The Impact of 3G Internet on Political Accountability Evidence from the U.S. House of Representatives

Anna Dagorret, Fang Guo

March 15, 2023

Abstract

How has 3G internet affected the political accountability of elected officials? Using a difference-in-difference design by exploiting the gradual roll-out of 3G network across different congressional districts in the U.S., we find that an increase in 3G coverage significantly increases the legislative activities of the U.S. House representatives: they introduce more substantive and significant bills, and allocate more staffing resources to legislation. However, representatives devote less effort to constituency service: they are less likely to serve on constituency-oriented committees, and there is weak evidence of lower district spending and lower staffing resources for constituency service. One possible mechanism is that the 3G internet makes elected officials more attentive to the feedback from their online voter base that rewards more legislative activities than constituency service. Analyzing over 1 million Facebook posts of the representatives, we find that online voters interact significantly more with legislation-related posts, but they engage much less with constituency-related posts. Posting legislation-related content also significantly increases the campaign donations in the days after the post by a larger amount than posting constituency-related content. Our preliminary findings suggest that while elected officials are more likely to be held accountable for their legislative actions, there is less incentive for them to provide constituency service.[1]

[1]We are grateful for the continued guidance from Greg Martin, Andy Hall, and Neil Malhotra. For comments, we thank Enerakd Fikejs, Hanna Folsz, Sandy Handan-Nader, Jake Jares, Janet Malzahn, Andy Myers, Toby Nowacki, Saikun Shi, Jennifer Wu, Shun Yamaya, Chenoa Yorgason, and participants at the 2022 Berkeley-Stanford American Politics Conference.

1 Introduction

The presence of media has long been considered a crucial force in holding elected officials accountable. From radios and newspapers to televisions, traditional media outlets provide voters with the necessary information to evaluate their representatives (Strömberg (2004a); Strömberg (2004b); Besley and Prat (2006); Snyder and Strömberg (2010); Strömberg (2015); Enikolopov and Petrova (2015)). The recent explosion of social media, thanks to the expansion of the third generation of wireless mobile telecommunications technology (3G) that enabled users to browse the internet from their smartphones, has dramatically reshaped how individuals access information about politics. In 2021, more than eight in ten U.S. adults reported getting news on digital devices, and half of them said they get news from social media (Shearer (2021)). 3G internet and social media have also allowed elected officials to directly broadcast their political activities and ideological positions online, as well as interact with and receive feedback from online voters. As early as 2015, more than 95% of the U.S. House representatives had their own Facebook and Twitter accounts (Straus (2018)). The prevalence of social media among both voters and elected officials raises an important question: how has social media affected political accountability, and how is that different from the previous era of traditional media?

On one hand, social media might increase political accountability. It offers a new channel of information consumption, potentially helping voters learn more about their representatives in ways that traditional media couldn't offer. Social media also allows elected officials to discuss public issues, receive immediate feedback on policy actions, and measure political discontent (Barberá et al. (2019); Zhuravskaya, Petrova, and Enikolopov (2020)). Improving the information flow between voters and elected officials could make elected officials more responsive to the demands of their constituents and make elected officials better representatives of their districts.

On the other hand, social media might decrease political accountability. Without proper content moderation or fact-checking, users face an extremely low cost of generating and sharing fake news, and the sensational nature of fake stories make them spread faster than true stories (Allcott and Gentzkow (2017); Vosoughi, Roy, and Aral (2018)). In addition, elected officials themselves could exaggerate their efforts and abilities on social media. As a result, the abundance of information, especially false and exaggerated information, could make it harder for voters to evaluate the performance of their representatives, thus allowing

incumbents to shirk their responsibilities without electoral punishment.

More importantly, social media might not affect political accountability in a clear-cut manner. For example, the U.S. House representatives (and their staff members) are responsible for a wide range of activities: sponsoring and analyzing legislation that addresses local, national, and international problems; serving on committees; participating in hearings and floor debate; representing their districts' interests in roll-call votes; communicating with voters; and last but not least, providing constituency service (Petersen (2022)). Given limited time and staffing resources, representatives face key trade-offs when allocating their efforts among various activities, specifically between legislative activities, which delivers national benefits, and constituency service, which focuses on district-specific benefits (Ashworth (2005)). If 3G internet and social media changed how voters or incumbents perceive the relative importance between these activities, we might see differential effects on different activities. A recent study in Brazil finds that the expansion of 3G network increases politicians' online communication with voters but crowds out offline engagement, as measured by speeches and earmarked transfers (Bessone et al. (2022)). Another possibility is that in the time of internet and social media expansion, voters focus more on national politics than on their local issues, so elected officials also allocate their effort toward activities related to national policy making and away from serving their local communities.

In this paper, we empirically study the effects of the expansion of 3G internet on the political accountability of U.S. House representatives between 2009 and 2019. Using a difference-in-difference design by exploiting the gradual roll-out of 3G network across different congressional districts, we examine the effects on three types of representatives' activities: legislation, constituency service, and roll-call voting. Specifically, we find that an increase in 3G coverage significantly increases the legislative activities of the representatives: they introduce more substantive and significant bills, and allocate more staffing resources to legislation. However, representatives devote less effort to constituency service: they are less likely to serve on constituency-oriented committees, and there is weak evidence of lower district spending and lower staffing resources for constituency service. Finally, we find no effect of 3G expansion on the alignment between representatives' actual roll-call votes and the policy preferences of their constituents.

We analyze one mechanism that might explain the opposite effects of 3G network on legislative activities and on constituency service: the rise of 3G network makes elected officials more attentive to the feedback from their online voter base that rewards legislative

activities more than constituency services. Analyzing over 1 million Facebook posts of the U.S. House representatives, we find that online voters interact significantly more with legislation-related posts, but they engage much less with constituency-related posts. Posting legislation-related content also significantly increases the campaign donations in the days after the post by a larger amount than posting constituency-related content. Our preliminary findings suggest that while elected officials are more likely to be held accountable for their national policy decisions, there is less incentive for them to provide constituency service.

Our paper contributes to several strands of literature. First, we add to the literature studying the effect of media outlets on political accountability (Strömberg (2004a); Strömberg (2004b); Besley and Prat (2006); Snyder and Strömberg (2010); Bessone et al. (2022), etc.). Second, we contribute to the literature studying the political impact of the internet and social media (Gentzkow and Shapiro (2011); Falck, Gold, and Heblich (2014); Bakshy, Messing, and Adamic (2015); Hendel, Lach, and Spiegel (2017); Acemoglu, Hassan, and Tahoun (2018); Yanagizawa-Drott, Petrova, and Enikolopov (2019); Gavazza, Nardotto, and Valletti (2019); Enikolopov, Makarin, and Petrova (2020); Fujiwara, Müller, and Schwarz (2021); Guess et al. (2021); Melnikov (2021), etc.). Third, our study relates to the broader literature on the political content of media and its impact on voters' views and behaviors (Martin and Yurukoglu (2017); Martin and McCrain (2019); Broockman and Kalla (2022); Kalla and Broockman (2022), etc.). Furthermore, our study speaks to the recent literature on the nationalization of politics (Hopkins (2018); Martin and McCrain (2019); Moskowitz (2021); Thompson et al. (2022), etc.).

