The Internet, Social Media and Elite Extremeness: Evidence from Chile

Pablo Argote

Department of Political Science, Columbia University

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Abstract

The internet and social media have significantly affected democracies around the world. Yet, little is known about its direct impact on political elites. This article posits that the expansion of the internet and social media increases elite ideological extremeness through two non-mutually exclusive channels: a) Users reward extreme politicians in social media, and b) access to the internet increases voter radicalism, affecting politicians who respond to their constituencies. I test these hypotheses in Chile, using spacial variation on 3G mobile internet, sentiment analysis of Facebook posts, roll-call voting data, and public opinion polls. I found that politicians increase their Facebook activity due to geographic variation in access to 3G mobile internet; and, as a result, they move to more ideologically extreme positions. Exploration of mechanisms confirms the two hypothesized channels: elite extremeness is rewarded in social media, as negative and angry posts have much more circulation. Likewise, internet access increases skepticism towards democracy and elections, consistently with a worldwide trend.

Keywords— 3G Mobile Internet, Social Media, Elite Extremism, Chile

Introduction

The impact of the internet and social media on representative democracy has been extensively discussed. The optimistic perspective points out that political discussions through social media would enhance democratic accountability, providing citizens unprecedented opportunities to voice their concerns and hold the powerful accountable.[1] However, recent events have called into question this perspective. For instance, a grimmer narrative has dominated public debates after the 2016 United States presidential election and the Brexit referendum. Nowadays, social media is deemed responsible for political polarization, ideological "echo chambers," and, more generally, overly aggressive and simplistic political discussions.

The academic literature in this area has heavily focused on voters, addressing how social media consumption affects citizen polarization (Allcott and Gentzkow, 2017), violence (Bursztyn et al., 2019), the spread of false news (Guess et al., 2020), among others.[2] However, with a few notable exceptions (e.g. Barberá et al., 2019; Bessone et al., 2019), empirical research on the relationship between the internet, social media, and political elites is much scarcer. In this sense, it is unclear whether politicians pay attention to social media and how they alter their behavior in office due to these interactions.

In what sense the internet and social media could affect political elites? In this paper, I argue that the expansion of internet access and the penetration of social media in politics increases ideological extremeness among political elites through two non-mutually exclusive mechanisms.

On the one hand, users may reward extremeness in political conversations on social media, allowing extreme messages to achieve higher circulation. Social media has been described as a generally vicious environment, characterized by ideological segregation (Bakshy et al., 2015) and a high presence of false news (Guess et al., 2019). Moreover, consumers of politics in social media

[1] See https://www.intelligencesquaredus.org/debates/social-media-good-democracy

[2] See Zhuravskaya et al. (2020) for an in-depth review of this literature.

are likely more politicized than the average citizen,[3] so they may have a predisposition to reward extreme actors. I call this the *intrinsic* mechanism, as the potential effect of social media on elite extremism is explained by the nature of political discussions on these platforms. In addition, access to the internet could increase voter polarization and distrust of government among voters (Guriev et al., 2021; Melnikov, 2021), which could be reflected in the way that users communicate on social media. As politicians may respond to an increasing portion of their constituency, they, in turn, could acquire more extreme positions. I denominate this as the *extrinsinc* channel, as the impact of social media on elites is a manifestation of a societal trend towards extremism partly due to access to the internet.

In this article, I examine the relationship between access to the internet, social media consumption, and elite extremeness in Chile in the 2010-2020 period. To test my argument, I conduct three types of analyses. In the first place, a necessary condition for my argument is that politicians increase social media consumption after the penetration of 3G mobile internet. Consequently, I examine whether Chilean members of the Chamber of Deputies[4] pay more attention to Facebook when an increasing share of their constituency has access to 3G mobile internet. Empirically, I estimate a two-way fixed effect model, regressing indicators of Facebook activity —likes, shares, and total interactions— on 3G mobile internet coverage, using a panel data of Chilean legislators.

Second, I analyze if either district-level access to the internet or large levels of Facebook activity increases the level of ideological extremeness among political elites. For this purpose, I regress a measure of ideological extremeness obtained from roll-call voting in congress on several indicators of Facebook activity and/or 3G coverage.

Finally, I explore the intrinsic and the extrinsic channels that may explain the potential effect

[3] I will provide evidence of this claim on the "3G and Social Media in Chile" section.

[4] I decided to use deputies instead of senators for two reasons. First, there are a higher number of deputies, allowing more statistical power. Second, senators are more nationally-oriented figures elected in larger electoral districts, so it would be unlikely to expect responsiveness to local-level variation in access to the internet. I could not use both because senators and deputies do not have the same districts.

of Facebook activity on extremeness. For the former, I use sentiment analysis on the universe of Facebook posts made by politicians in the mentioned period, to analyze whether negative and angry posts have higher circulation than positive and joyful ones. Meanwhile, to explore the extrinsic channel, I utilize public opinion data, regressing indicators of skepticism towards democracy on 3G mobile internet coverage.

The Chilean case is optimal for addressing these research goals. Besides variation in access to the internet and Facebook activity among politicians in the last decade, the political context has interesting characteristics. Chileans have exhibited increasing distrust of traditional institutions, including the traditional media —TV and printed newspapers. However, the opposite trend applies to social media. Indeed, an increasing number of Chileans seem to trust more social media (Facebook and Twitter) than other outlets, which is probably reflected in the growing number of citizens who use these platforms to consume political news. Thus, social media has become one of the main sources of political information (see section Chilean Context).

I found a substantive effect of 3G mobile internet on Facebook activity among politicians, implying that when citizens have more access to the internet, legislators spend much more time interacting in Facebook. More importantly, I consistently found that higher levels of Facebook interactions increase ideological extremeness among Chilean politicians. Why do we observe this effect? The analysis of mechanisms suggests that extremeness is rewarded in social media, as angry, fearful, and negative posts written by politicians receive much more reactions, and, consequently, have more circulation. Additionally, we see that due to access to 3G, voters acquired more extreme positions about trust in democracy and elections, which is consistent with other research in this area (Guriev et al., 2021). Taken together, the analysis of elite extremeness suggests the presence of *both* the intrinsic and the extrinsic mechanisms: a) Facebook interactions have an impact on politicians' extremeness, likely because negative circulate more in social media; and b) as 3G expanded, politicians move to extreme responding to increasingly radical positions among voters.

My main contribution to the literature is demonstrating that social media affect political elites in areas beyond the digital world. Previous research has documented that internet does erodes confidence in government (Guriev et al., 2021), and that social media enhances voters' extremeness (Bursztyn et al., 2019; Müller and Schwarz, 2021). However, we lack an understanding of whether the nature of the political discussion in social media or the increasing skepticism towards democracy caused by the internet translates into political elites.

More broadly, my findings are problematic from a democratic standpoint, as social media could be a relevant factor driving elite polarization in Chile and beyond. In the last years, Latin American countries like Colombia, Peru, Brazil, and Chile have experienced levels of elite polarization, as evidenced by the type of candidates disputing the presidential elections. Social media penetration is a plausible driving force behind this phenomenon, as it encourages politicians to chase "likes" or take advantage of an underlying skepticism towards democratic institutions.

The Media, Voters and Politicians

An extensive body of scholarship in Political Science and Economics has established a connection between media presence and voters' outcomes, as the media was considered a key source of information about public affairs. Scholars in the United States have studied this topic by exploiting variation in entry of traditional media, finding a positive impact of both newspaper and television on political participation and voter turnout (Gentzkow, 2006; Gentzkow et al., 2011; Schulhofer-Wohl and Garrido, 2013). Not surprisingly, these effects on voters are translated into politicians. Scholarship in the developed world suggests that media penetration induces politicians to pay attention to voters with higher media access, which is manifested in the disbursement of federal resources and in government responsiveness (Stromberg, 2004; Snyder and Strömberg, 2010; Raffler, 2019).

With the expansion of the internet, studies have also analyzed its effect on voters' behavior. However, the main findings paint a very different picture than traditional media: it seems that the internet decreases political participation. Indeed, in Western Europe, studies have found that the internet decreases voter turnout in Germany (Falck et al., 2014), Italy (Campante et al., 2018) and the United Kingdom (Gavazza et al., 2019), likely because it crowded-out TV consumption and increased entertainment consumption online.

Following this line of inquiry, a recent paper has explored the connection between the internet and attitudes towards democracy, finding consistent results with the mentioned papers because the internet increases non-civic attitudes. In a study covering 116 countries during the 2008-2017 period, Guriev et al. (2021) found that access to 3G internet increases skepticism towards democracy in various indicators: confidence in government, the judicial system, elections, and government corruption. In the case of Europe, they also found that 3G favored anti-establishment populist opposition, typically the far-right. In terms of mechanisms, the authors point out that 3G helps expose actual government corruption. In the United States, Melnikov (2021) found that 3G internet increases the levels of polarization, meaning that Democratic voters become more liberal, whereas Republican lean was more conservative.

Why is the internet associated with negative attitudes towards democratic institutions? A plausible answer relates to the content to which people are exposed on social media. As Zhuravskaya et al. (2020) claims, social media decreases the cost of entry to the political discussion, implying an easiness of transmitting false news or hate speech. Indeed, scholars have found that Facebook and Twitter were the most important channels through which false news was diffused Guess et al. (2019); Grinberg et al. (2019). In addition, studies have also related social media to violence (Bursztyn et al., 2019; Müller and Schwarz, 2021) and to political polarization (Allcott et al., 2019)

If the internet and social media cause skepticism toward democratic institutions and propagate false news, a relevant question relates to how politicians react to this new reality. In other

words, are politicians also acquiring more extreme views by mimicking voters or spending excessive time interacting on these platforms?

Scholarship in this area is considerably scarcer, so there is insufficient evidence to answer the previous question. A notable exception is Bessone et al. (2019), who studies the impact of 3G mobile expansion on political elites in Brazil, finding that politicians become more active in social media in covered municipalities compared to non-covered. However, at the same time, they decrease their offline engagement places with higher 3G access, transferring fewer state resources. In this sense, even if the internet induces politicians to spend time on social media, this is not translated into actual benefits to the more covered areas.

Other scholars have addressed this topic in the United States. Indeed, Barberá et al. (2019) shows that legislators follow the issues discussed on social media, although only those prioritized by core supporters. On this basis, they conclude that social media contributes to the polarized political environment in American politics, as politicians are influenced by users who are not representative of the general public.

