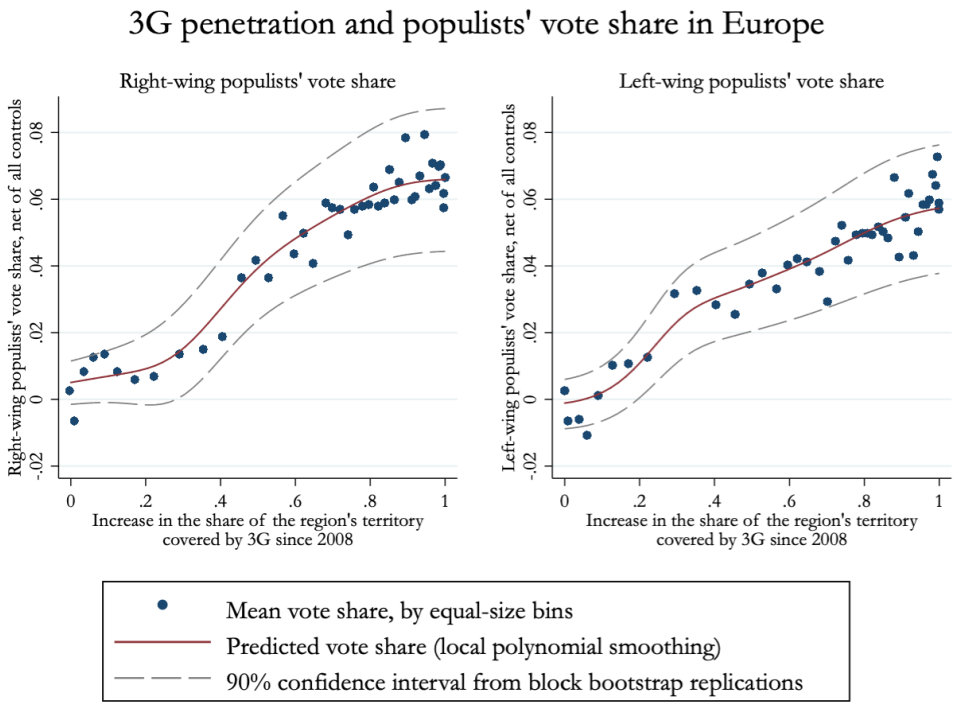
Note: The Figure presents the coefficients from the regressions on the lags and leads of 3G penetration, controlling for country-year fixed effects. In particular, it shows that the coefficients for 3G penetration in years $t+1$ and $t+2$ are not distinguishable from zero. Thus, future expansions of 3G networks are not predicted by current changes in government approval, confirming the parallel pre-trends assumption required for identification.

Figure A3: 3G coverage, confidence in government, and individual internet access in countries with censored and uncensored internet, net of all controls