2 Empirical Study

2.1 3G Network Coverage Data

The 3G mobile network is the first generation of mobile networks that enabled users to browse the internet from their smartphones, which gave rise to the popularity of social media (Rainie and Wellman (2012)). We collect the 3G coverage of every congressional district between 111 to 116 Congress sessions (2009 - 2019) through *Collins Bartholomew's Mobile Coverage Explorer*.[2] The data consists of 1-1 kilometer binary grid cells. Figure

[2]Ideally, we want to include the earliest expansion of 3G from 2007 to 2009 into our sample as well, but due to data issues, we have not yet included this time period.

Figure 1: Map of 3G coverage in the US in 2010 and 2019

(a) 3G coverage in 2010

(b) 3G coverage in 2019

1 and Figure 2 illustrate the expansion of 3G network coverage between 2010 and 2019 [3], showing that very few locations had 3G coverage in 2010, while by 2020, 3G mobile internet had become available in most parts of the country.

For each district and Congress session, we compute the district level population-weighted 3G coverage by utilizing the Census population data at the block group level:

$$3G_d = \frac{\sum_{b \in B_d} \alpha_b N_b}{\sum_{b \in B_d} N_b} \tag{1}$$

where $\alpha_b = \frac{Area_{b,3G}}{Area_b}$. B_d is the set of block groups that lie within district d. For each block group b with N_b population, we use the share of area covered by b (α_b) as a proxy for computing the share of population covered by 3G in b. Aggregating to the district level gives us the population weighted 3G coverage at the district level. A few block groups overlap with several districts. For these particular cases, we compute the area from each block group that belongs to each district, and that is covered by 3G, and we compute the corresponding share of population.

2.2 Specification

We estimate the following difference-in-difference model using the data of House representatives from 111th to 116th Congress sessions (2009 to 2019):

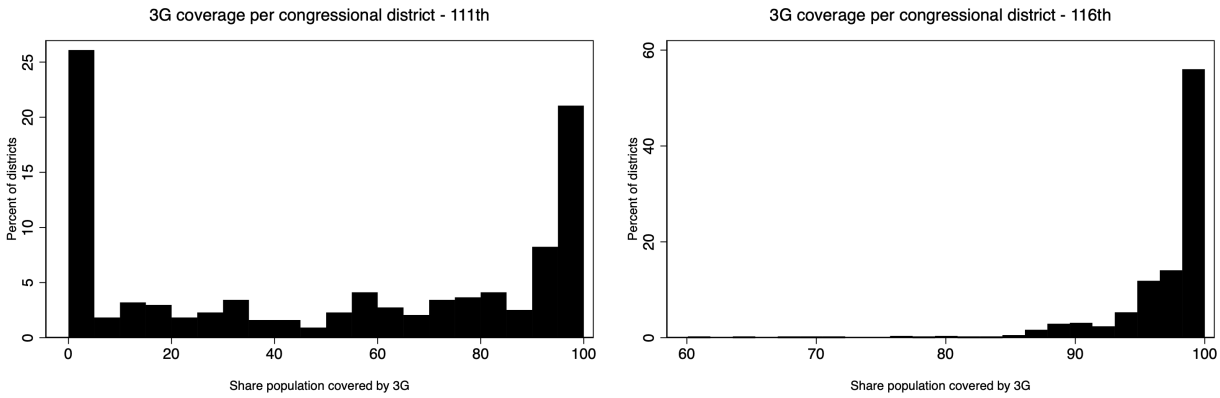
$$Y_{i,t} = \beta 3G_{d,t} + \mathbf{X}'_{d,t}\lambda_1 + \mathbf{Z}'_{i,t}\lambda_2 + \varphi_i + \tau_t + \varepsilon_{i,t} \tag{2}$$

where i and t index a representative i during session t.[4] For the outcome variable

[3] We don't have access to the 2009 (resp. 2021) 3G coverage map, so we assume that 3G coverage in 2009 (resp. 2019) is the same than in 2010 (resp. 2020).

[4] We drop observations where two representatives served in the same district during the same session due

Figure 2: Distribution of 3G coverage in the US in 2010 and 2019



(a) 3G population coverage in 2010

(b) 3G population coverage in 2019

$Y_{i,t}$, we use a variety of measures of a representative's legislative activities, constituency service, and roll-call voting, which will be discussed in detail in the following sections. $3G_{d,t}$ is the population weighted 3G coverage in district d of representative i during session t. $\mathbf{X}_{d,t}$ is a vector of time-varying district level controls (population, median age, share of population over 60 years of age, share of white, share of population working in agriculture and manufacturing, share of population with a bachelor degree, median income, district density). $\mathbf{Z}_{i,t}$ is another vector of time-varying individual level controls (seniority, whether i belong to majority party or not during session t, committee and subcommittee chair status). φ_i and τ_t are individual and session fixed effects.

The identification of the 3G effects relies on a few assumptions. First, there is no unobserved time-varying confounders that correlate with the expansion of 3G and affect incumbents' activities at the same time. This is similar to the classic parallel trend assumption in a binary difference-in-difference design. To ensure that this assumption holds, we include several time-varying covariates at both individual and district level. For example, one concern is that 3G expanded most rapidly in the rural areas in early 2010s, and it was also the time period where the House majority switched from the Democrats to the Republicans, so the changes in incumbents' activities could be a result of majority party status. To address this concern, we add a control variable for majority party indicator for representative i during session t. In addition, based on our data, 3G coverage increased most significantly in the rural areas from the 112th to 113th Congress (2011 to 2013), when the House majority

to one representative resigning before her term ended.

was already Republican. For similar concerns about the correlation between 3G roll-out and representatives' seniority, district economic conditions, etc., we also add the relevant controls into our regression model. The second assumption is no anticipation effects, i.e. the level of future 3G coverage does not affect representatives' behaviors in the current period. To test this, we regress our outcomes during the pre-treatment period (in 2005 and 2007) on the share of 3G coverage in 2009. In order to test for pre-trends in the evolution of 3G, we also regress pre-treatment outcomes on the difference in 3G coverage between 2009 and 2019. We include the same set of district level controls. The regression outputs in Table 7 (see Appendix) document the absence of pre-trends. Columns (3) and (5) show that there is no significant effect of 3G coverage in 2009 and of the evolution in 3G coverage throughout the period on pre-treatment outcomes.

2.3 Legislative Activities

A major responsibility of a U.S. House representative is legislation. To assess how 3G internet affects their legislative activities, we obtain data on from the *Center for Effective Lawmaking* (Volden and Wiseman (2014)). Specifically, for each member during each session, we have the number of bills introduced, the number of those bills that received any action in committee (AIC), the number of those bills that received any action beyond committee (ABC) on the floor of the House, the number of those bills that subsequently passed the House, and the number of those bills that eventually became law. Following the definitions of the *Center for Effective Lawmaking*, all bills are categorized into substantive and significant, substantive, and commemorative. A bill is considered as substantive and significant if it had been the subject of the end-of-the-year write-up in the Congressional Quarterly Almanac (113th Congress or before) or if it had been mentioned on two or more occasions in the stories published in Congressional Quarterly Weekly/CQ Magazine during that Congress (114th Congress or later). A bill is deemed commemorative if it relates to providing for a renaming, commemoration, or private relief of an individual, etc. Finally, all other bills are grouped into the substantive category.