In sum, several scholars have established that media coverage is a crucial variable affecting voters and politicians. Nonetheless, there is a relevant difference between traditional media and the internet: while the former increases political participation and disbursement of state resources, the latter is associated with skepticism toward democratic institutions, likely because of the content that circulates in social media.

Hypotheses

Bases on the previous review, I propose the following hypotheses to be tested in the paper:

1. Chilean politicians whose district has higher access to 3G mobile internet should exhibit higher

social media activity levels.

The rationale of this statement is straightforward: If more access to 3G implies that more people engage in politics through the internet, then politicians should spend more time interacting on social media. Engaging voters in social media has become a prominent device to attract voters among politicians, On this matter, I follow the hypotheses tested by Bessone et al. (2019), which also use interactions on Facebook as dependent variables.

It is worth noting that an effect of 3G coverage on politicians' social media activity is a necessary condition for a potential effect of exposure to social media on a different outcome, since it would imply an increase in social media consumption among politicians. In this sense, even if this hypothesis looks obvious, it is still important to establish this basic fact.

In addition, the following hypotheses explore whether politicians adopt more extreme positions due to higher exposure to social media. These are listed as follow:

2. Chilean politicians with increasing access to 3G mobile internet and high levels of social media activity should move towards extreme positions, as revealed by their latent ideology.

   Why should we expect an impact of social media interactions on the elite's ideological extremeness? This paper explores two options, which will be stated as subsequent hypotheses:

   a. Extrinsic channel: Political elites may acquire extreme views responding to an increasing share of voters who, because of internet access, have skeptic views about democratic institutions.

      In the previous section, I describe previous scholarship showing that internet access plausibly causes a decrease in civic participation, a decrease in confidence in democracy and an increase in polarization. On this basis, politicians who represent these groups could find beneficial to mimic these positions. This resembles the idea of strategic extremism developed by Glaeser et al. (2005), who claims that an increasing share of voters with extreme views could induce

politicians to move to the extreme due to the expectation of electoral benefits.

b. Intrinsic channel: Politicians may acquire extreme views because extremeness is rewarded in social media, regardless of the positions of politicians' constituencies.

   As explained previously, the content that circulates in the internet, and in social media in particular, tend to be vicious, with high presence of false news and hate speech. Thus, it is plausible that social media user reward extreme politicians. Consequently, politicians who become heavy consumers of social media could adopt extreme positions by virtue of being constantly rewarded for extreme messages. In other words, the movement to the extreme could respond to the intrinsic nature of the political discussion on these platforms. Additionally, there could be benefits associated to being rewarded in social media. For example, an unknown politician could become "trending topic" in Twitter or Facebook after a controversial post, allowing him/her to reach a national audience.

Both mechanisms assume that politicians change their ideological positioning after acquiring information. In the case of the extrinsic channel, the claim is that radicalism in social media is a manifestation of a trend in a given constituency, that could be partly explained by the expansion of the internet. Thus, politicians could have acquired this information through social media or other channels, such as public opinion polls or direct contact. In contrast, in the intrinsic channel, the information is provided solely by the reaction of the public within social media, who most likely, reward negative messages more than positive ones.

3G and Social Media in Chile

Mobile internet was launched in Chile in 2005, although it had little penetration until the first years of the 2010's decade. However, with the roll-out of 3G technology, access to mobile internet immediately exploded. As shown by table A1, the number of people covered by 3G greatly

increased between 2010 and 2014; in the latter year, 4G technology started to operate, resulting in a practically universal coverage by 2019. Figure 1 shows 3G coverage in 2011 and 2015 in the most populated part of the country —the Metropolitan Region—where darker spots represent a higher share of 3G. The map suggests that there was important spatial variation, and an overall upward trend between both periods.[5]

The expansion of 3G was conducted through a concession system. In 2008, the Chilean Subsecretaria de Comunicaciones called for a public tender of radioelectric spectrum, which allowed the three incumbent companies to participate and promoted the entry of more competitors.[6] The public tender ended in September 2009, resulting in a market of five competitors, as two new companies were able to operate in three available frequency blocks.[7] Nonetheless, the market was heavily concentrated in three companies —Claro, Entel, Movistar— until 2016, when Wom acquired a higher market share.[8] Note that the 3G roll-out was not affected by short-term political interests since elected officials in parliament did not influence settlement patterns. On the contrary, it was a process directed by the central government and adjudicated based on transparent standards.

During these years, Chileans became heavy consumers of social media. Polling data shows that the number of frequent consumers of social media for political news largely increased in the 2010-2020 period, as we see in figure 2. Moreover, table 1 confirms that social media tends to attract more politicized users: a majority of both left and right-wing respondents are social media consumers, while only a small fraction of self declared independents use these platforms.

Certainly, Chilean politicians also started to use social media as a key source of political communication. Table 2 shows the increase in Facebook pages[9] and in the yearly average number of interactions, namely likes, shares and total reactions made in response to politicians' posts. By

[5]Note that compared to other Latin American today Chile has the highest internet usage, only comparable to Argentina. See https://www.internetworldstats.com/stats15.htm

[6]See https://www.reuters.com/article/internet-telecomunicaciones-chile-movile-idLTAN1745027420080717

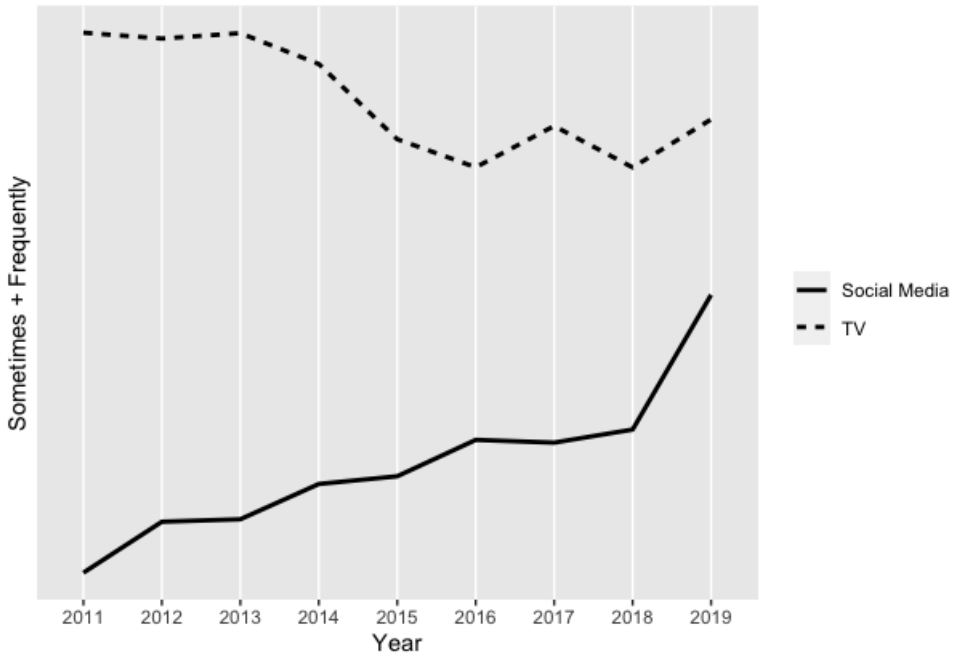
[7]See https://www.subtel.gob.cl/gobierno-introduce-mas-competencia-en-telefonia-movil-3g/

[8]See https://www.subtel.gob.cl/wp-content/uploads/2018/09/PPT_Series_JUNIO_2018_V1.pdf

[9]Facebook pages are used exclusively for political purposes. I did not include personal accounts.

Figure 1: Increase in 3G coverage Metropolitan Area (Chile) 2011-2015

Figure 2: Social Media and TV Consumption for Political News



Sources: Centro de Estudios Públicos

Table 1: Social Media Consumption by Ideology (Source: CEP 2019)

Ideology	Non-Consumer	Consumer	Total
Right	45.6	54.4	100
Center	51.4	48.6	100
Left	46.8	53.3	100
Independent / None	70.4	29.6	100
Total	63	37	100

2011, only 11% of politicians had a Facebook page, which increased to 90% in 2019. The average number of interactions also exhibits a similar trend.

Table 2: Average Number of Facebook Pages and Interactions by Year (Source: CrowdTangle)

Year	Pages	Likes	Shares	Total interactions
2011	0.11	0.28	0.01	0.34
2012	0.12	0.69	0.06	0.82
2013	0.21	3.92	0.50	5.01
2014	0.41	14.48	6.36	22.05
2015	0.53	26.41	17.98	47.42
2016	0.62	26.08	8.13	39.95
2017	0.70	55.96	11.03	85.77
2018	0.89	52.26	15.91	87.63
2019	0.90	67.51	46.07	152.02
2020	0.89	107.10	51.49	230.21

Political Context

Besides the expansion of 3G internet and the penetration of social media in politics, it is also relevant to consider the recent political history and today's context.

After the return to democracy in 1989 until 2010, Chile was ruled by the center-left Concertacion coalition, an alliance that brought together the centrist Christian Democracy with a series of left-leaning parties, including the Socialist Party. The main opposition to this alliance came from

a rightist coalition formed by the traditional center-right (National Renewal) and the Independent Democratic Union, a party that emerged from the Pinochet regime. This coalition won the presidency in 2010 and again in 2017.