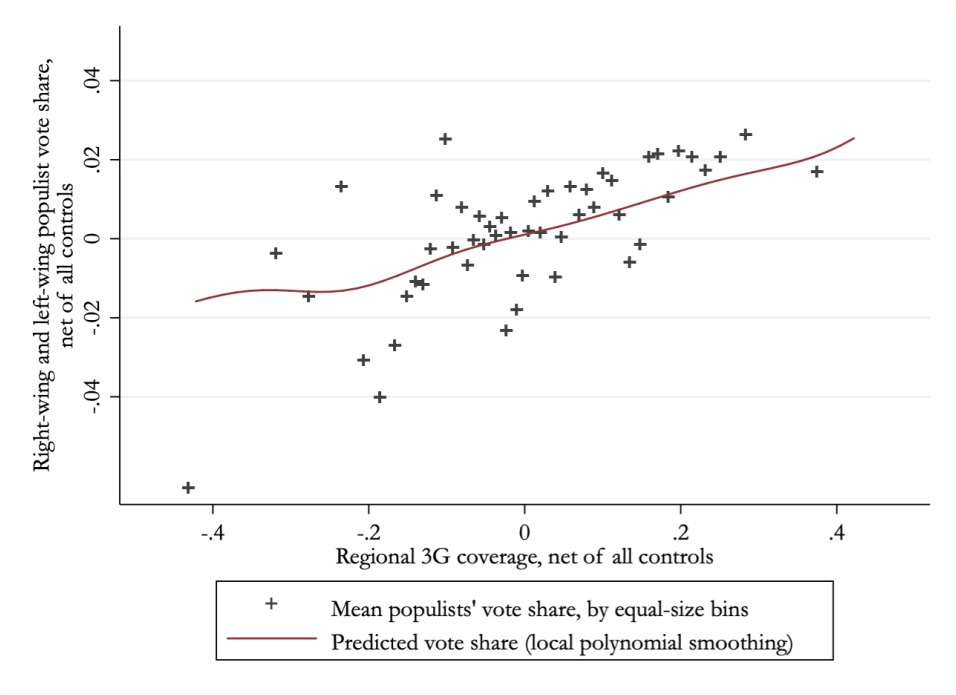
Note: Panel A of the figure illustrates the non-parametric (local polynomial smoothing) relationship between government approval and regional 3G coverage in countries with high and low censorship from column 6 of Panel A of Table 2. The effects of all the controls are subtracted prior to estimating the non-parametric relationship. The dots show the means of the respective outcome variables net of all the controls by equal-size bins. The lines on the graphs show the predicted outcomes (Gaussian kernel, local polynomial smoothing). Panel B of the figure illustrates the first-stage non-parametric (local polynomial smoothing) relationship between individual internet access and regional 3G coverage in countries with high and low censorship. The effects of all the controls are subtracted prior to estimating the non-parametric relationship. The dots show the means of the respective outcome variables net of all the controls by equal-size bins. The lines on the graphs show the predicted outcomes (Gaussian kernel, local polynomial smoothing).

Figure A4: 3G coverage and the populists' vote share, separately for right-wing and left-wing populists



Note: The Figure illustrates the results presented in columns 1 and 2 of Table 3. The dots represent the populists' vote share net of all the controls by equal-size bins. The line of the graph shows the predicted vote share (Gaussian kernel, local polynomial smoothing). The confidence interval is constructed by performing a block bootstrap at the level of the clusters.

Figure A5: 3G coverage and the populists' vote share, net of all controls



Note: The Figure presents the non-parametric (local polynomial smoothing) relationship between regional 3G coverage and the vote share of right-wing and left-wing populists (net of all controls), illustrating the results presented in Column 4 of Table 3. The effects of all the controls are subtracted prior to estimating the non-parametric relationship.

Table A1: The summary statistics of the variables used in the analysis

	Mean	SD	Observations	Source of data
Panel A: GWP				
Individual access to the internet	0.440	0.496	840,538	GWP
Confidence in national government	0.514	0.500	772,354	GWP
Confidence in judicial system	0.534	0.499	748,471	GWP
Honesty of elections	0.505	0.500	732,856	GWP
No corruption in government	0.226	0.418	722,768	GWP
Share of positive government approval responses	0.432	0.348	617,863	GWP
1st principal component of government approval responses	0.439	0.352	617,863	GWP
Regional 3G coverage	0.395	0.401	840,538	Collins Bartholomew
Regional 2G coverage	0.781	0.310	840,538	Collins Bartholomew
Censorship (Limits on Content score)	11.840	6.009	378,534	Freedom House
Dummy for low censorship	0.949	0.220	715,304	Freedom House and Polity IV
Freedom of the Press score	46.602	21.255	840,538	Freedom House
Polity2 score > 7	0.541	0.498	840,538	Polity IV
Polity2 score > 5	0.694	0.461	840,538	Polity IV
Incidence of actual corruption (GICI)	0.272	0.307	801,488	IMF
Ln average regional income	8.309	1.220	840,538	GWP
Ln luminosity (DMSP-OLS)	1.484	2.050	430,017	DMSP-OLS (2008-2013)
Ln luminosity (VIIRS)	-0.788	2.632	191,648	VIIRS (2015-2016)
Female	0.541	0.498	840,538	GWP
Age	41.901	17.776	840,538	GWP
Number of children	1.178	1.834	840,538	GWP
Highest level of education = high school	0.531	0.499	840,538	GWP
Highest level of education = tertiary	0.161	0.368	840,538	GWP
Unemployed	0.059	0.236	840,538	GWP
Employment status not known	0.426	0.494	840,538	GWP
Married	0.573	0.495	840,538	GWP
Divorced	0.065	0.247	840,538	GWP
Widow[er]	0.079	0.269	840,538	GWP
Urban status = large city	0.307	0.461	840,538	GWP
Urban status = suburb of large city	0.096	0.295	840,538	GWP
Urban status = rural location	0.597	0.490	840,538	GWP
Ln GDP per capita	9.323	1.141	840,538	World Bank
Unemployment rate	7.361	5.382	840,538	World Bank
Panel B: Populists' vote share				
Right-wing populists' vote share	0.148	0.172	1192	National election statistics
Left-wing populists' vote share	0.060	0.100	1192	National election statistics
Other (unclassified) populists' vote share	0.079	0.135	1192	National election statistics
All populists' vote share	0.286	0.203	1192	National election statistics
Ln GDP per capita	10.353	0.342	1192	World Bank
Unemployment rate	10.468	6.380	1192	World Bank
Inflation rate	2.208	2.608	1192	World Bank
Share of population over 65 years	17.839	2.033	1192	World Bank
Ln luminosity (DMSP-OLS)	2.401	0.872	823	DMSP-OLS (2007-2013)
Ln luminosity (VIIRS)	0.407	1.078	311	VIIRS (2015-2016)