The dataset also includes the legislative effectiveness score (LES), which combines all the above activities into a weighted composite measure of legislative activities:

$$LES_{it} = \left[\begin{array}{l} \left(\frac{\alpha BILL_{it}^{C} + \beta BILL_{it}^{S} + \gamma BILL_{it}^{SS}}{\alpha \sum_{j=1}^{N} BILL_{jt}^{C} + \beta \sum_{j=1}^{N} BILL_{jt}^{S} + \gamma \sum_{j=1}^{N} BILL_{jt}^{SS}} \right) \\ + \left(\frac{\alpha AIC_{it}^{C} + \beta AIC_{it}^{S} + \gamma AIC_{it}^{SS}}{\alpha \sum_{j=1}^{N} AIC_{jt}^{C} + \beta \sum_{j=1}^{N} AIC_{jt}^{S} + \gamma \sum_{j=1}^{N} AIC_{jt}^{SS}} \right) \\ + \left(\frac{\alpha ABC_{it}^{C} + \beta ABC_{it}^{S} + \gamma ABC_{it}^{SS}}{\alpha \sum_{j=1}^{N} ABC_{jt}^{C} + \beta \sum_{j=1}^{N} ABC_{jt}^{S} + \gamma \sum_{j=1}^{N} ABC_{jt}^{SS}} \right) \\ + \left(\frac{\alpha PASS_{it}^{C} + \beta PASS_{it}^{S} + \gamma PASS_{it}^{SS}}{\alpha \sum_{j=1}^{N} PASS_{jt}^{C} + \beta \sum_{j=1}^{N} PASS_{jt}^{S} + \gamma \sum_{j=1}^{N} PASS_{jt}^{SS}} \right) \\ + \left(\frac{\alpha LAW_{it}^{C} + \beta LAW_{it}^{S} + \gamma LAW_{it}^{SS}}{\alpha \sum_{j=1}^{N} LAW_{jt}^{C} + \beta \sum_{j=1}^{N} LAW_{jt}^{S} + \gamma \sum_{j=1}^{N} LAW_{jt}^{SS}} \right) \end{array} \right] \left[\frac{N}{5} \right] \tag{3}$$

where for each representative i during Congress session t, the five large terms represent the member's fraction of bills introduced, receiving AIC, receiving ABC, passing the House, and becoming law, relative to all N representatives. Within each of these five terms, commemorative bills are weighted by $\alpha = 1$, substantive bills by $\beta = 5$, and substantive and significant by $\gamma = 10$. The overall weighting of N/5 normalizes the average LES to take a value of 1 in each Congress (Volden and Wiseman (2014)).[5] For easier interpretation, we further normalize the LES to range from 0 to 1.

Table 1 presents the estimated effects of 3G coverage on representatives' LES, following Equation 2. In column (1), only representative and session fixed effects are included. Column (2) additionally controls for time varying covariates. Column (3) replaces session FE and majority party indicator with a session by party FE, which controls for any unobserved characteristics of each party in each session. For example, the estimate in Column (1) means that an increase of 3G coverage from 0% to 100% is associated with a 0.027 increase in normalized LES, which is around a 40% increase from the average of 0.062. All three columns show a consistently positive effect of similar magnitude and similar significance level, suggesting that the expansion of 3G internet increases legislative activities.

In Figure 3, we use the same specification as in Table 1 Column (2) to analyze the fifteen specific items that are used in computing LES. We normalize each outcome to range from 0 to 1 for easier comparison, and report our results by party. We find that 3G coverage significantly increases the number of substantive and significant bills sponsored, bills that received AIC and ABC, but we find no effect on commemorative bills and mixed effects on substantive bills. Since substantive and significant bills are more visible and impactful than commemorative and substantive bills, our results further show that the representatives increase their legislative activities in a meaningful way as their districts get more 3G coverage.

[5] See https://thelawmakers.org/methodology for more details.

Table 1: The Effect of 3G Coverage on Legislative Effectiveness Score, U.S. House 111th - 116th Congress Sessions

	(1)	(2)	(3)
	Legislative Effectiveness Score		
3G Coverage	0.027**	0.026***	0.028**
	(0.010)	(0.010)	(0.012)
Session FE	Y	Y	N
Session by Party FE	N	N	Y
Time-Varying Covariates	N	Y	Y
Mean DepVar	0.062	0.062	0.062
Observations	2550	2550	2550
R^2	0.480	0.649	0.651

Notes: This table presents the results of estimating Equation (2). The unit of observation is representative-session. The study period covers U.S. House representatives from 111th to 116th Congress sessions (2009 to 2019). The outcome variable Legislative Effectiveness Score (LES) is a weighted index of fifteen indicators of legislative activities defined by the *Center for Effectiveness Lawmaking* (Volden and Wiseman (2014)). We normalize LES to range from 0 to 1. The main independent variable 3G Coverage is the share of population in representative i's district covered by 3G at the beginning of session t. Column (1) includes representative and session fixed effects. Column (2) includes representative and session fixed effects, as well as time-varying covariates (majority party, seniority, committee/subcommittee chair, percent of redistricting, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Column (3) includes representative fixed effects and session by party fixed effects, as well as time-varying covariates except for majority party. Standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

In addition, the effect sizes are similar for both Democratic and Republican representatives, suggesting that our results are not driven by any particular party.

2.4 Committee Choices

We next study how increasing 3G coverage affects incumbents' committee choices. Snyder and Strömberg (2010) finds that representatives from more "congruent" districts (more press coverage of the representative) more frequently serve on committees that help promote constituency interests. In this section, we study whether there is a similar or different effect on constituency service in the context of higher 3G coverage.

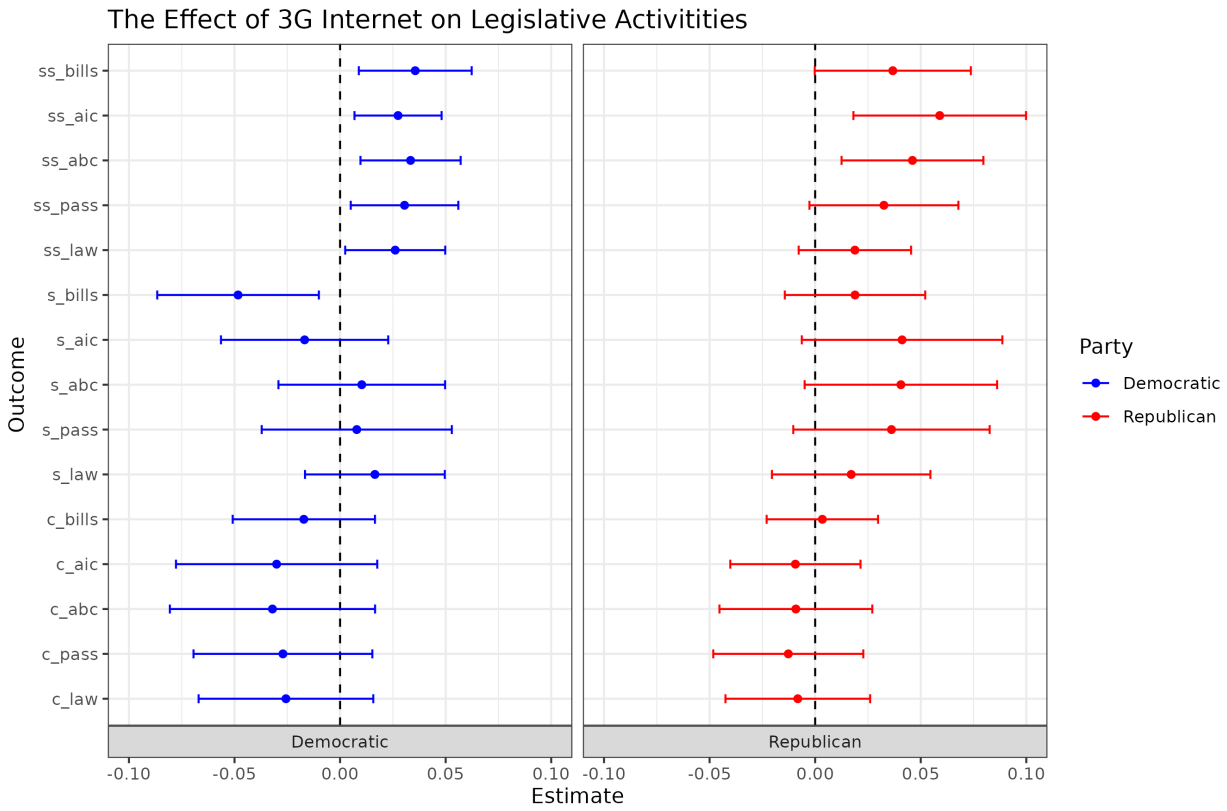
Committee assignments typically involve four steps. At the beginning of each congress, members first submit their choices for committees to the steering committees of each party, which comprise the elected party leadership and members appointed by the leadership, etc. Second, the steering committee for each party votes by secret ballot to nominate members for assignments to the committees. Third, the full party caucus votes to approve the steering committee's nominations. Finally, the nominations are forwarded to the House floor, which votes on simple resolutions to officially make the assignments (Schneider (2007), Greene (2022)).[6]