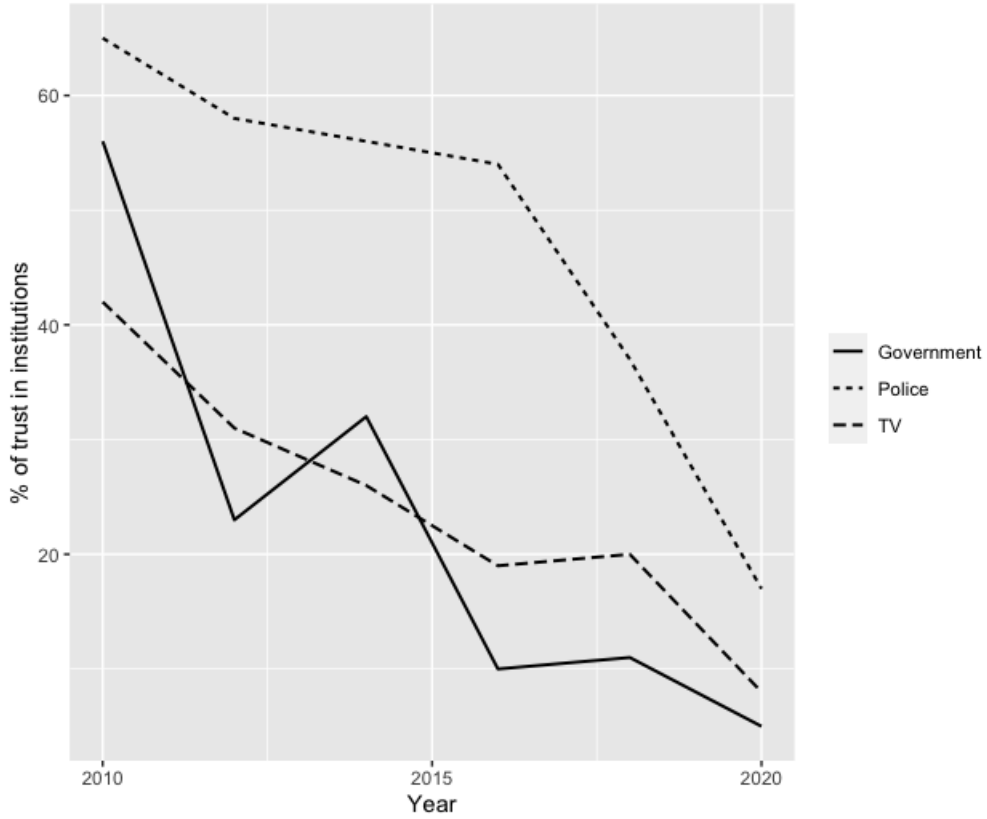
In the 2010s decade, new parties —both on the left and the right— started to emerge, challenging the establishment of the post-authoritarian period. Indeed, a myriad of left-wing leaders gained national prominence after the student protests of 2011; eventually, they formed their own parties, obtaining seats in congress in 2013 and becoming a relevant political force in 2017.

Before 2017, the electoral system to elect congress was an open-list PR system, allocating two seats in every single district. To allocate seats, the system utilized the d'Hondt seat distribution formula. The presence of two representatives per district implied that, for a list to win both seats, it must have received twice as many votes as the second-best coalition (Argote and Navia, 2018). Thus, in most districts, the right and the center-left obtained one seat each. This electoral system changed for the 2017 parliamentary election, when it became more proportional, with districts allocating different numbers of seats based on population (between three and eight). Not surprisingly, after 2017, the Chilean congress incorporated several new political parties, creating a very fragmented political landscape.

Increasingly, Chilean voters became skeptical and disaffected with traditional institutions, including the government, political parties, the church, the media, and the police. Indeed, according to polling data from the think-tank Centro de Estudios Públicos, trust in government declined from nearly 60% at the beginning of the 2010s to below 10% by 2020 (see table 3), whereas trust in the police and TV followed a similar pattern. Scholars have interpreted this phenomenon as a crisis of representation, meaning that political parties became unable to respond to social demands through the political process (Luna, 2016).

Nonetheless, social media does not follow the same pattern of increasing distrust in institutions. Figure 4 shows the percentages of Chileans who trust different types of media outlets.

Figure 3: Trust in Institutions 2010-2020

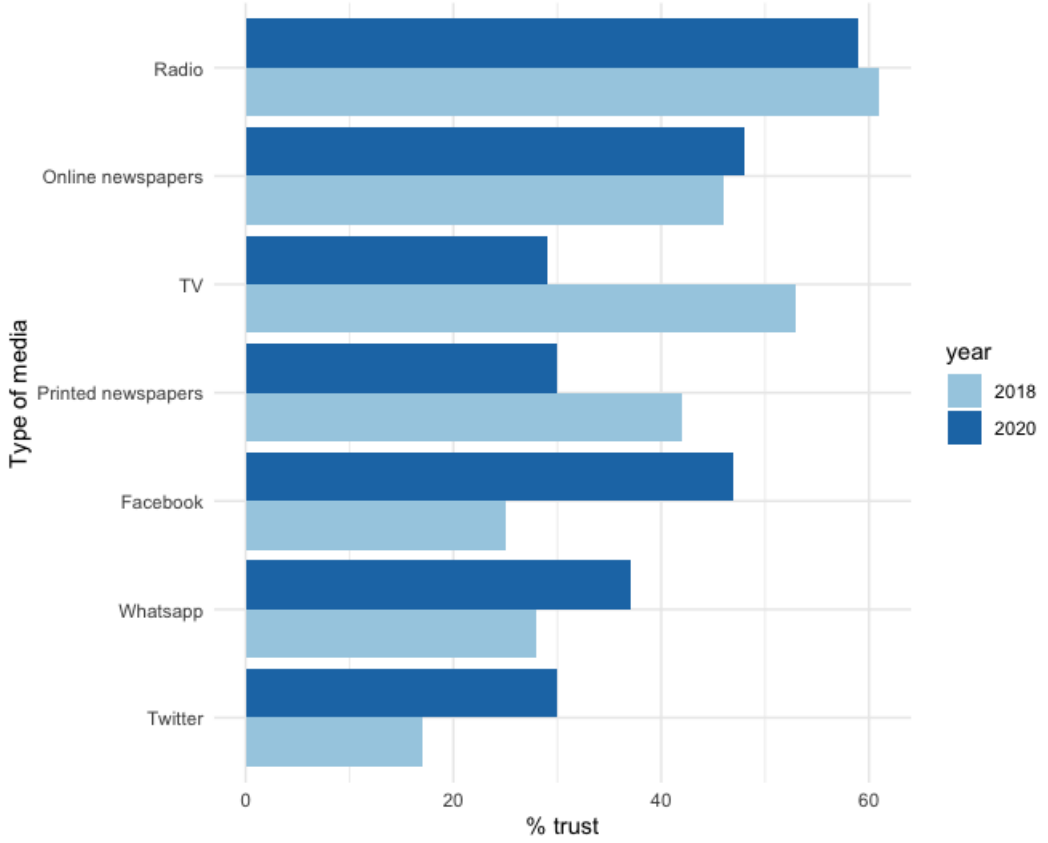


Sources: Centro de Estudios Públicos

According to Cadem, a market research company: Facebook, Twitter, and Whatsapp are the only media outlets that increased their trust between 2018 and 2020, suggesting that the public believes in the information received by these channels, probably more than in more established outlets.

This underlying distrust and skepticism towards democratic institutions were beyond the protests of October 2019, which accomplished nothing less than a change in the constitution that governed the country since the return to democracy —the constitution created by the Pinochet dictatorship and further reformed by successive democratic governments.[10]

Figure 4: Trust in the Media 2018-2020



Sources: Cadem

[10]See appendix E for a description of this event and for an analysis of the role that social media played in it.

Roadmap of the Empirical Analysis

The empirical analysis will be divided in three parts. First, I examine the relationship between 3G mobile internet and politicians' attention to social media. As I mentioned in the hypotheses section, this is a pre-condition for an effect of Facebook activity on extremeness, so it is logical to present this evidence first. Second, I present the models relating 3G and Facebook activity with elite ideological extremeness, together with some robustness checks. Finally, I explore the intrinsic and the extrinsic channels, which could plausibly explain the findings displayed previously. In Appendix B, I discuss the challenges for causal identification and my proposed solutions.

3G and Attention to Social Media

Data, Measures and Empirical Strategy

To uncover wether politicians engage more with social media as 3G increases, I use several sources of data.[11] The independent variable, that is 3G access, was constructed using maps of global 3G network coverage from 2011 to 2018 provided by Collins Bartholomew's Mobile Coverage Explorer. This data set included 1*1 kilometers grid cells, showing the presence or absence of internet coverage at this geographical level. I combined this data with a proxy of population density obtained from the Socioeconomic Data and Applications Center, a data center owned by the NASA's earth observing center.[12] in order to create a continuous indicator of the share of the population covered by 3G at a given level, following the same procedure as Guriev et al. (2021). In addition, I estimate the effect of the introduction of 4G in 2015, using the share of citizens covered by 4G.[13]

[11] See appendix C for a longer explanation of how I constructed the data sets used in this paper.

[12] This data is available at https://urs.earthdata.nasa.gov/

[13] The data of 4G from Collins Bartholomew did not vary over time, so probably it was less precise than the one from 3G. Thus, it was not possible to create a treatment variable at different periods. Hence, I

To capture social media interactions between politicians and the public, I used Facebook indicators of activity provided by the platform CrowdTangle. The first outcome is equal to one if a politician opened a Facebook page, zero otherwise. Moreover, I use the yearly average number of likes, shares, and total interactions; the latter includes other expressions, such as sad, angry, laugh, etc. Given the long tails of the distributions of this count variables, I use the formulas $log(1+likes)$, $log(1+shares)$ and $log(1+total)$.[14] It is worth mentioning that a share is a more costly action than a like since it reveals a more significant commitment.

The data set is constructed at the politician*year level, including all members of the Chamber of Deputies in the 2011-2018 period. In total, there are 258 unique politicians, considered that many were reelected either in 2013 or in 2017.

To identify the effect of access to the internet on Facebook activity, I estimate a two-way fixed effect model, where the main predictor indicates the share of 3G coverage. The main identifying assumption is that there is no pre-trend that could explain both higher access to 3G and social media consumption among political elites. To test this assumption, I estimated models with lead versions of the 3G variable, which will indicate whether there is a pre-trend that may challenge the validity of potential effects.

The econometric model can be described as follows:[15]

$$Y_{idry} = \alpha + \beta(3G)_{dry} + \gamma_{idry} + \lambda_{ry} + \epsilon \tag{1}$$

Where Y_{idry} represents the outcome of interest of politician i, in district d, in region r in year

defined the treatment as the share of people covered by 4G in a fixed year, namely 2015. For this reason, in these models, I restrict the sample to the 2013-2017 congressional session because there is no variation in other sessions.

[14] I assigned the value of zero to the period before the politician opened an account, as there were zero interactions in Facebook.