Table A2: The effect of 3G internet on confidence in government, controlling for country×year fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var:	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: The effect of 3G coverage in year t						
Regional 3G coverage at t	-0.016	-0.029*	-0.056***	-0.036***	-0.037***	-0.036***
	(0.017)	(0.017)	(0.016)	(0.013)	(0.013)	(0.013)
Mean dep. var	0.439	0.534	0.505	0.226	0.432	0.439
Observations	772,353	748,471	732,856	722,768	617,863	617,863
Number of countries	111	116	112	112	110	110
F-stat from the first stage	16.55	15.92	17.45	13.07	18.90	18.90
Panel B: The test for a pre-trend: the effect of the lead of the 3G coverage						
Regional 3G coverage at $t+1$	0.015	-0.012	-0.021	-0.006	-0.006	-0.005
	(0.017)	(0.018)	(0.019)	(0.014)	(0.014)	(0.014)
Mean dep. var	0.514	0.534	0.505	0.226	0.432	0.439
Observations	772,353	748,471	732,856	722,768	617,863	617,863
Number of countries	111	116	112	112	110	110
Subnational region & country×year FEs	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. 3G internet has a significant negative effect on government approval even after controlling for the country-by-year fixed effects. Future expansion of the internet is not correlated with the change in government approval, suggesting that the parallel trends assumption holds. The unit of observation is an individual. Controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, and the regions' average level of income. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A3: The effect of 2G coverage on internet usage and confidence in government.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var:	Individual access to the internet	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: The effect of 2G on internet access and confidence in the government							
Regional 2G coverage	-0.013	0.045	0.031	0.098***	0.054***	0.056***	0.056**
	(0.020)	(0.029)	(0.020)	(0.030)	(0.019)	(0.021)	(0.022)
Observations	840,537	772,353	748,471	732,856	722,768	617,863	617,863
Mean dep. var.	0.44	0.514	0.534	0.505	0.226	0.432	0.439
Panel B: The effect of 3G and 2G and on internet access and confidence in the government							
Regional 3G coverage	0.080***	-0.060***	-0.038***	-0.074***	-0.032**	-0.053***	-0.053***
	(0.017)	(0.020)	(0.015)	(0.020)	(0.014)	(0.015)	(0.015)
Regional 2G coverage	-0.002	0.037	0.026	0.088***	0.049**	0.048**	0.048**
	(0.019)	(0.028)	(0.019)	(0.030)	(0.019)	(0.021)	(0.021)
Observations	840,537	772,353	748,471	732,856	722,768	617,863	617,863
Mean dep. var.	0.440	0.514	0.534	0.505	0.226	0.432	0.439

Note: *** p<0.01, ** p<0.05, * p<0.1. The table presents the reduced form effects of 2G penetration on internet usage and government support. The results suggest that, as expected, the change in 2G coverage did not increase individual internet usage and, on average, increased government support. The unit of observation is an individual. Panel A reports results for the effect of 2G coverage, Panel B—similar results with 3G coverage included as a control variable. Column 1 presents the results of the first stage, columns 2-7—of the reduced form. The dependent variables in columns 2-7 are individuals' perceptions of government and the country's institutions. Other controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A4: Altonji-Elder-Taber test and Oster test