Following Snyder and Strömberg (2010), we focus on three major categories of the House committees: constituency-oriented, prestige, and policy-oriented. Constituency-oriented committees include agriculture, resources, science, small business, transportation and infrastructure, national security, and veterans affairs. Members on these committees can better engage in constituency service and pork barrel politics. Prestige committees include appropriations, budget, rules, and ways and means, which are influential in determining the budget, amount of appropriations, and taxation. Policy-oriented committees include the judiciary committee and the international relations/foreign affairs committee, which help representatives better influence foreign policies. Figure 4 shows the share of Democratic/Republican representatives on constituency-oriented/prestige/policy-oriented committees over time. The trend seems fairly stable over time for both Democratic and Republican representatives, where around 45% of them serve on constituency-oriented committees, 30% on prestige committees, and 20% on policy-oriented committees.

For each category, we construct two types of outcome variables: (1) binary indicator

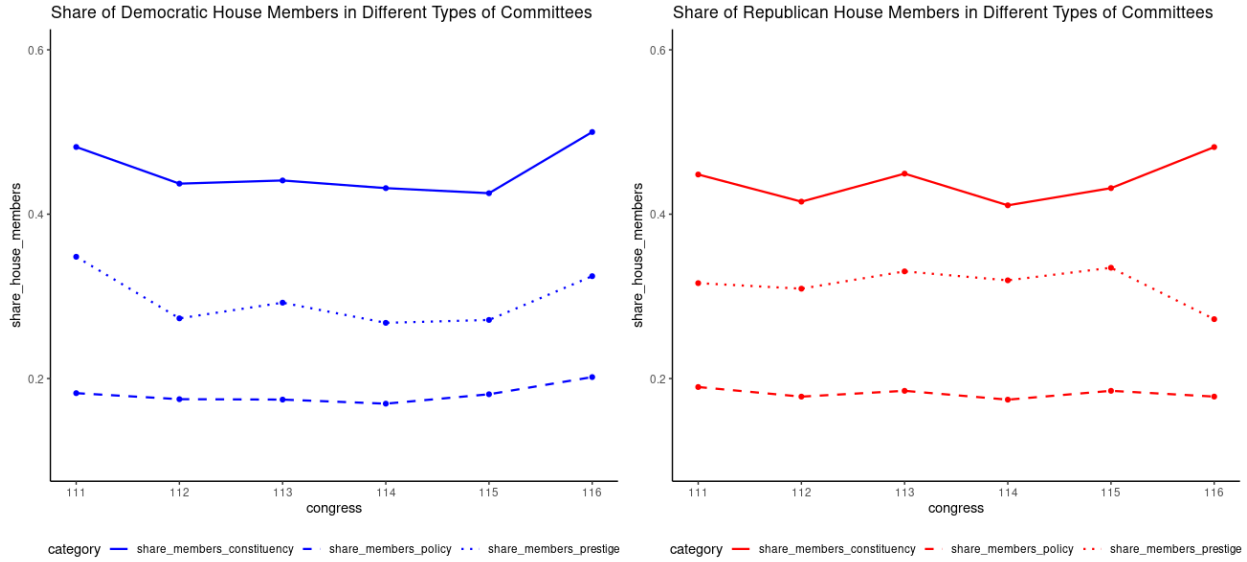
[6]The Speaker of the House and the majority leader usually do not serve on committees, so they have been excluded from this analysis.

Figure 3: The Effect of 3G Internet on Legislative Activities, U.S. House 111th - 116th Congress Sessions



Notes: This figure presents the 95% confidence intervals of the coefficient estimates of Equation (2) separately for Democratic representatives and Republican representatives. The unit of observation is representative-session. The study period covers U.S. House representatives from 111th to 116th congress sessions (2009 to 2019). The outcome variables are the fifteen different components of LES (number of substantive and significant/substantive/commemorative bills introduced/AIC/ABC/passed/became law). We normalize each outcome to range from 0 to 1. The main independent variable 3G Coverage is the share of population in representative i's district covered by 3G at the beginning of session t. All regressions include representative and session fixed effects, as well as time-varying covariates (seniority, committee/subcommittee chair, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Standard errors in parentheses, clustered at representative level.

Figure 4: Committee Assignments, U.S. House 111th - 116th Congress Sessions



Notes: This figure plots the share of U.S. House representatives by party on the three different types of committees over time from 111th to 116th Congress sessions. The solid lines refer to the share of Democratic/Republican representatives on constituency-oriented committees. The dotted lines refer to the share of Democratic/Republican representatives on prestige committees. The dashed lines refer to the share of Democratic/Republican representatives on policy-oriented committees.

of whether representative i is on any committee in this category during session t, and (2) the total number of committees in this category that representative i served on during session t. Table 2 shows the results of estimating Equation 2 with committee assignments as outcomes. Notably, on both the extensive and intensive margins, increasing 3G coverage decreases representatives' involvement in constituency-oriented committees. There is null effect on prestige or policy-oriented committees. The negative results on constituency-oriented committees stand in contrast to the positive effect on legislative activities in the previous section, suggesting that the rise of 3G internet might induce incumbents to make trade-offs between legislative activities and constituency service. Our findings also depart from Snyder and Strömberg (2010), implying that in the era of new media technology like 3G and social media, representatives are less likely to be held accountable for their constituency services.