[15] For the sake of space, I did not include the equation using 4G as the treatment. It is equivalent to equations 1 and 2, but with a 4G variable instead of 3G.

y; the treatment of interest corresponds to $3G$, indicating the share of 3G coverage in district d. The parameter of interest is β, corresponding to the treatment effect. The parameter γ represents politician*district fixed-effects, which adjust for any heterogeneity across politicians*districts which are constant over time. Moreover, λ_{ry} constitutes year*region fixed-effects, which accounts for over-time variation in a given region, which is particularly relevant, given the regional differences in 3G access. Thus, the source of variation is within politicians in a given district over time; in other words, the estimated effects corresponds to a change of behavior in a politician who became more exposed to 3G at some point of their tenure in office compared to other politicians who did not. In addition, I will present models controlling for district and individual-level covariates: political coalition, politician's vote share, log of population, log of average income, the share of urban population, and the average age in the district.

The second model follows the logic of Bessone et al. (2019), who exploit the presence of municipalities within districts with different levels of access to 3G coverage. This model allows analyzing whether, within a district, politicians paid more attention to municipalities with higher 3G coverage. Put another way, it allows studying whether politicians adopt more specific strategies based on micro-level differences in internet coverage. To this end, I set up the data set at the municipality*year level, exploiting variation of 3G coverage across municipalities within districts.

As an outcome, I use whether a politician mentioned the name of municipality m in a Facebook post in a given year and the number of times that such municipality was mentioned: $log(1 + frequency)$. I estimate two different specifications, which exploits different sources of variation:

$$Y_{mi} = \alpha + \eta(3G)_m + \gamma_i + \epsilon \tag{2}$$

This equation leverages cross-sectional variation in 3G across municipalities. The treatment

$3G$ indicates the share of 3G in a municipality, while γ accounts for politician fixed-effects. The source of variation is across municipalities, controlling for politician in a given year. The purpose is to exploit between municipality variation in 3G, analyzing whether politicians pay more attention to places with higher 3G, and to see how this relationship evolves. I estimated these models separately from 2015 and on, as more than half of politicians had a Facebook page in such year.

Nonetheless, the previous model does not take into account whether *changes* over time in 3G per municipality causes higher mentions in such locality. To this end, I estimate the following model, which leverages this over time variation:

$$Y_{imry} = \alpha + \zeta(3G)_{mry} + \gamma_{imry} + \lambda_{ry} + \epsilon \tag{3}$$

Where the dependent variable is defined for politician i, municipality m, in the region r, at year y. In equation 3, the parameter of interest is ζ, the effect of increases on 3G coverage on changes in municipality mentions. Moreover, γ_{imry} accounts for politician*municipality fixed effects + and λ_{ry} adjust for regional time trends.

Content Analysis

The models described in the previous section allow to determine whether access to the internet at the district or municipality level affects politicians' level of attention to social media. However, we are still missing a key point: what are politicians saying on Facebook?

To explore this theme, I use topic modeling. This unsupervised machine learning technique allows to characterize the main topics present in a set of documents, by identifying words patterns within them. In a panel data structure, this analysis describes how certain topics become more relevant over time. In particular, topic modeling detects the k number of topics for a given document. For each k topic, there is a distribution of words. In this sense, document i may be characterized by

a distribution of topics k, and in turn, topic k includes a set of words in different proportions. The share of each document for each topic is also denominated the "mean contribution". I use a Latent Dirichet Allocation (LDA) topic modeling, which utilizes a prior distribution called Dirichet for the per-document topics and the per-topic words. In my case, the unit of analysis —or documents— are Facebook messages per year, separated by politicians in districts with high and low access to 3G, in order to compare potential differences by level of internet access.[16] Thus, I will present the topic modeling results differentiated by 3G access (high or low).

The main advantage of this approach is that the researcher does not decide ex-ante what topics emerge (Catalinac, 2016). Rather, the researcher must choose the number of topics to estimate the model, and interprets the substantive meaning of each topic by analyzing the most common words. Generally, scholars pick a given number of topics, run the specification, and then change the number of topics based on substantive meaning (Grimmer, 2010). The intuition is that more topics allow to "zoom-in" on narrower themes (Catalinac, 2016), whereas a lower number creates more comprehensive topics. Following this approach, I started by selecting twenty topics,[17] and I analyzed their substantive meaning, by looking at the most common words. Then, in subsequent analysis, I reduced the number of topics because it was difficult to distinguish some topics from each other. Every time, the results were fundamentally the same, with some slight variations.[18]. In the analysis, I present the model results with eight topics. [19]

It is worth noting that in the early 2010s, just a few legislators had a Facebook page, so the topics that emerged could overweight the handful of legislators on Facebook. However, as shown in table 2, there is a steady increase in Facebook pages over time, implying that the topics became more representative of all legislators after 2014.

[16] I define High 3G as being above the median.

[17] I selected a relatively low number of topics because there is not much variation in the type of Facebook messages sent by politicians, so it does not make sense zoom in too much on specific themes.

[18] See appendix C for a description of the results with varying values of k

[19] For the analysis, I removed Spanish stopwords, such us "de", "y", "es", among others; and words that were repeated in many posts, for example, "Ahora", "Chile", "Hoy" and others.

3G Increases Attention

Table 3: Effects of 3G Coverage on Indicators of Facebook Activity

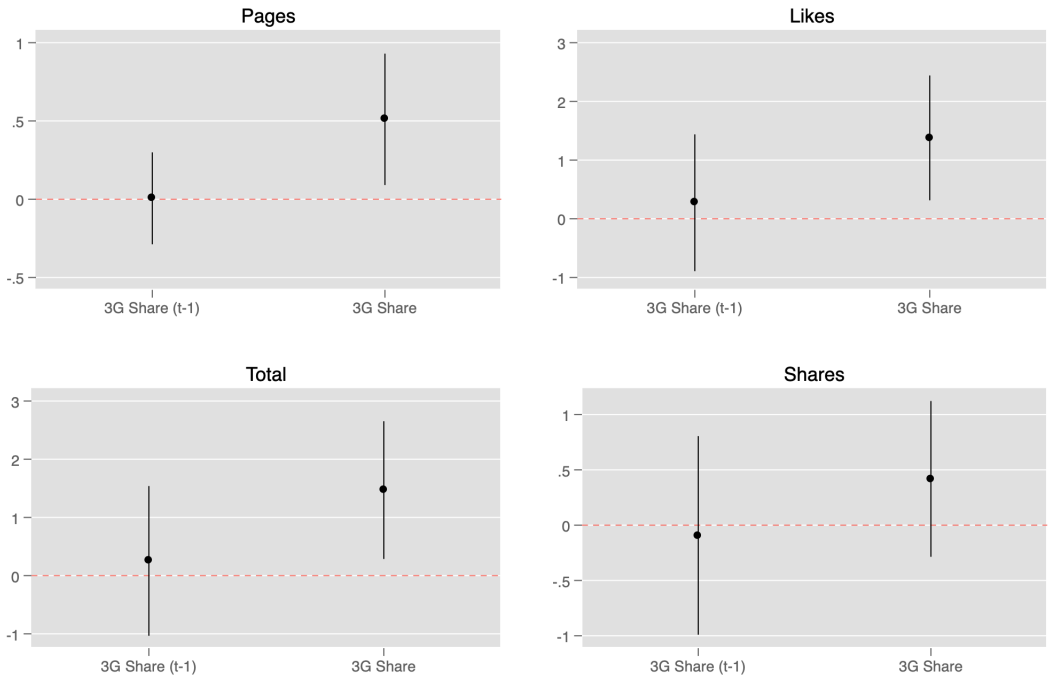
	(1) Pages	(2) Pages	(3) Likes	(4) Likes	(5) Total	(6) Total	(7) Shares	(8) Shares
Share 3G	0.462*	0.453**	1.570***	1.414**	1.674***	1.505**	0.585	0.436
	(0.232)	(0.219)	(0.536)	(0.594)	(0.585)	(0.662)	(0.390)	(0.404)
Adjusted	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.755	0.760	0.781	0.784	0.782	0.785	0.781	0.786
Obs.	826	814	826	814	826	814	826	814

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*years between 2011 and 2018, the period covered by the 3G data. All models include politician*district and region*year fixed effects. Adjusted models control for log of population, log of income, urban status, average age, vote share and political coalition.

Clearly, internet access have a large effect on Facebook usage among Chilean politicians. Table 3 shows the impact of 3G access on different indicators of Facebook activity. As all models adjust for politician*district fixed effects and for regional time trends, these results mean that changes in 3G coverage within districts substantively increases Facebook interactions over time for the average politician. The most critical result refers to the opening of a Facebook page —displayed in columns 1 and 2—, since it is a clear behavioral outcome, whose interpretation is straight forward: an additional percentage point increase in 3G access augments the chance that a politician opens a Facebook profile page in 45 percentage points, a very substantial effect. Likewise, column 4 shows that the marginal effect of 3G access increases enormously the amount of likes, which is not surprising, considering the effect described before. In this sense, the evidence confirms that access to the internet increases politicians' attention to social media.

Figure 5 shows a visualization of the previous results, including lead versions of 3G. The figure confirms that the impact of 3G is not explained by a previous trend on districts that gained access to 3G. On the contrary, the effect appears after the installation of 3G, which supports the

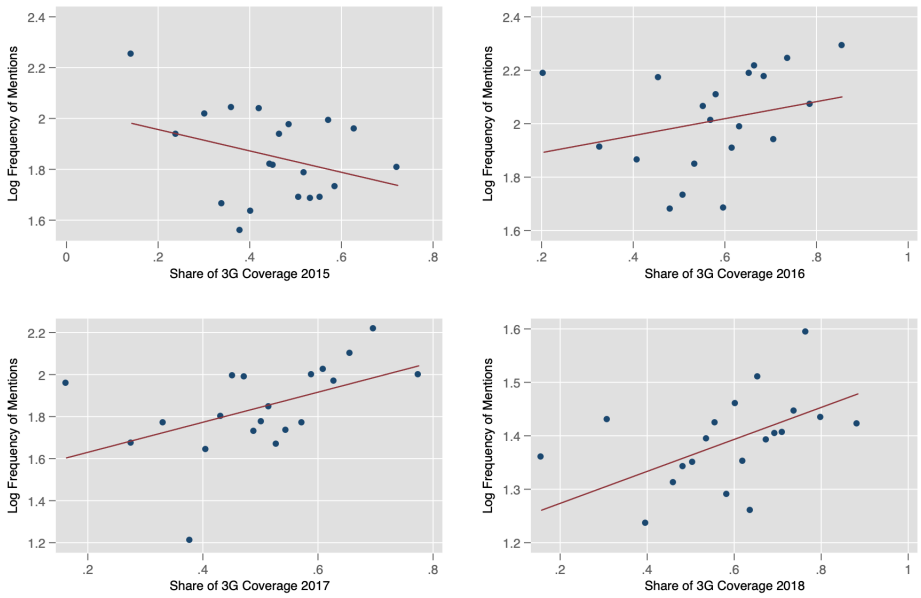
Figure 5: Coefficient Plot Effects of 3G on Indicators of Facebook Activity



The circle represents the point estimate, and the line the 95% confidence interval.

robustness of these findings.[20] Regarding the impact of 4G, we do not see a significant effect. Indeed, the introduction of 4G did not impact any of the indicators of Facebook activity (see table A3), probably because those districts that received 4G already had high access to 3G.