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var:	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: Altonji-Elder-Taber test						
Predicted from observables	0.119	-0.074	0.150	-0.039	0.030	0.031
regional 3G coverage	(0.322)	(0.200)	(0.321)	(0.202)	(0.238)	(0.241)
Panel B: Oster test						
Oster δ for $\gamma_1 = 0$	-4.22	5.83	-7.49	1.63	-1012.00	-733.96

Note: *** p<0.01, ** p<0.05, * p<0.1. Panel A presents the results of the ATE test, showing that the variation from the control variables does not explain the effect of regional 3G coverage on government approval. The estimation involves a two-stage procedure. First, regional 3G coverage is predicted using all the control variables as well as the subnational region and year fixed effects. Controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of luminosity, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. The government approval variables are then regressed on the predicted level of regional 3G coverage, controlling for the subnational region and year fixed effects but not the additional controls. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation). Panel B presents the δs from the Oster test, showing that selection on unobservable variables needs to be very high to reduce the effect of regional 3G coverage to zero. Following Oster (2017), we set the value of $R_{\max}$—the R-squared from a hypothetical regression of the outcome on treatment and both observed and unobserved controls—to be equal to $1.3\tilde{R}$, where $\tilde{R}$ is the R-squared from Table 1.

Table A5: The effect of 3G penetration on life satisfaction and on confidence in local police (placebo outcomes)

	(1)	(2)	(3)	(4)	(5)
Dep. Var:	Current level of life satifaction Range: 0-10	Expected level of life satisfaction in 5 year Range: 0-10	Satisfied with standard of living Range: 0-1	Standard of living getting better Range: 1-3	Confidence in local police Range: 0-1
Panel A: All respondents					
Regional 3G coverage	0.079	0.016	0.009	-0.024	0.009
	(0.063)	(0.074)	(0.012)	(0.028)	(0.014)
Observations	922,399	858,368	865,001	861,972	755,852
Mean dep. var	5.560	6.794	0.621	2.157	0.664
Panel B: Respondents from rural areas					
Regional 3G coverage	0.039	-0.015	0.000	0.010	-0.020
	(0.082)	(0.103)	(0.015)	(0.031)	(0.015)
Observations	528,126	490,372	499,787	505,678	456,173
Mean dep. var	5.278	6.581	0.592	2.138	2.137

Note: *** p<0.01, ** p<0.05, * p<0.1. The table shows that 3G internet did not affect individuals' attitudes towards their life or towards the *local* police, suggesting that access to the internet did not make individuals more negative about the things with which they were already familiar. The unit of observation is an individual. Controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A6: The effect of 3G penetration on government support, depending on the level of censorship of the internet and of the traditional media, subsample of rural residents