2.5 District Spending

In the previous section, we show that increasing 3G coverage makes representatives less likely to serve on committees that promote constituency service. In addition to committee

Table 2: The Effect of 3G Internet on Committee Choices, U.S. House 111th - 116th Congress Sessions

	Committee Choices					
	Binary			Count		
	Constituency	Prestige	Policy	Constituency	Prestige	Policy
	(1)	(2)	(3)	(4)	(5)	(6)
3G Coverage	-0.197^{***}	-0.019	0.014	-0.403^{***}	-0.021	0.014
	(0.050)	(0.050)	(0.041)	(0.086)	(0.062)	(0.044)
Rep. FE & Session FE	Y	Y	Y	Y	Y	Y
Time-Varying Covariates	Y	Y	Y	Y	Y	Y
Mean DepVar	0.446	0.308	0.181	0.639	0.344	0.202
Observations	2520	2520	2520	2520	2520	2520
R^2	0.802	0.798	0.826	0.807	0.792	0.840

Notes: This table presents the results of estimating Equation (2). The unit of observation is representative-session. The study period covers U.S. House representatives from 111th to 116th congress sessions (2009 to 2019). Observations for the House speaker and majority leader are dropped as they typically do not serve on committees. Column (1) to (3) use binary outcomes for whether a representative i during session t serve on any constituency-oriented/prestige/policy-oriented committees. Column (4) to (6) use the number of constituency-oriented/prestige/policy-oriented committees that representative i during session t serve on. The main independent variable 3G Coverage is the share of population in representative i's district covered by 3G at the beginning of session t. All columns include representative and session fixed effects as well as time-varying covariates (majority party, seniority, committee/subcommittee chair, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

assignments, securing federal funding for the districts is also an important channel of serving the constituents. If representatives spend less effort serving their districts, then we should observe less federal funds flowing into the districts with higher 3G coverage. To test this, we collect district spending data from *USASpending.gov*, which tracks all the contracts, grants, loans, and other forms of financial assistance from federal agencies to congressional districts since 2008.[7] We understand the limitations of our current measure, as it might not just be the result of a representative's effort, but also the result of presidential and bureaucratic influence. As a next step, we plan to follow Hammond and Rosenstiel (2020) to refine our measure of district funding.

Table 3 shows the results of estimating Equation 2 using our current measure of spending. Column (1) uses the total amount of district spending (in million dollars) as outcome. Column (2) uses per person district spending (in dollars), which is the total spending divided by the district population. Column (3) uses logged total amount of district spending as outcome. All specifications show a negative effect, although only the first two columns are significant. In general, there is suggestive evidence that higher 3G coverage might be associated with lower district spending, which is consistent with the previous finding that representatives shift their focus away from serving their constituents' interests.

2.6 Congressional Staffing

Staff members in every U.S. House representative' office play an essential role in supporting legislation and providing constituency services (Eckman (2017)). As elected officials re-allocate their efforts toward legislative activities and decrease their constituency service following the rise of 3G network, one should expect a similar pattern of re-allocation of staffing resources between legislative staff and constituency service staff. We use a comprehensive dataset of congressional staff employment records covering the years between the 111th and 116th Congress sessions from *Legistorm*. The employment period of each staffer could be on a yearly, half a year, or quarterly term, so we assign each staffer's employment to a Congress session based on the start date of the employment. The dataset also includes the job titles of the staffers and links staffers directly to each representative, allowing us to see how many staffers and what types of staffers each representative hired during each session.

We mainly categorize the staffers' positions into legislative support and constituency

[7] We currently focus on the grants to counties or cities or towns and exclude contracts to companies.

Table 3: The Effect of 3G Coverage on District Spending, U.S. House 111th - 116th Congress Sessions

	(1) Total Amount	(2) Per Person Amount	(3) Logged Total
3G Coverage	-57.389^{***}	-65.730^{**}	-0.047
	(21.874)	(29.830)	(0.148)
Rep. FE & Session FE	Y	Y	Y
Time-Varying Covariates	Y	Y	Y
Mean DepVar	139.4	191.0	18.16
Observations	2550	2550	2550
R^2	0.820	0.825	0.679

Notes: This table presents the results of estimating Equation (2). The unit of observation is member-session. The study period covers U.S. House members from 111th to 116th congress sessions (2009 to 2019). Column (1) uses the total amount of district spending (in million dollars) as outcome. Column (2) uses per person district spending (in dollars) as outcome. Column (3) uses logged total amount of district spending as outcome. The main independent variable 3G Coverage is the share of population in member i's district covered by 3G at the beginning of session t. All columns include representative and session fixed effects as well as time-varying covariates (majority party, seniority, committee/subcommittee chair, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Standard errors in parentheses, clustered at congress member level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

service based on the job titles. If a title contains the word "legislative" or "policy", then we consider it as a legislative support position. If a title contains the word "district", "constituent", "local", "grant" as well as state, county, city and town names that lie within a congressional district, then we consider it as a constituency service position.[8] In addition, we also include a category for interns if the title contains the word "intern", as offering internship opportunities to students is also considered as constituency service given its educational nature (Eckman (2017)).

Table 4 shows that 3G coverage significantly increases the number of legislative staffers in a representative's office. A representative on average has 6.295 staffers working on legislation, so the increase of 0.767 is around a 12% increase from the average. On the other hand, there is only a small and insignificant decline in the number of constituency service staff. Interestingly, there is a sizable decrease in the number of interns, although the estimate is significant at only 10% level. Overall, we find supporting evidence of 3G increasing the number of legislative staff, but only weak evidence of decreasing constituency service staff and interns.

[8]Staffers who help local organizations with grant applications are considered as constituency service staffers (Eckman (2017)).

Table 4: The Effect of 3G Coverage on Congressional Staffing, U.S. House 111th - 116th Congress Sessions

	Number of Staff		
	Legislative	Constituency	Intern
3G Coverage	0.767^{***}	-0.157	-1.193^{*}
	(0.261)	(0.294)	(0.626)
Rep. FE & Session FE	Y	Y	Y
Time-Varying Covariates	Y	Y	Y
Mean DepVar	6.300	7.008	4.202
Observations	2550	2550	2550
R^2	0.597	0.778	0.803

Notes: This table presents the results of estimating Equation (2). The unit of observation is representative-session. The study period covers U.S. House representatives from 111th to 116th congress sessions (2009 to 2019). Column (1) to (3) use number of legislative staff, number of constituency service staff, and number of interns during each session as outcome variables, respectively. The main independent variable 3G Coverage is the share of population in representative i's district covered by 3G at the beginning of session t. All columns include representative and session fixed effects as well as time-varying covariates (majority party, seniority, committee/subcommittee chair, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

3 Mechanisms

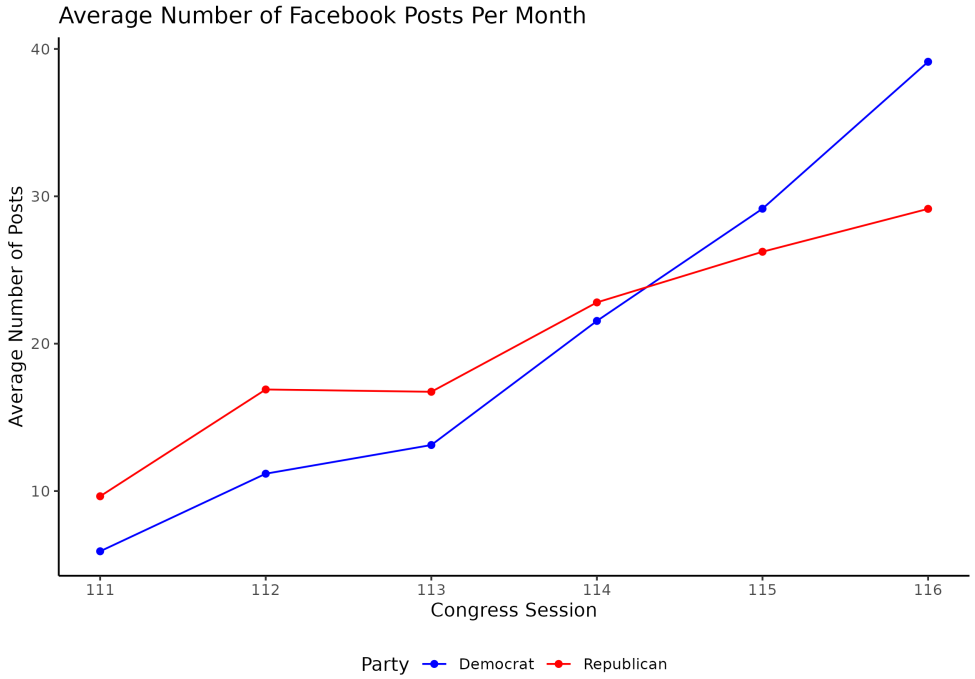
Our empirical study finds that an increase in 3G coverage significantly increases the legislative activities of the representatives: they sponsor and pass more substantive and significant bills and allocate more staffing resources to legislation. However, representatives devote less effort to constituency service: they are less likely to serve on constituency-oriented committees, and there is weak evidence of lower district spending and lower staffing resources for constituency service.