Figure 6: Bin Scatters Municipality Mentions and Share 3G



The scatter plots include politician fixed-effects, and controls for for log of population, log of income, urban status, average age.

Now, let us turn to the analysis of municipalities within districts. In general, it is unclear whether politicians distinguish between municipalities with higher or lower access to the internet within municipalities. Indeed, figure 6 shows the cross-sectional analysis by year, including politician fixed effects and a set of controls (table A4 in the appendix show the corresponding table with the regression coefficients). We see that the slope of the regression coefficient becomes positive over time, suggesting that politicians increasingly pay more attention to municipalities with higher internet access. However, only for 2017, the slope is statistically different from zero — see table

[20] See table A2 for a model with two 3G leads. I was not able to include more than two leads because the sample size was greatly reduced. As my data set begins in 2011, for many districts, I do not have more than two periods before the increases in 3G.

A4.[21] Table 4 presents the models which exploits the over time variation of municipalities. Again, we observe a positive effect, but none of the models are statistically significant.

Table 4: Effects of 3G at the Municipal Level on Mentions

	(1) One Mention	(2) One Mention	(3) Log Mentions	(4) Log Mentions
Share 3G	0.186	0.173	0.826	0.763
	(0.209)	(0.207)	(0.596)	(0.579)
Adjusted	No	Yes	No	Yes
R^2	0.584	0.587	0.750	0.753
Obs.	1075	1075	1075	1075

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the municipality level. The sample size includes politician*years*municipalities between 2015 and 2018, period where at least half of politicians had a Facebook page. All models include politician*municipality and region*year fixed effects. Adjusted models control for log of population, log of income, urban status, average age, vote share, and political coalition.

Taken together, these results suggest that a district level increase in 3G access increments politicians' attention to social media; nevertheless, it is unclear whether politicians pay more attention to municipalities with higher access to 3G within their districts.

The next step of this analysis is to explore the content of messages of politicians' Facebook posts through topic modeling. The algorithm distinguishes two main prevalent topics for legislators in high 3G districts. I call the first topic "Personal appeal", as its main words are the following: "contact me", "help", "sincerely", "support", and so on. In this sense, the topic relates to a direct appeal to voters, encouraging them to contact legislators to voice their concerns, highlighting that they will support them. The second is focused on the legislative process itself, highligting what are the legislators doing in a daily basis in parliament. This is characterized by the words "bill", "project", "development", "reform", etc. The translated keywords for each topic is displayed in table 5.

[21] Note that starting in the 2017 parliamentary election there was an increase in district size, as each district incorporated more municipalities. That explains the increase in sample size in 2018 described in table A4.

Table 5: Main Words Topics High 3G Access

Policy	**Appeal**
Project	Best
Government	Effort
Municipality	help
Jobs	Contact me
Law	Support
Region	Always
Education	Make
Health Care	Government
National	Online
President	Law
Chamber	Sincerely

Importantly, the mean contribution of each topic radically changed over time. Panel a) in figure A1 shows that the topic "Personal appeal" substantively decreased its mean contribution after 2012, which coincides with the period when more politicians opened Facebook pages. In turn, communication about the legislative process became by far the most prevalent topic by 2018. Thus, politicians increasingly use Facebook to communicate about bills, votes, and projects but not to gather information about voters. Note that the number of Facebook pages is not fixed over time, so this change probably reflects that more legislators opened a Facebook page during the decade, as shown in table 2. Still, it confirms that legislators mostly use Facebook their own actions in the legislative process, which could explain why politicians are affected more by access to the internet at the district than at the municipal level. If politicians use Facebook exclusively to communicate about legislation, it should not matter which locality within the district has higher access to internet, as their goal is restricted to a unidirectional messaging to all voters within the district.

Regarding legislators in low 3G districts, the topic modeling algorithm finds just one relevant topic —Legislative process.[22] In other words, among low 3G districts, we do not observe the

[22]See appendix C for a descriptive for an explanation of the topics found among the low 3G group.

"Personal appeal" topic. Panel b) in figure A1 plots the mean contribution of the "Legislative Process" topic by 3G status, showing that nowadays, in both type of districts, most politicians use Facebook to send messages about legislative issues.

Extremeness

Data, Measures and Empirical Strategy

The second part of the empirical analysis relates 3G coverage and social media usage, with elite extremeness.[23] To measure extremeness, I use roll-call voting data of the Chilean Chamber of Deputies, which includes all votes from the 2011-2020 period. Then, I created an original measure of extremeness following this procedure. First, I computed the DW-nominate scores, which created a measure of politicians' ideal points in the left-right scale, based on roll-call voting data in congress. The algorithm use the whole set of bills for the legislative sessions between 2011-2020, which includes 7953 votes, covering a myriad of areas. Table A6 show the share of topics discussed in the 2011-2020 period.[24] Second, based on the DW-nominate scores on the left-right dimension, I created a measure consisting of deviations from the average ideological positioning in a given year, which can be described as follow:

$$Extreme = |(wnom_{iy} - wn\bar{o}m_y|$$

Which indicates the deviation of politician i in year y from the average ideological position

[23] Another plausible behavioral outcome would have been disbursement of resources, as Bessone et al. (2019) did. However, Chilean legislators does not have the power to allocate fiscal resources to their localities.

[24] The DW nominate packager omits all unanimous bills, defining unanimous when more than 97.5% of congress agreed on a bill.

of the congressional session of year y. Higher values of this measure indicate larger deviations from the average legislator, and therefore, higher extremism. The maximum value is approximately 1.2, while the minimum is around zero.

I want to discuss the merits of this variable. DW nominate scores are typically used as a measure of latent ideology in American Politics. Indeed, scholars have used it to show the increasing levels of polarization between Democrats and Republicans (e.g. Ladewig, 2021) and for analyzing the impact of close elections on ideological positioning (e.g. Lee et al., 2004). I use this variable mainly because it incorporates the whole set of non-unanimous roll-call votes, without cherry-picking any particular vote that we may think that reveals extremeness. Indeed, the other option would have been exactly that: pick a few votes of important bills per year, decide ex-ante which option would indicate an extreme position, and use it as the outcome. I decided against this option precisely because there are several arbitrary decisions involved. For instance, there might be votes that we can consider extreme, such as the attempt to impeach the president in 2019. However, the impeachment was practically split along party lines, as the opposition took it as a display of strength, so the definition of being "extreme" would apply to all deputies of one side of the political spectrum. Therefore, by using latent ideology in all roll-call votes, I rely on a measure that includes most of the bills per year, avoiding such arbitrary decisions —choosing bills, and defining what is extreme.

In general, the extremeness measure has a normal distribution. Figure A2 display histograms of this indicator in a yearly basis, showing that the distribution approaches normality, although there are some years with higher skeweness (2012 and 2020). As this indicator is measured in absolute deviations from the average, it implies that most legislators moderately deviate from the yearly average, as they represent different political parties. However, just a few legislators could be classified as extremist, since it is unusual to exceed the threshold of one.

A quick glance of the most extreme legislator each year confirms the validity of this measure

as a proxy of ideological extremism. Table A5 shows that from 2011 to 2013, the most extreme legislators were from the Communist Party, which is not surprising given their history and their current positions: support of the Maduro regime in Venezuela, embracing of the Soviet Union in the past, among others. However, between 2014 and 2017, the most extreme legislators belonged to the right, typically to the Independent Democratic Union, party that emerged from the Pinochet dictatorship. In the 2018-2020 period, the extremist legislators were, again, from left-wing parties which formed a coalition with the communists. It is worth noting that the most extreme politicians always belong to the opposition —when the right governs, they are from the left, and viceversa—, likely because being in government creates incentives for aligning with the executive.

The econometric model relating access to the internet and ideological extremism, can be described as follow:

$$Extreme_{imry} = \alpha + \tau(3G)_{dry} + \gamma_{idry} + \lambda_{ry} + \epsilon \tag{4}$$

Where the outcome $Extreme_{imry}$ is regressed on 3G access, including politician*year and year*region fixed effects.

The parameters estimated in equation four are meaningful because, as demonstrated in the previous results section, access to the internet increases politicians' attention to social media. If paying attention to social media affects extremeness, then 3G should be a proxy for social media activity. However, we can estimate a model that tests this proposition more directly, by including interactions in Facebook as *independent variables*. With such a model, there is a risk of reverse causality, since both measures —interactions in Facebook and extremeness— are yearly averages, and therefore, are computed almost simultaneously. Therefore, I use a lagged version of the independent variables; that is, I regressed extremeness on year $y + 1$ on Facebook interactions

in year $(y1)$.[25] The model can be described as follows:

$$Extreme_{idry+1} = \alpha + \mu(FB)_{dry} + \gamma_{idry} + \lambda_{ry} + \epsilon \tag{5}$$

Where the variable FB accounts for Facebook interactions. In equation five, the parameter of interest is μ, the effect of Facebook interactions in the previous year. An alternative specification would have been to control for access to 3G. Such a strategy is not convincing, since I am interested, precisely, in how social media activity, which 3G enhances, could affect elite extremeness. Thus, it would be more convenient to avoid conditioning on access, as the quantity of interest is precisely the variation between politicians with high and low access. Still, I control for 3G as a robustness check, although we might expect somewhat different results, as it would show the effect of interactions net of internet access.

Note that the models described in equations four and five adjust for politician-district fixed effects and region-specific time trends, implying that the source of the variation is within politician. In this sense, we can rule out that results are explained due to selection of extreme politicians in recent years, or because of radical changes in ideological positions among parties.

Facebook Increases Extremism

Table 6 shows the impact of 3G coverage on extremeness in congress. In columns 1 and 2, we see a positive effect of 3G on extremeness, although it is not statistically significant at conventional levels; when adding a lagged term, we see a similar result.