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var:	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: Dummy for high internet censorship						
Regional 3G coverage	-0.134***	-0.083***	-0.163***	-0.079***	-0.112***	-0.114***
	(0.029)	(0.020)	(0.027)	(0.019)	(0.020)	(0.021)
Regional 3G coverage ×	0.154***	0.080**	0.241***	0.065**	0.137***	0.139***
Censored internet dummy	(0.044)	(0.039)	(0.032)	(0.030)	(0.034)	(0.035)
Observations	387,537	372,315	365,515	361,210	307,391	307,391
R-squared	0.166	0.161	0.151	0.210	0.224	0.222
Panel B: Continuous measure of internet censorship						
Regional 3G coverage	-0.241***	-0.144***	-0.267***	-0.122***	-0.171***	-0.174***
	(0.073)	(0.043)	(0.068)	(0.040)	(0.052)	(0.053)
Regional 3G coverage ×	0.087**	0.051**	0.115***	0.025	0.054*	0.055*
Censorship of the internet	(0.038)	(0.023)	(0.038)	(0.026)	(0.031)	(0.031)
Observations	200,349	195,949	190,566	190,752	158,813	158,813
R-squared	0.175	0.163	0.153	0.155	0.209	0.210
Panel C: Continuous measure of internet censorship and continuous measure of censorship of the traditional press						
Regional 3G coverage	-0.340***	-0.203***	-0.427***	-0.190***	-0.263***	-0.267***
	(0.074)	(0.063)	(0.083)	(0.042)	(0.055)	(0.056)
Regional 3G coverage ×	0.279***	0.162***	0.331***	0.101***	0.207***	0.212***
Censorship of the internet	(0.060)	(0.051)	(0.069)	(0.037)	(0.046)	(0.047)
Regional 3G coverage ×	-0.082***	-0.044**	-0.071***	-0.021	-0.057***	-0.058***
Censorship of the traditional media	(0.025)	(0.018)	(0.024)	(0.013)	(0.015)	(0.016)
Observations	200,349	195,949	190,566	190,752	158,813	158,813
R-squared	0.189	0.169	0.166	0.164	0.224	0.225
Subnational region & year FEs	✓	✓	✓	✓	✓	✓
Censorship and baseline controls	✓	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The table replicates the results of Table 2 in the subsample of rural residents. The unit of observation is an individual. The dependent variables are individuals' perceptions of government and the country's institutions. Censorship of the internet is measured using the Limits on Content component of the Freedom on the Net (FOTN) index. In Panel A, it is used as a dummy which is equal to one if the Limits on Content index is 22 or above and zero if the Limits on Content index is below 22 or if a country is a democracy according to Policy IV dataset (i.e., if the Polity2 score is 5 or above). Censorship of the traditional media is measured using Freedom House's Freedom of the Press score. The mean of the latter is subtracted before creating the interaction with 3G coverage. The first principal component of the government approval variables is normalized to vary between zero and one. All regressions include the measure of internet censorship itself (either the dummy, Panel A, or the continuous Limits on Content index, Panel B and Panel C). In Panel C, we also include dummies for all levels of censorship of the traditional press. Other controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A7: The effect of 3G on confidence in government, controlling for log luminosity instead of log average regional income.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var:	Individual access to the internet	Confidence in national government	Confidence in judicial system	Honesty of elections	No corruption in government	Share of questions with positive responses	1st principal component of responses
Panel A: All respondents							
	1st stage	*Reduced form*					
Regional 3G coverage	0.090***	-0.050**	-0.029*	-0.057***	-0.037**	-0.045***	-0.046***
	(0.017)	(0.022)	(0.015)	(0.021)	(0.015)	(0.016)	(0.016)
		Second stage, 2SLS					
Individual access to the internet		-0.554**	-0.312*	-0.628**	-0.410**	-0.479**	-0.483**
		(0.252)	(0.163)	(0.258)	(0.184)	(0.186)	(0.188)
F-stat, excluded instrument	28.22	26.91	30.86	26.17	27.52	28.05	28.05
Observations	839,642	771,483	747,624	731,993	721,945	617,104	617,104
Mean dep. var	0.441	0.514	0.533	0.505	0.226	0.432	0.439
Number of countries	116	111	116	112	112	110	110
Panel B: Respondents from rural areas							
	1st stage	*Reduced form*					
Regional 3G coverage	0.084***	-0.063**	-0.038**	-0.079***	-0.053***	-0.059***	-0.060***
	(0.017)	(0.025)	(0.017)	(0.025)	(0.017)	(0.018)	(0.018)
		Second stage, 2SLS					
Individual access to the internet		-0.797**	-0.451**	-0.955***	-0.633***	-0.709***	-0.714***
		(0.315)	(0.197)	(0.348)	(0.210)	(0.230)	(0.233)
F-stat, excluded instrument	23.84	22.13	24.67	21.38	24.14	22.84	22.84
Observations	501,091	463,990	447,631	439,952	431,665	370,324	370,324
Mean dep. var	0.350	0.538	0.556	0.516	0.215	0.444	0.452
Number of countries	115	110	115	111	111	109	109

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is an individual. Panel A reports results for the full sample and Panel B for the subsample of respondents from rural areas. Column 1 presents the results of the first stage, columns 2-7—of the second stage and of the reduced form. The dependent variables in columns 2-7 are individuals' perceptions of government and the country's institutions. Controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of luminosity, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status. As the luminosity data for 2008-2013, 2014, and 2015-2017 come from different sources (DMSP-OLS, a combination of DMSP-OLS and VIIRS, and VIIRS, respectively), we also interact the measure of luminosity with a dummy for each of those time periods. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A8: The effect of 3G penetration on the populists' electoral performance in Europe, controlling for log luminosity