Unlike traditional media outlets that tend to hold elected officials accountable for all their activities, the rise of 3G network and social media fundamentally changes the effort allocation of the representatives. In the following section, we provide one possible mechanism focusing on role of online feedback. As a next step, we also plan to explore another possible mechanism related to voter information and knowledge.

3.1 3G and Feedback on Social Media

One important change associated with the rise of 3G internet is the rising popularity of social media among voters and politicians. Especially for U.S. House representatives, they use social media to communicate their political positions, broadcast their activities in

Figure 5: Facebook Activities, U.S. House 111th - 116th Congress Sessions



Notes: This figure plots the average number of Facebook posts per month of U.S. House representatives (who have a Facebook account) by party from 111th to 116th Congress sessions.

Congress, and interact with their constituents. Therefore, one mechanism behind the reallocation of efforts could be that the House representatives receive more positive feedback on social media for their legislative activities than for their constituency service.

We collect over 1 million Facebook posts of all the House representatives from 111th to 116th Congress session through *CrowdTangle*. For each post, we have the posting date, the full text of the post, the number of likes, comments, shares and other interactions with the post. Many studies have analyzed politicians' behaviors on Twitter, which is mostly used by journalists and more liberal voters in the US. Using Facebook data allows us to analyze politicians' behaviors and their implications on a platform with equal representation of liberal and conservative voters (Van Kessel et al. (2020)). Figure 5 shows the average monthly Facebook activities of the House representatives over time, where the Democrats and the Republicans do not display substantial difference in the level and trend of Facebook usage.

Using the Facebook post level data, we first classify content into two major categories. Specifically, we flag a post as legislation-related if it includes keywords such as "bill", "legislation", "sponsor", "law", etc. We also flag a post as constituency-related if it contains

any local place name (state, county, city, or town) in the district.[9] Based on this categorization, 22% of the Facebook posts in our sample are legislation-related, and 41% of the posts are constituency-related. The omitted category is for posts that do not fall into either category.[10] To analyze whether the legislation-related posts receive more attention on social media, we estimate the following equation:

$$Y_j = \beta_1 Legislation_j + \beta_2 Constituency_j + \mathbf{X}_j'\lambda + \varphi_i + \tau_m + \varepsilon_j \tag{4}$$

where j indexes a Facebook post created by representative i in year month m. $Legislation_j$ and $Constituency_j$ are indicator variables for whether Facebook post j contains legislation-related or constituency-related content. $\mathbf{X}_j$ is a vector of post level controls (total number of words, whether the post includes a link, photo or video, number of shares of the post). We include representative fixed effects φ_i to account for the different levels of Facebook popularity across different representatives. We also include year-month fixed effects τ_m to account for the different levels of Facebook popularity in different time periods. Y_j is an integer outcome variable capturing how many interactions (measured as the total number of likes, comments, and other reactions) there are with a given post j.

Table 5 shows that Facebook posts that contain legislation-related content receive significantly more interactions whereas posts that contain constituency-related content receive significantly less. The effect is substantial: in column (1), a post that discusses legislation attracts 16 more interactions, and the average number of interactions is 315.23, so the increase is around 5%. The negative effect of mentioning constituency and local issues is even larger: a decrease of 64 interactions from an average of 315.23 is around 20%. Our results are similar when we focus on the number likes of a post in Column(3), which is the most common type of interactions on Facebook. These results suggest that House representatives might have an incentive allocate more effort to legislative activities and less effort to constituency service based on the feedback from online voters.

Moreover, legislation-related posts not only attract social media attention, but also attract campaign donations. We use campaign donations data from the *Database on Ideology, Money in Politics, and Elections (DIME)* created by Bonica (2019). The DIME dataset provides comprehensive information on the date and amount of contributions made from

[9]The two categories are not mutually exclusive. A post could contain both legislation-related content and constituency-related content.

[10]For example, representatives sometimes post about holidays and their families, which do not contain any legislation or constituency related content.

Table 5: Facebook Users' Reaction to Facebook Posts that Mention Legislation

	(1) Interactions	(2) Log Interactions	(3) Likes	(4) Log Likes
Mention Legislation	16.218***	0.161***	11.665***	0.136***
	(5.971)	(0.011)	(4.438)	(0.011)
Mention Constituency	−63.660***	−0.204***	−35.101***	−0.120***
	(11.262)	(0.014)	(7.428)	(0.013)
Rep. FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y
Covariates	Y	Y	Y	Y
Mean DepVar	315.23	315.23	173.23	173.23
Nobs	1064955	1064955	1064955	1064955
R^2	0.733	0.525	0.260	0.507

Notes: This table presents the results of estimating Equation (4). The unit of observation is a Facebook post. The study covers all Facebook posts of the U.S. House representatives from 111th to 116th congress sessions (2009 to 2019). Column (1) to (4) use the total number of interactions, logged number interactions, total number of likes, logged number of likes as outcome variables, respectively. The main independent variables are the two indicator variables for legislation-related and constituency-related posts. All columns include representative fixed effects, year-month fixed effects, as well as post level covariates (total number of words, whether the post includes a link, photo or video, number of shares of the post). Robust standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

each donor to each recipient. These variables allow us to track the campaign donations in the next few days following a politician's Facebook activities.

Combining DIME data with Facebook data, we construct a representative-day level panel of Facebook activities and campaign donations. In particular, we flag whether a representative posts legislation-related content or constituency-related content in one day and track the campaign donations she receives on that day and the following day. If donors also reward legislation-related posts, then we should see a positive relationship between posting legislation-related content and campaign contributions. Specifically, we estimate the following equation at representative-day level:

$$Y_{i,t} = \beta_1 Legislation_{i,t} + \beta_2 Constituency_{i,t} + \mathbf{X}'_{i,t}\lambda + \varphi_i + \tau_m + \varepsilon_j \tag{5}$$

where we subset to the representative-days where there is at least one Facebook post.[11] $Y_{i,t}$ reports three fundraising outcomes by representative i on day t and the following day: log total amount raised, log total number of receipts, and log total number of unique donors. $Legislation_{i,t}$ and $Constituency_{i,t}$ are indicator variables for whether any Facebook post

[11]We decide to do the subsetting to avoid comparing days where representatives made a post to days where representatives didn't make any post.