Table 7 shows the effects of Facebook activity on extremeness. I remind the reader that to avoid reverse causality, I estimate the models using all independent variables the year before the

[25] In this model, I was able to use more years (until 2020), because I am not including the 3G variable, which covered until 2018. Thus, I was able to include more leads and lags than in the results of the previous section, as displayed in figure 7.

Table 6: Effects of 3G on Extremeness

	(1) Extreme	(2) Extreme	(3) Extreme	(4) Extreme
Share 3G	0.098	0.070	0.109	0.085
	(0.076)	(0.066)	(0.077)	(0.064)
Share 3G lagged			0.030	0.030
			(0.056)	(0.056)
Adjusted	No	Yes	Yes	Yes
R^2	0.726	0.774	0.799	0.799
Obs.	826	814	656	656

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*years between 2011 and 2018, the period covered by the 3G data. The outcome for all regressions is level of extremeness in congress. All models include politician*district and region*year fixed effects. Adjusted models control for 3G coverage, vote share, log of population, log of income, urban status, average age, and political coalition.

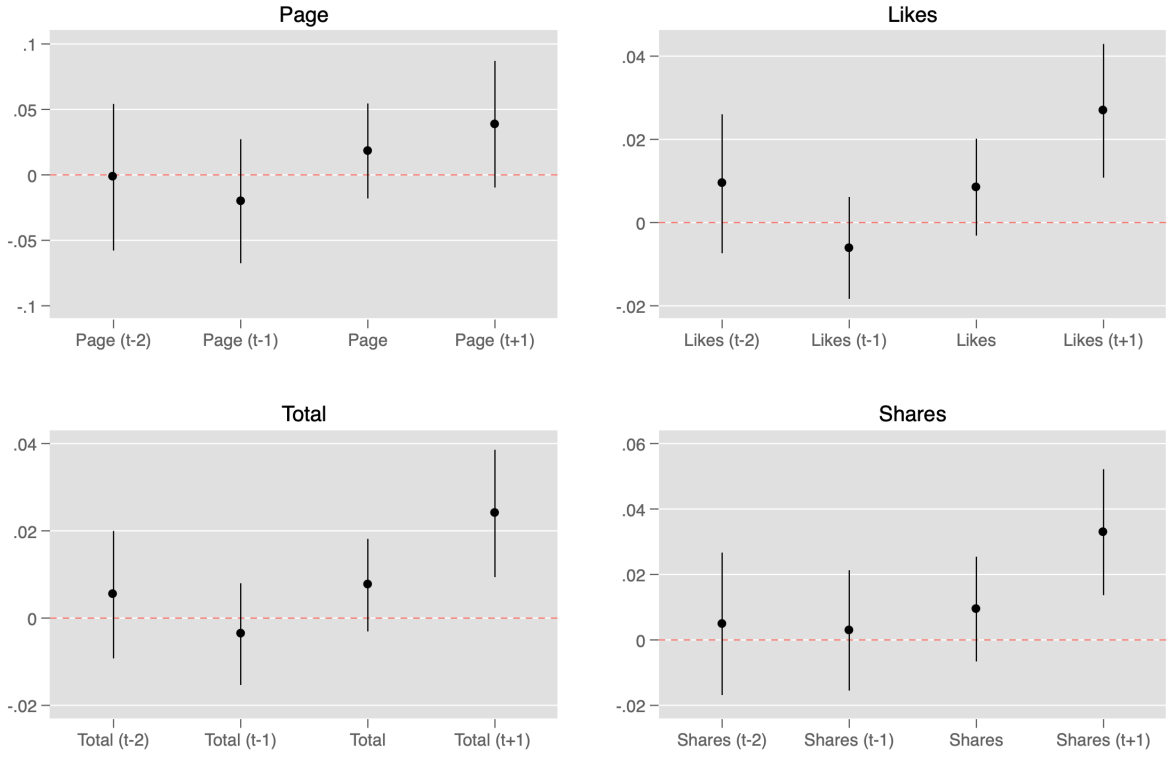
Table 7: Effects of Facebook Activity on Extremeness

	(1) Extreme	(2) Extreme	(3) Extreme	(4) Extreme	(5) Extreme	(6) Extreme	(7) Extreme	(8) Extreme
Page	0.043	0.045*						
	(0.026)	(0.024)						
Likes			0.029***	0.026***				
			(0.009)	(0.008)				
Total					0.027***	0.024***		
					(0.008)	(0.007)		
Shares							0.039***	0.032***
							(0.009)	(0.008)
Adjusted	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	1145	1137	1145	1137	1145	1137	1145	1137

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*years between 2011 and 2020. The outcome for all regressions is level of extremeness in congress. All models include politician*district and region*year fixed effects. Adjusted models control for log of population, log of income, urban status, average age, vote share, and political coalition.

outcome. Clearly, there is a positive effect of Facebook activity on extremeness. For instance, column 2 shows that opening a Facebook page in year $(y-1)$ increases a politician's extremeness levels in 0.045 units; similarly, column 8 shows that the marginal effect of a 1% growth in shares causes a 0.032 increment in extremeness. These findings suggest that internet access by itself does not seem to impact elite behavior; however, when considering Facebook interactions in the previous year as a treatment, we clearly see a strong impact.

Figure 7: Coefficient Plot Effects Facebook Activity on Extremeness



The circle represents the point estimate, and the line the 95% confidence interval.

The coefficient plot displayed in figure 7 confirms the findings presented above. Clearly, the effect of Facebook activity on extremeness becomes significant a year after the exposure, and not the years before. Therefore, we can discard that the results are explained by a previous trend. Moreover, it seems that the effects are larger regarding the amount of likes compared to having

a page, suggesting that the reactions to politicians' posts are the most relevant factor. When adjusting by 3G access (table A7), we see almost identical results, suggesting that even when controlling for access, higher Facebook reactions has an impact on ideological extremeness.

Taken together, the results presented in this section suggest a positive effect of social media activity on ideological extremeness. In the next section, I will explore plausible channels explaining this effect.

Intrinsic and Extrinsic Channels

In the first place, I will explore the intrinsic mechanism, by analyzing the internal nature of the political discussion involving politicians in Facebook. If I can establish that negativity is rewarded in this set of Facebook posts, then it is plausible politicians who are heavy users of social media become more extreme.

To this end, I analyze the sentiment of Facebook messages over time, using the Spanish version of the R package "syuzhet", which contains the NRC Valence, Arousal, and Dominance (NRC VAD) lexicon developed by Mohammad, Saif M. (2020). This dictionary is suitable to analyze words, or sentences, assigning a valence score to each of them based on seven emotions: anger, disgust, fear, joy, sadness, trust and surprise. Each sentence receives a score for negative and positive sentiment, which is also called valence. The maximum value for each sentiment or emotion is seven, while the minimum is zero. For my analysis, I focus on three emotions —fear, anger and joy— and two sentiments —positive and negative—, since my theoretical interest is to analyze whether clearly negative emotions have higher reactions on Facebook.

My analytic strategy is the following. First, I classify each Facebook post during 2014-2020[26]

[26]I start in 2014 because in that year, a sufficient number of politicians had a Facebook page (more than 40%).

as high or low number of total reactions.[27] Then, I calculate the average sentiment score for each emotion over time, for both groups. For example, if the high reaction group has a higher "Anger" score than the low reaction, it would mean that anger posts are more rewarded in Facebook. The NRC VAD dictionary was especially designed to analyze sentiment and emotions of short sentences, such as Facebook messages or tweets (Kiritchenko et al., 2014). Moreover, it has been used on several research articles, covering issues from hashtags analysis (Mohammad and Kiritchenko, 2015), movie dialogues (Hipson and Mohammad, 2021), among others. Just to provide an example from my data set, this is a Spanish sentence associated with fear:

> "Se han perdido 30 mil puestos de empleo en lecherías y esta decisión de la comision antidistorsiones es una verdadera falta de respeto a nuestros productores lecheros"

In English, the prior sentence reveals a legislator complaining for the loss of employment among the milk-producing sector. Meanwhile, this is a sentence associated with joy:

> "Un gran saludo y abrazo para tod@s que las energías del universo reinen en sus hogares y llege el amor, la paz y las esperanzas de un buen año nuevo 2020 de grandes desafíos para el pais, la región y en especial para nuestro querido puerto de Coquimbo, Bendiciones para ustedes y sus familias."

Which is basically a message about love and peace in the context of the new year.

Second, I explore the plausibility of the extrinsic channel; that is, that voters who are increasingly skeptic of democratic institutions would be driving force behind elite extremeness. For this purpose, I use individual-level polling data from the Lapop survey, a nationally representative survey of several Latin American countries. In this case, I use the observations of Chile for the 2012,

[27] I defined high number of reactions as being above the median.

2014, 2017, and 2019 waves.[28] I merged this data with the 3G share indicator at the municipal level over time, resulting in a repeated cross-sectional data set, covering 119 of the 345 Chilean municipalities.[29]

As dependent variables, I use two indicators of skepticism towards democratic institutions, which are arguably proxies of anti-democratic attitudes. The first variable is the extent to which the respondent agrees with the following statement: "Despite its problems, democracy is better than any other form of government". This variable is routinely used in the Lapop survey and other public opinion polls, to measure attitudes towards authoritarianism, as a distrust in democracy implies an openness towards other regimes. In this survey, the original variable used a seven-point scale, where one meant "Strongly Disagree" and seven "Strongly Agree". From this measure, I created an indicator variable equal to one if respondents answer either six or seven —that is, if they agree with the statement—, zero otherwise

The second dependent variable was constructed from the following question: "To what extent do you trust in Chilean elections?". Again, this measure touches upon the most basic act in a democracy, namely, elections to choose the main authorities. This indicator also used a seven-point scale, where seven means "A lot of trust". Similarly to the support democracy measure, I created a dummy variable equal to one if respondents answered either six or seven —that is, if they trust in elections.[30]

The regression equation can be written as follow:

$$Y_{imy} = \alpha + \omega(3G)_{my} + \gamma_{my} + \theta_y + \epsilon \tag{6}$$

[28] As any public opinion poll, the Lapop survey is not representative at the municipality level, so there could be a threat to the external validity of this analysis. However, as I use multiple waves, there is a decent number of observations per municipality —110 individuals on average. Still, I caution the reader that, most likely, the sample over-represent urban places, as many rural locations are not typically reached by these type of polls.