Dep. Var:	(1)	(2)	(3)	(4)	(5)
	Vote share of:				
	Right-wing populists	Left-wing populists	Other populists	Right-wing and left-wing populists	All populists
Regional 3G coverage	0.059**	0.070***	-0.010	0.129***	0.119***
	(0.028)	(0.019)	(0.019)	(0.035)	(0.034)
Observations	1,192	1,192	1,192	1,192	1,192
R-squared	0.959	0.899	0.947	0.939	0.933
Mean dep. var	0.148	0.060	0.079	0.208	0.286
Subnational region & year FEs	✓	✓	✓	✓	✓

Note: *** p<0.01, ** p<0.05, * p<0.1. The expansion of 3G networks led to an increase in both right-wing and left-wing populists' vote share. The unit of observation is a subnational region within a country. The data cover 87 parliamentary elections in 30 European countries. Other controls include the countries' unemployment rate, inflation rate, GDP per capita, the share of urban population, the share of population that is 65 years or older, and the regions' average level of luminosity. As the luminosity data for 2007-2013, 2014, and 2015-2018 come from different sources (DMSP-OLS, a combination of DMSP-OLS and VIIRS, and VIIRS, respectively), we also interact the measure of luminosity with a dummy for each of those time periods. Standard errors presented in parentheses are corrected for two-way clusters at the level of subnational districts (to account for over time correlation) and at the level of countries in each year (to account for within-country-year correlation).

Table A9: Robustness to alternative assumptions about variance-covariance matrix

Dependent variable: 1st principal component of responses about confidence in government		
	Assumptions about variance-covariance matrix:	Regional 3G coverage
Coefficient		-0.057
(1)	Baseline: 2-way clusters by region and country-year	(0.015)***
(2)	Clusters by country	(0.019)***
	Conley correction for spatial correlation within:	
(3)	- 500km and 1 temporal lag	(0.013)***
(4)	- 500km and 5 temporal lags	(0.014)***
(5)	- 500km and 10 temporal lags	(0.014)***
(6)	- 1000km and 1 temporal lag	(0.014)***
(7)	- 1000km and 5 temporal lags	(0.014)***
(8)	- 1000km and 10 temporal lags	(0.015)***
Observations		617,863

Note: *** p<0.01, ** p<0.05, * p<0.1. The table shows that the results are robust to clustering by country and to adjusting standard errors to spatial correlation at 500 and 1000 km radii with 1 and 5-year temporal lags.

Table A10: Heterogeneity with respect to country's geography, income, and democracy

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.:	The 1st principal component of the measures of government approval							
Sample:	All	Rural	All	Rural	All	Rural	All	Rural
Regional 3G coverage × Africa	-0.067**	-0.086**						
	(0.026)	(0.039)						
Regional 3G coverage × Asia & Oceania	-0.030	-0.050*						
	(0.026)	(0.029)						
Regional 3G coverage × Europe	-0.011	-0.042*						
	(0.021)	(0.022)						
Regional 3G coverage × North and Central America	-0.167***	-0.199***						
	(0.039)	(0.046)						
Regional 3G coverage × South America	-0.173***	-0.208***						
	(0.045)	(0.063)						
Regional 3G coverage × OECD			-0.023	-0.043*				
			(0.025)	(0.025)				
Regional 3G coverage × non-OECD			-0.068***	-0.085***				
			(0.015)	(0.020)				
Regional 3G coverage					-0.054***	-0.069***	-0.056***	-0.064***
					(0.014)	(0.019)	(0.016)	(0.022)
Regional 3G coverage × Ln GDP per capita (demeaned)					-0.015	-0.014		
					(0.014)	(0.017)		
Regional 3G coverage × Polity 2 (demeaned)							-0.000	-0.004
							(0.003)	(0.004)
Observations	617,863	371,055	617,863	371,055	617,863	371,055	617,863	371,055
R-squared	0.242	0.226	0.242	0.225	0.242	0.225	0.242	0.225