Table 6: The Effect of Facebook Posts that Mention Legislation on Campaign Donations

	Log Amount	Log No. Receipts	Log No. Donors
Mention Legislation	0.151***	0.032***	0.032***
	(0.017)	(0.009)	(0.008)
Mention Constituency	0.069***	0.014*	0.015**
	(0.021)	(0.008)	(0.007)
Rep. FE	Y	Y	Y
Year-Month FE	Y	Y	Y
Covariates	Y	Y	Y
Mean DepVar	3.276	0.965	0.942
Nobs	523469	523469	523469
R^2	0.351	0.461	0.455

Notes: This table presents the results of estimating Equation (5). The unit of observation is a representative-day. The study covers all the U.S. House representatives who used Facebook from 111th to 116th congress sessions (2009 to 2019). Column (1) to (3) use logged total amount raised, logged total number of receipts, and logged total number of unique donors on the day and the day after the representative posted on Facebook, respectively. The main independent variables are the two indicator variables for whether a representative in a given day posted legislation-related or constituency-related posts. All columns include representative fixed effects, year-month fixed effects, as well as covariates (total number of words in all the posts on that day, whether any post includes a link, photo or video, number of shares of all the post). Robust standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

of representative i on day t is legislation-related or constituency-related. $\mathbf{X}_{i,t}$ is a vector of controls for the Facebook post characteristics (total number of words in all the posts on that day, whether any post includes a link, photo or video, number of shares of all the post). We include representative fixed effects φ_i to account for different levels of campaign fundraising of different representatives. We also include year-month fixed effects τ_m to account for the potential time specific patterns of donation. Table 6 shows that posting legislation-related content increases campaign contributions by almost 5% from the average, which aligns with the earlier findings on online interactions, suggesting that representatives not only receive more online attention, but also receive monetary returns for discussing legislation-related issues on social media. Interestingly, the coefficient estimate on constituency-related content is also positive and significant, but the effect size is much smaller, which is only around half of the return on legislation-related content. These results indicate that donors reward legislation-related content similarly as Facebook users in general, although their response to constituency-related content is not as negative. Our findings further suggest that the popularity of social media in the wake of 3G expansion gives representatives more incentives to allocate their efforts toward legislative activities and away from constituency service.

3.2 3G and Voter Knowledge

Having sufficient knowledge of their representatives and current events helps voters hold elected officials accountable. We plan to perform an in-depth analysis of how 3G expansion affects voters' knowledge of politics. Specifically, we will use the CCES data from 2009 to 2019, which covers questions about whether a respondent knows the party affiliation of her representative/senators/governor, her level of approval of her representative/senators/governor, and her general interests in news, etc. We are also in the process of getting more granular 3G coverage data at the zipcode-year level.[12] Putting the two datasets together, we can study how 3G coverage affects voter knowledge by running the following specification at the individual respondent level:

$$Y_{i,t} = \beta 3G_{z(i),t} + \mathbf{X}_i'\lambda_1 + \mathbf{W}_{z(i),t}'\lambda_2 + \varphi_{d(i),t} + \varepsilon_{i,t} \tag{6}$$

where $Y_{i,t}$ is the outcome variable on voter knowledge for respondent i surveyed in year t. Since CCES contains various questions on voter knowledge, we will construct a composite index of the different knowledge variables. $3G_{z(i),t}$ is the population weighted 3G coverage in zipcode d of respondent i in year t, which is a proxy for how likely respondent i's home is covered by 3G. $\mathbf{X}_i$ includes a set of respondent level controls (age, family income, partisanship, etc.). $\mathbf{W}_{z(i),t}$ includes a set of zipcode level controls (population, density, median income etc.). $\varphi_{d(i),t}$ is the district by year fixed effect, which allows us to compare respondents who are represented by the same incumbent in the same year. Once we finish collecting and cleaning the relevant datasets, we will include our findings in this section.

4 Conclusion

In this paper, we empirically study the effects of the expansion of 3G internet on the political accountability of U.S. House representatives between 2009 and 2019. Using a difference-in-difference design by exploiting the gradual roll-out of 3G coverage across different congressional districts, we examine the effects on three types of representatives' activities: legislation, constituency service, and roll-call voting. Specifically, we find that an increase in 3G coverage significantly increases the legislative activities of the representatives: they introduce more substantive and significant bills, and allocate more staffing resources

[12] The most granular information we have for CCES respondent's address is zipcode, so we use 3G coverage at zipcode level as a proxy for how likely respondent i's home is covered by 3G.

to legislation. However, representatives devote less effort to constituency service: they are less likely to serve on constituency-oriented committees, and there is weak evidence of lower district spending and lower staffing resources for constituency service. Finally, we find no effect of 3G expansion on the issue agreement between representatives' actual roll-call votes and the policy preferences of their constituents.

We analyze one possible mechanism that explains the opposite effects of 3G network on legislative activities and on constituency service: the rise of 3G network makes elected officials more attentive to the feedback from their online voter base that rewards legislative activities more than constituency services. Analyzing over 1 million Facebook posts of the U.S. House representatives, we find that online voters interact significantly more with legislation-related posts, but they engage much less with constituency-related posts. Posting legislation-related content also significantly increases the campaign donations in the days after the post by a larger amount than posting constituency-related content. Our preliminary findings suggest that although elected officials are more likely to be held accountable for their legislative activities, there is less incentive for them to provide constituency service.

For next steps, we plan to improve our paper in the following aspects. First, in section 2.5, we will construct a more accurate measure of district funding using the appropriations data. Second, we will continue studying how 3G internet affects voter knowledge in section 3.2. Finally, we will perform more robustness checks for our main results and results in the mechanism sections.

References

Acemoglu, Daron, Tarek A Hassan, and Ahmed Tahoun (2018). "The power of the street: Evidence from Egypt's Arab Spring". In: *The Review of Financial Studies* 31(1), pp. 1–42.

Allcott, Hunt and Matthew Gentzkow (2017). "Social media and fake news in the 2016 election". In: *Journal of economic perspectives* 31(2), pp. 211–236.

Ashworth, Scott (2005). "Reputational dynamics and political careers". In: *Journal of Law, Economics, and Organization* 21(2), pp. 441–466.

Bakshy, Eytan, Solomon Messing, and Lada A Adamic (2015). "Exposure to ideologically diverse news and opinion on Facebook". In: *Science* 348(6239), pp. 1130–1132.

Barberá, Pablo et al. (2019). "Who leads? Who follows? Measuring issue attention and agenda setting by legislators and the mass public using social media data". In: *American Political Science Review* 113(4), pp. 883–901.

Besley, Timothy and Andrea Prat (2006). "Handcuffs for the grabbing hand? The role of the media in political accountability". In: *American Economic Review* 96(3), pp. 720–736.

Bessone, Pedro et al. (2022). *Social Media and the Behavior of Politicians: Evidence from Facebook in Brazil*. Tech. rep. National Bureau of Economic Research.

Bonica, Adam (2019). "Database on ideology, money in politics, and elections (DIME)". In.

Broockman, David E and Joshua L Kalla (2022). "The impacts of selective partisan media exposure: A field experiment with Fox News viewers". In.

Eckman, Sarah J (2017). "Constituent Services: Overview and Resources". In: *Congressional Research Service*, pp. 7–5700.

Enikolopov, Ruben, Alexey Makarin, and Maria Petrova (2020). "Social media and protest participation: Evidence from Russia". In: *Econometrica* 88(4), pp. 1479–1514.