[29] Given that the 3G data covers until 2018, I merged the 2018 3G data with the 2019 Lapop survey.

[30] As a robustness check, I used the original scales for both of these outcomes. Results are in table A8.

Where the dependent variable for respondent i, in municipality m, in year y is regressed on 3G access at the municipal level. The coefficients γ and θ account for municipality and year fixed effects, respectively. The parameter of interest is ω, the impact of an additional percentage-point of access to 3G on the probability of supporting democracy, or in the chance of trusting elections.

Before presenting the results, I want to warn the reader that testing for mechanisms is not an easy task. For instance, the fact that negative posts wrote by politicians may have higher circulation does not necessarily imply a connection with elite extremeness; the same applies to a potential effect of 3G on voter's perceptions about democratic institutions. However, if we do find evidence of either the intrisic or the extrinsic channel, then it is more plausible that these are connected to elite extremeness than in the opposite case. Thus, even if these empirical analyses are not definite proofs, they could provide evidence in a similar direction that the main results.

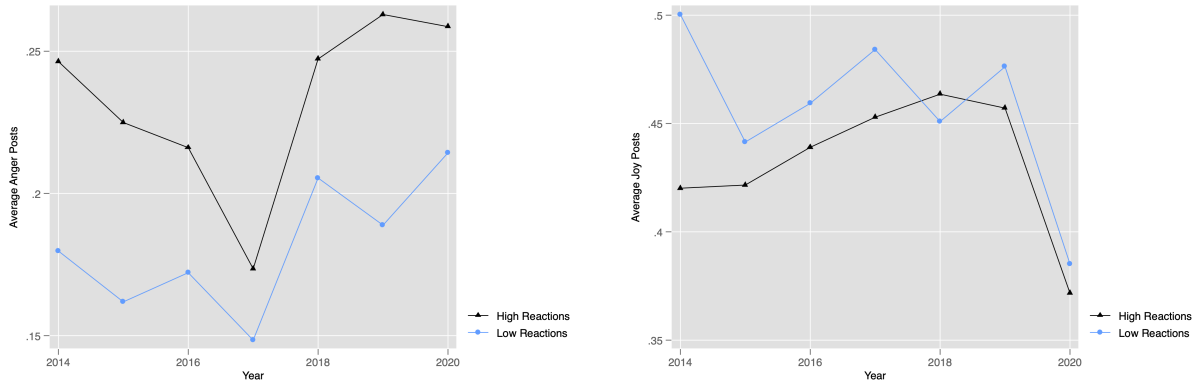
Facebook Sentiments and Public Opinion

Results from sentiment analysis confirm that negative and angry posts are rewarded in social media. Figure 8 show that among posts with high number of reactions (black line), the average anger score is systematically higher in every year. On the contrary, when analyzing panel b, we see that the joy score is higher among posts classified as low reactions (blue line). In figure A3 we see a very similar trend when considering positive and negative sentiments.[31] Thus, I can confirm that Facebook users engage more with angry posts made by politicians, and less with joyful ones. Thus, there is a premium associated to being angry, and a punishment for being joyful, which is consistent with the fact that Facebook interactions causes an increase in ideological extremeness.

Do voters also drive the result? Further evidence suggest an affirmative answer. Results from table 8 show that 3G access at the municipality level is associated to a decrease in support for

[31] In 2017, there is a generalized drop in negative and angry posts, likely because there was a presidential and parliamentary election, so politicians posted more positive messages for their campaigns.

Figure 8: Sentiment Analysis Facebook Posts 2014-2020



(a) Anger

(b) Joy

democracy of about 0.27 probability points; moreover, there is a negative effect of 3G on confidence in elections, although the magnitude is smaller (see figures A4 and A5 for the corresponding coefficient plots including a treatment lead). As a robustness check, I use the original ordinal scales of both dependent variables to discard a plausible impact of coding decisions. I find the same results, with somewhat different magnitude. For instance, in table A8, we see that an additional percentage point of 3G decreases support for democracy in 0.48 units and diminishes confidence in elections by 0.44.

Table 8: Effects of 3G on Democracy Best Government

	(1) Support Dem.	(2) Support Dem.	(3) Conf. Elections	(4) Conf. Elections
Share 3G	-0.272**	-0.274***	-0.123	-0.116
	(0.111)	(0.103)	(0.077)	(0.076)
Adjusted	No	Yes	No	Yes
R^2	0.078	0.10	0.06	0.07
Obs.	5516	4638	5710	4762

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the municipality level. Adjusted models control for income, education, urban status, and gender.

These findings are consistent with other research at a global scale (Guriev et al., 2021),

which finds that higher access to the internet erodes confidence in government. Likewise, if offers an additional channel for the documented impact of social media on elite extremeness.

Discussion

Throughout the history of representative democracy, strong and independent media has been considered a critical factor in holding the powerful accountable. However, in the last few years, the impact of social media in politics has been interpreted through a more pessimistic perspective, based on recent political events and the findings of the academic literature. Despite the growing evidence of the impact of social media on voters, a key question remains: Do these effects on voters translate into politicians?

This article explores several aspects of how social media affects political elites by focusing on Chile as a test case. Indeed, the country has experienced an explosive increase in access to mobile internet coverage, which is reflected in the level of penetration of social media in politics. I hypothesized that social media activity increases ideological extremeness among political elites due to two non-mutually exclusive channels. The intrinsic channel posits that politicians will move to the extreme because negative posts have more circulation in social media. Meanwhile, the extrinsic channel argues that politicians mirror extremeness among voters, who, due to internet access, are becoming more skeptical about democratic institutions.

I first show that politicians pay considerably more attention to social media as internet coverage augments in their districts. More specifically, if 3G covers a higher share of their constituency, politicians are much more likely to open a Facebook page and interact on social media. Moreover, content analysis shows that Facebook became more of a tool for unidirectional communication than a platform to obtain information about voters' concerns. In this sense, besides the particularities of social media —for example, the possibility to interact directly with voters— legislators increasingly

use these platforms only to communicate messages, just as the radio or the TV.

The core findings of the paper are that Facebook interactions increase ideological extremeness among political elites. In other words, as politicians spend more time on Facebook, perceiving the feedback of their messages, they move to more extreme positions. When exploring mechanisms, I found evidence of the two hypothesized channels. First, descriptive evidence suggests that angry and hostile messages have better reception on social media than joyful and positive ones. In other words, as negativity is rewarded in social media, angry posts have much more circulation, allowing politicians to reach a broader audience. Put another way, as politicians spend excessive time on social media, perceiving the benefits of getting high circulation through angry and negative messages, they subsequently move to ideologically extreme positions.

Second, I found that due to internet access, voters acquire more extreme views concerning support for democracy and trust in elections. This result —in line with Guriev et al. (2021)— suggests that internet expansion is causing increasing skepticism about representative democracy among the public. Most likely, such skepticism is perceived by legislators in social media and in other instances, ultimately causing an increase in their extremism, as they have incentives to respond to an increasing share of their constituencies.

My main contribution to the literature is establishing concrete mechanisms through which the internet and social media affect political elites. The few papers that have addressed this relationship have generally focused on how politicians react to the internet or social media within the digital domain (Barberá et al., 2019; Bessone et al., 2019). By building on these scholars, I also provide several pieces of evidence about how politicians use Facebook in their daily activities, addressing variables such as the penetration, the content, and the sentiment of their posts. Most importantly, I empirically demonstrate that social media increases elite extremeness, implying that it affects areas far beyond the digital world.

My results are problematic from a democratic standpoint. In the last few years, Latin America

has experienced increased political polarization. In countries like Colombia, Brazil, Peru, and Chile, the second round of the presidential election has included candidates who lean towards the extremes, lacking any consistent political majority to govern effectively. The evidence provided here sheds light on a plausible explanation for this phenomenon, as social media and the internet reward specific types of leadership. In this sense, it will not be surprising to witness countless politicians chasing "likes" on social media in the coming years.

The fact that extremeness is rewarded in social media highlights the importance of intermediaries in the political discussion: that is, journalists and editors with a commitment to fighting misinformation and filtering certain types of speech. However, demagogues around the world precisely attack the intermediaries, claiming that social media allows a more genuine contact with the people, as opposed to an allegedly corrupt traditional media;[32] In this paper, I show that the reality is entirely the opposite: it is the absence of intermediaries what makes social media a space where extremeness is rewarded, which end up lighting the flames of polarization.

Another worrisome fact is that Chile conforms with the worldwide trend of increasing skepticism towards democracy explained, in part, by the expansion of internet coverage. Essentially, this and other papers show that the sea of information provided by the internet is not only affecting incumbent governments or corrupt politicians but democratic institutions themselves: elections, the judiciary, parliament, and others. In this sense, democratic regimes must establish mechanisms that help people to appreciate the value of institutions. In the Chilean case, it is paramount for traditional media to regain trust among citizens. Free and independent media, with inquisitive journalists, is a much more effective tool to hold the powerful accountable than having politicians misinforming, chasing likes, or taking advantage of an underlying negative sentiment towards democracy.

[32] An example is Franco Parisi, a candidate who in the 2021 Chilean presidential election obtained a non-negligible 12.8% of the vote. He made his campaign entirely through social media, as he was not allowed to enter the country. See https://www.latercera.com/la-tercera-pm/noticia/convertir-likes-en-votos-usuarios-en-votantes-la-formula-parisi-para-salir-tercero-desde-su-celular/5GMRK4NB3NCUFEM7VQFJ2PBOIA/

This study opens up a series of new questions for future research. For example, an interesting question is how exposure to the internet affects political attitudes in developing or middle-income countries. In this paper, I show the impact of 3G on only two outcomes related to support of democracy and elections, as this was not the paper's main focus. However, it is plausible that the internet also increases support for more "progressive" initiatives —especially among young people— , since voters could be exposed to arguments from more developed nations. Nevertheless, it is also possible that access to information gives better arguments to groups on the fringes of the political spectrum, allowing them to persuade more people of their point of view.

A second area is to continue exploring how politicians interact on Facebook, Twitter, Instagram, and Tik Tok, and the impact on myriad outcomes. In this paper, I heavily focused on Facebook, given that my data set started in 2010. However, nowadays, politicians rely heavily on Twitter and Instagram to talk about national politics and Tik Tok to try to be intimate and funny. In this sense, qualitative research could be valuable to explore the multiple ways they use these platforms. Do politicians quantify the success of a given post? How sophisticated are they in analyzing impact indicators? How important is this information compared to other feedback they could receive, such as polling data or personal contact? Answering these questions could shed light on the multiple ways social media affects elite behavior.