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is an individual. Odd columns report results for the full sample and even columns for the subsample of respondents from rural areas. Unreported controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status, and 20 dummies 5-point intervals measuring the level of censorship of the traditional press. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A11: Heterogeneity with respect to respondent's education, employment status, income, and age

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.:	The 1st principal component of the measures of government approval							
Sample:	All	Rural	All	Rural	All	Rural	All	Rural
Regional 3G coverage	-0.048***	-0.065***	-0.081***	-0.096***	-0.070***	-0.084***	-0.057***	-0.074***
	(0.015)	(0.018)	(0.016)	(0.019)	(0.015)	(0.017)	(0.015)	(0.018)
Regional 3G coverage × Unemployed	-0.023***	-0.027***						
	(0.007)	(0.008)						
Regional 3G coverage × Employment status missing	-0.015***	-0.015***						
	(0.005)	(0.006)						
Regional 3G coverage × Tertiary education			0.082***	0.103***				
			(0.013)	(0.015)				
Regional 3G coverage × Secondary education			0.020**	0.019**				
			(0.008)	(0.009)				
Regional 3G coverage × Income above country median					0.038***	0.043***		
					(0.003)	(0.004)		
Regional 3G coverage × Income missing					-0.018	-0.019		
					(0.031)	(0.038)		
Regional 3G coverage × Age below 20							0.025***	0.033***
							(0.007)	(0.008)
Regional 3G coverage × Age above 65							-0.007	-0.004
							(0.007)	(0.006)
Observations	617,863	371,055	617,863	371,055	617,863	371,055	617,863	371,055
R-squared	0.242	0.225	0.242	0.226	0.242	0.226	0.242	0.226

Note: *** p<0.01, ** p<0.05, * p<0.1. The unit of observation is an individual. Odd columns report results for the full sample and even columns for the subsample of respondents from rural areas. Unreported controls include age, age squared, gender, marital status, dummies for high school and university education, employment status, urban status, the regions' average level of income, the log of the countries' GDP per capita, the countries' unemployment rate, and dummies for democracy status, and 20 dummies 5-point intervals measuring the level of censorship of the traditional press. Standard errors in parentheses are corrected for two-way clusters at the level of the subnational regions (to account for correlation over time) and at the level of countries in each year (to account for within-country-year correlation).

Table A12: The classification of populist political parties in Europe

Country	Right-wing populists	Left-wing populists	Unclassified populists
Austria	Freedom Party of Austria (2008, 2013, 2017), BZÖ – Jörg Haider's List (2008), Alliance for the Future of Austria (2013), Team Stronach (2013)	List Peter Pilz (2017)	List Roland Düringer - My Vote Counts (2017)
Belgium	Vlaams Belang (2007, 2010, 2014), Libertair, Direct, Democratisch (2007, 2010, 2014), Parti Populaire (2010, 2014), National Front (2007, 2010, 2014)		
Bulgaria	Attack (2009, 2013, 2014), National Front for the Salvation of Bulgaria (2013), IMRO – Bulgarian National Movement (2013), Patriotic Front (2014), Bulgaria without Censorship (2014), United Patriots (2017), Volya Movement (2017)	Coalition for Bulgaria (2009, 2013), BSP - Left Bulgaria (2014, 2017)	GERB (2009, 2013, 2014, 2017), Order, Law and Justice (2009, 2013), National Movement for Stability and Progress (2009), People's Voice (2013, 2014)
Croatia	Croatian Party of Rights (2007, 2011, 2016), Croatian Democratic Alliance of Slavonia and Baranja (2007, 2011, 2016), Croatian Party of Rights Dr. Ante Starčević (2011)	Croatian Labourists – Labour Party (2011)	Human Shield (2016), STRANKA RADA (2016)
Cyprus	ELAM - National Popular Front (2011, 2016)	Citizens' Alliance (2016)	DIKO - Democratic Party (2011, 2016)
Czech Republic	Dawn of Direct Democracy (2013), Freedom and Direct Democracy (2017)	Party of Citizens' Rights - Zemanovci (2010, 2013)	Public Affairs (2010), ANO 2011 (2013, 2017)
Denmark	Danish People's Party (2007, 2011, 2015)		
Estonia			Estonian Centre Party (2007, 2011), People's Union of Estonia (2007, 2011)
Finland	Finns Party (2007, 2011)		
France	Front National (2007, 2012, 2017), Debout la France (2017)	La France Insoumise (2017)	
Germany	National Democratic Party of Germany (2009, 2013, 2017), The Republicans (2009), Alternative for Germany (2013, 2017)	Die Linke (2009, 2013, 2017), Die Partei (2017)	
Greece	LA.O.S. - Popular Orthodox Rally (2007, 2009, 2012), Golden Dawn (2012, 2015), ANEL - Independent Greeks (2012, 2015)	SYRIZA - Coalition of the Radical Left (2007, 2009, 2012, 2015), Popular Unity (2015)	