Enikolopov, Ruben and Maria Petrova (2015). "Media capture: empirical evidence". In: *Handbook of media Economics*. Vol. 1. Elsevier, pp. 687–700.

Falck, Oliver, Robert Gold, and Stephan Heblich (2014). "E-lections: Voting Behavior and the Internet". In: *American Economic Review* 104(7), pp. 2238–65.

Fujiwara, Thomas, Karsten Müller, and Carlo Schwarz (2021). *The effect of social media on elections: Evidence from the United States*. Tech. rep. National Bureau of Economic Research.

Gavazza, Alessandro, Mattia Nardotto, and Tommaso Valletti (2019). "Internet and politics: Evidence from UK local elections and local government policies". In: *The Review of Economic Studies* 86(5), pp. 2092–2135.

Gentzkow, Matthew and Jesse M Shapiro (2011). "Ideological segregation online and offline". In: *The Quarterly Journal of Economics* 126(4), pp. 1799–1839.

Greene, Michael (2022). "Rules Governing House Committee and Subcommittee Assignment Procedures". In: Congressional Research Service, Library of Congress.

Guess, Andrew M et al. (2021). "The consequences of online partisan media". In: *Proceedings of the National Academy of Sciences* 118(14), e2013464118.

Hammond, Ben and Leah Rosenstiel (2020). "Measuring the influence of political actors on the federal budget". In: *American Political Science Review* 114(2), pp. 603–608.

Hendel, Igal, Saul Lach, and Yossi Spiegel (2017). "Consumers' activism: the cottage cheese boycott". In: *The RAND Journal of Economics* 48(4), pp. 972–1003.

Hopkins, Daniel J (2018). *The increasingly United States: How and why American political behavior nationalized*. University of Chicago Press.

Kalla, Joshua L and David E Broockman (2022). ""outside lobbying" over the airwaves: A randomized field experiment on televised issue ads". In: *American Political Science Review* 116(3), pp. 1126–1132.

Martin, Gregory J and Joshua McCrain (2019). "Local news and national politics". In: *American Political Science Review* 113(2), pp. 372–384.

Martin, Gregory J and Ali Yurukoglu (2017). "Bias in cable news: Persuasion and polarization". In: *American Economic Review* 107(9), pp. 2565–99.

Melnikov, Nikita (2021). "Mobile Internet and Political Polarization". In: *Available at SSRN 3937760*.

Moskowitz, Daniel J (2021). "Local news, information, and the nationalization of US Elections". In: *American Political Science Review* 115(1), pp. 114–129.

Petersen, R Eric (2022). "Roles and duties of a member of congress: Brief overview". In: *Congressional Research Service*.

Rainie, Harrison and Barry Wellman (2012). *Networked: The new social operating system*. Vol. 10. Mit Press Cambridge, MA.

Schneider, Judy (2007). "House Committees: Assignment Process". In: Congressional Research Service, Library of Congress.

Shearer, Elisa (2021). "More than eight-in-ten Americans get news from digital devices". In: *Pew Research Center* 12.

Snyder, James M and David Strömberg (2010). "Press coverage and political accountability". In: *Journal of political Economy* 118(2), pp. 355–408.

Straus, Jacob R (2018). *Social media adoption by members of congress: Trends and congressional considerations*. Congressional Research Service Washington, DC.

Strömberg, David (2004a). "Mass media competition, political competition, and public policy". In: *The Review of Economic Studies* 71(1), pp. 265–284.

Strömberg, David (2004b). "Radio's impact on public spending". In: *The Quarterly Journal of Economics* 119(1), pp. 189–221.

Strömberg, David (2015). "Media coverage and political accountability: Theory and evidence". In: *Handbook of media Economics*. Vol. 1. Elsevier, pp. 595–622.

Thompson, Daniel M et al. (2022). "Have Changes to Media and Technology Helped to Nationalize American Elections?" In: *Working Paper*.

Van Kessel, Patrick et al. (2020). "Congress soars to new heights on social media". In: *Pew Research Center, Washington, DC, July 16th*.

Volden, Craig and Alan E Wiseman (2014). *Legislative effectiveness in the United States congress: The lawmakers*. Cambridge university press.

Vosoughi, Soroush, Deb Roy, and Sinan Aral (2018). "The spread of true and false news online". In: *science* 359(6380), pp. 1146–1151.

Yanagizawa-Drott, David, Maria Petrova, and Ruben Enikolopov (2019). *Echo Chambers: Does Online Network Structure Affect Political Polarization?* Tech. rep. Mimeo.

Zhuravskaya, Ekaterina, Maria Petrova, and Ruben Enikolopov (2020). "Political effects of the internet and social media". In: *Annual review of economics* 12, pp. 415–438.

Appendices

Table 7: Correlation between Pre-treatment Outcomes and 3G Coverage in 2009/ Evolution of 3G Coverage between 2009 and 2019

	Observations (Districts)	Mean (sd)	Coeff (se)	p-value	Coeff (se)	p-value
Explanatory variable			3G cov. 2009		Change in 3G cov.(2009-2019)	
Pre-Treatment Outcomes						
LES 2005	435	1.007	-0.004	0.987	-0.004	0.124
		(1.601)	(0.229)		(0.002)	
LES 2007	435	1.003	-0.215	0.191	0.000	0.992
		(1.549)	(0.162)		(0.002)	
SS bills 2005	435	0.316	0.055	0.703	-0.002	0.474
		(0.969)	(0.143)		(0.002)	
SS bills 2007	435	0.295	-0.262	0.100	0.000	0.828
		(1.243)	(0.156)		(0.002)	
Substantive bills 2005	435	13.602	0.347	0.872	0.006	0.769
		(11.443)	(2.135)		(0.022)	
Substantive bills 2007	435	15.385	0.150	0.953	0.041	0.120
		(11.027)	(2.533)		(0.026)	
Commemorative bills 2005	435	0.631	0.121	0.542	-0.003	0.109
		(0.999)	(0.197)		(0.002)	
Commemorative bills 2007	435	0.718	-0.143	0.436	0.000	0.972
		(1.091)	(0.182)		(0.002)	
All bills 2005	435	14.549	0.522	0.809	0.002	0.923
		(11.782)	(2.147)		(0.022)	
All bills 2007	435	16.399	-0.254	0.918	0.041	0.110
		(11.524)	(2.451)		(0.025)	

Notes: This table presents descriptive statistics of pre-treatment outcomes and regression results. The unit of observation is a congressional district. The outcome variables are the Legislative Effectiveness Score (LES) and its major components defined by the *Center for Effectiveness Lawmaking* (Volden and Wiseman (2014)). Column (1) gives the number of observations/ districts. Column (2) gives the mean and standard deviation of each pre-treatment outcomes. Column (3) gives the coefficient of a cross-sectional regression of pre-treatment outcomes on the share of population covered by 3G in 2009 (the regression also includes control variables at the district level, such as representative's race, age, gender, majority party, seniority, committee/subcommittee chair, district population, median age, share above 60 years old, share white, share of agricultural workers, share manufacturing workers, share bachelor degree, median income, density). Column (4) gives the corresponding p-value. Column (5) gives the coefficient of the regression of pre-treatment outcomes on the difference of the share of population covered by 3G in 2019 and 2009 (the regression also includes control variables as in (3)). Column (6) gives the corresponding p-value. Standard errors in parentheses, clustered at representative level. $^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.