Hungary	FIDESZ - Hungarian Civic Union (2010, 2014, 2018), JOBBIK - Movement for a Better Hungary (2010, 2014, 2018), MDF - Hungarian Democratic Forum (2010)		
Italy	Fratelli d'Italia (2013, 2018), Lega Nord (2008, 2013, 2018), CasaPound Italia (2018)	Rivoluzione Civile (2013), Potere al Popolo! (2018)	Movimento 5 Stelle (2013, 2018), Il Popolo della Libertà (2008, 2013), Italia dei Valori (2008), Forza Italia (2018)
Latvia	NA - National Alliance (2010, 2011, 2014), For Latvia from the Heart (2014)		
Liechtenstein	DU - The Independents (2013, 2017)		
Lithuania	TT - Party "Order and Justice" - Liberal Democratic Party (2008, 2012), JL - Party "Young Lithuanians" (2008, 2012)	FRONTAS - Political party "Frontas" (2008), SLF - Socialist People's Front (2012)	TPP - National Resurrection Party (2008), DP+j - The Coalition "Labor party + youth" (2008), DK - Political Party 'The Way of Courage' (2012), DP (2012)
Luxembourg		KPL - Communist Party of Luxembourg (2009, 2013)	
Montenegro	Movement For Changes – We Can Do It (2009), Serbian National List (2009), Democratic Front (2012, 2016)	European Montenegro (2009, 2012), Democratic Party of Socialists (2016), Albanians Decisively (2016)	Montenegro
Netherlands	Party for Freedom (2010, 2012, 2017), Forum for Democracy (2017)	Socialist Party (2010, 2012, 2017)	50PLUS (2012, 2017)
Norway	Progress Party (2009, 2013, 2017)		Centre Party (2009, 2013, 2017)
Nothern Macedonia	VMRO-DPMNE (2008, 2011), United for Macedonia (2011)		
Poland	Self-Defense (2007), Law and Justice (2007, 2011, 2015), League of Polish Families (2007), Kukiz'15 (2015)		Palikot's Movement (2011)
Portugal		B.E. - Left Bloc (2009, 2011, 2015)	CDS – People's Party (2009, 2011, 2015), Democratic Republican Party (2015)
Romania	Greater Romania Party (2008, 2012), New Generation Party – Christian Democratic (2008)	People's Party - Dan Diaconescu (2012)	

Slovakia	Slovak National Party (2010, 2012, 2016), L'SNS - Kotleba – People's Party Our Slovakia (2010, 2012, 2016), SME RODINA - We Are Family (2016)	SMER - Direction (2010, 2012, 2016)	HZDS - People's Party – Movement for a Democratic Slovakia (2010, 2012), 99perc (2012)
Slovenia	SDS - Slovenian Democratic Party (2008, 2011, 2014, 2018), SNS - Slovene National Party (2008, 2011, 2014, 2018), Lipa - Party Lime Tree (2008)		LMS - List of Marjan Šarec (2018)
Spain	Plataforma per Catalunya (2011), Vox (2015, 2016)	PODEMOS (2015, 2016)	Convergència i Unió (2008, 2011), Ciudadanos-Partido de la Ciudadanía (2015, 2016)
Sweden	Sweden Democrats (2010, 2014, 2018)		
Switzerland	Swiss People's Party (2007, 2011, 2015), Federal Democratic Union (2007, 2011, 2015), Swiss Democrats (2007, 2015), Ticino League (2007, 2011, 2015), Geneva Citizens' Movement (2011, 2015)		
United Kingdom	UKIP (2010, 2015, 2017), British National Party (2010)		