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Appendix A: Additional Tables and Figures

Table A1: Population Covered by 3G and 4G

Year	Population covered by 3G + 4G	Share 3G + 4G
2009	638,787	0.04
2010	1,445,875	0.08
2011	3,154,995	0.18
2012	4,983,888	0.29
2013	6,366,120	0.36
2014	9,155,723	0.52
2015	10,283,244	0.57
2016	13,215,139	0.73
2017	16,322,988	0.88
2018	18,153,905	0.97
2019	18,464,155	0.97

The roll-out of 4G started in 2015.

Table A2: Robustness Check of Effects 3G Coverage on Indicators of Facebook Activity (Two Treatment Leads)

	(1) Page	(2) Likes	(3) Total	(4) Shares
3G Share	0.447**	1.371**	1.414**	0.400
	(0.213)	(0.558)	(0.611)	(0.378)
3G Share (t+1),	-0.037	0.199	0.158	-0.209
	(0.122)	(0.602)	(0.663)	(0.466)
3G Share (t+2),	0.222	0.803	0.909	0.570
	(0.157)	(0.640)	(0.695)	(0.453)
R^2	0.761	0.804	0.804	0.802
Obs.	579	579	579	579

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district-year level. Adjusted models control for log of population, log of income, urban status, average age, and political coalition.

Table A3: Effects of 4G Coverage on Indicators of Facebook Activity

	(1) Likes	(2) Likes	(3) Likes	(4) Likes
Share 4G	-0.320	-1.331	-1.324	-0.283
	(0.258)	(0.948)	(1.054)	(0.829)
R^2	0.797	0.815	0.814	0.822
Obs.	466	466	466	466

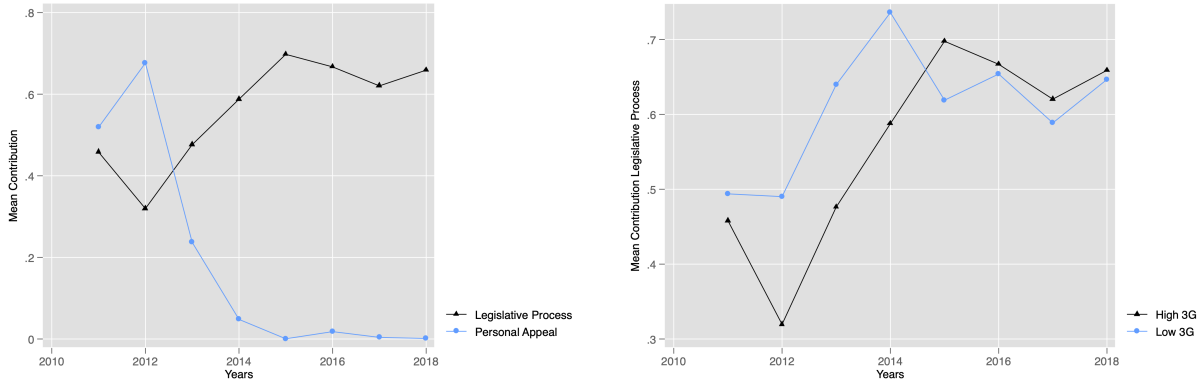
*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district-year level. The sample size for these regressions correspond to politician*years in the 2013-2017 congressional session. Adjusted models control for 3G coverage, log of population, log of income, urban status, average age, and political coalition.

Table A4: Effects of 3G municipal level (cross sectional models)

	(1) Log Mentions 2018	(2) Log Mentions 2017	(3) Log Mentions 2016	(4) Log Mentions 2015
Share 3G	0.299	0.710**	0.304	-0.407
	(0.209)	(0.311)	(0.327)	(0.310)
Adjusted	Yes	Yes	Yes	Yes
R^2	0.654	0.750	0.732	0.822
Obs.	1359	394	277	249

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the municioality-year level. The sample size for these regressions correspond to politician*municipality*years between 2015 and 2018. Adjusted models control for 3G coverage, log of population, log of income, urban status, average age, and political coalition.

Figure A1: Mean Contribution Topics Facebook Posts



(a) High 3G

(b) By 3G Status

Figure A2: Histograms Extremeness Indicator by Year

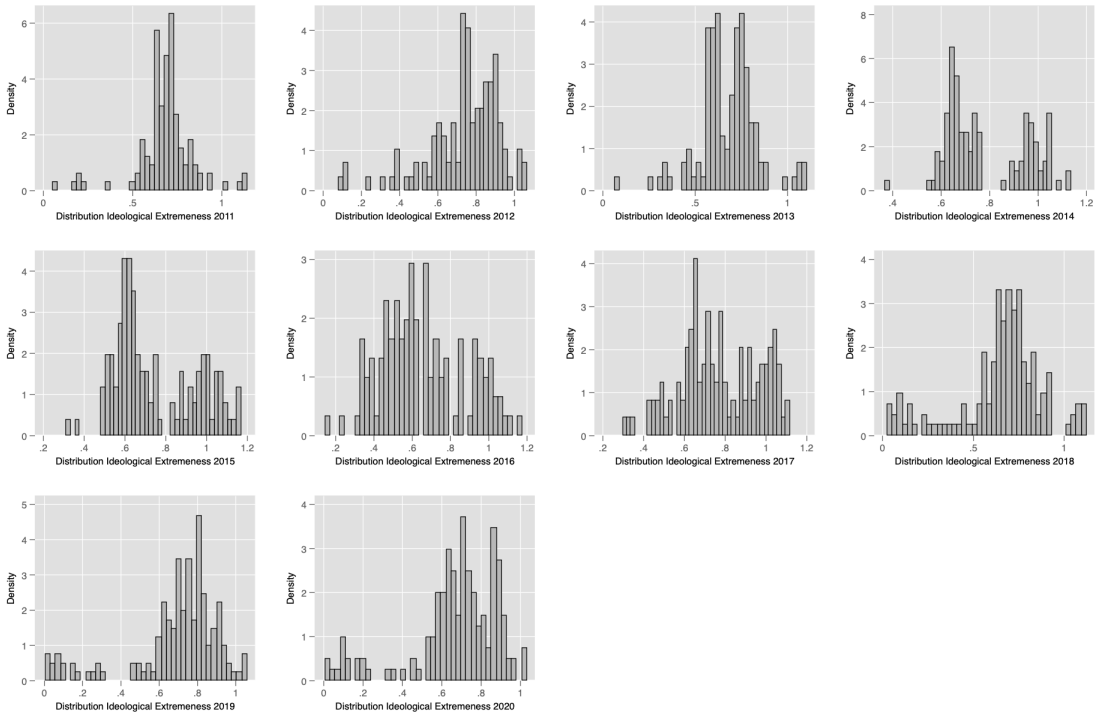


Table A5: Most Extreme Legislators by Year

Most extreme legislator	Party	Year	Who governed?
Hugo Gutierrez	Communist	2011	Right
Lautaro Carmona	Communist	2012	Right
Hugo Gutierrez	Communist	2013	Right
German Becker	National Renewal	2014	Center-Left
Gustavo Hasbún	Independent Democratic Union	2015	Center-Left
Gustavo Hasbún	Independent Democratic Union	2016	Center-Left
Jorge Ulloa	Independent Democratic Union	2017	Center-Left
Claudia Mix	Comunes	2018	Right
Florcita Alarcón	Humanist	2019	Right
Pamela Jiles	Humanist	2020	Right

Table A6: Bills 2011-2019

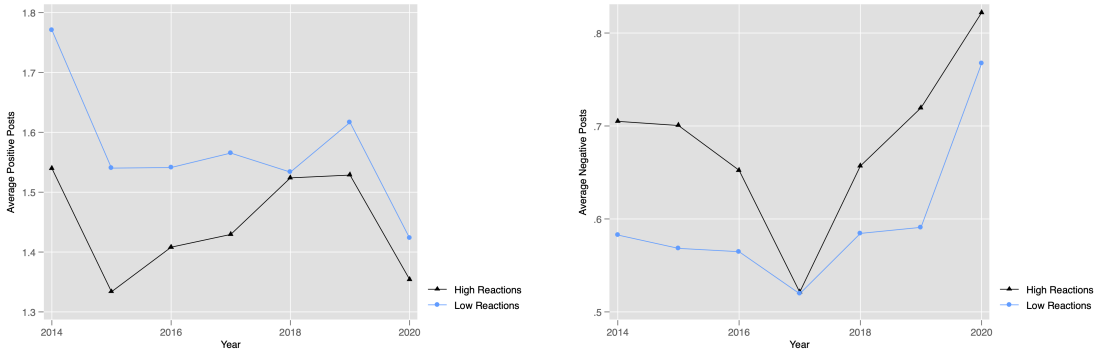
Issues	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Science and Technology	5.7	0.2	7.6	2.1	0.9	1.1	1.1	0.9	0.4	1.8	1.9
Constitution	7.8	5.7	1.7	10.9	3.4	1.3	4.1	3.4	4.9	5.5	5.1
Defense	0.6	4.8	3.4	0.2	2.1	7.3	9.7	5.2	7.7	7.0	5.2
Economy	9.9	9.5	0.5	0.0	8.9	7.2	3.3	9.2	8.2	17.8	7.2
Education	1.9	4.6	2.7	28.5	21.2	10.9	28.4	9.8	3.3	5.4	11.6
Homeland	10.1	9.0	17.6	3.1	1.1	0.1	3.3	0.1	0.9	0.1	4.0
Fiscal policy	39.9	41.7	24.9	40.5	32.2	28.2	21.2	36.9	30.8	19.5	30.4
Infraestructure	0.0	1.1	0.3	0.0	13.1	12.5	4.2	18.8	15.0	23.3	9.5
Fishing	1.0	11.5	0.0	0.8	1.1	0.0	9.5	0.1	6.7	0.8	3.5
Health	5.7	3.7	6.8	0.0	3.3	4.1	2.5	3.7	0.7	0.6	3.0
Labor	2.7	1.5	0.9	0.4	2.0	5.5	1.8	3.0	4.0	6.1	3.6
Other	14.8	6.9	33.7	13.4	10.9	21.7	11.0	8.9	17.4	12.2	15.2
Total	100	100	100	100	100	100	100	100	100	100	100

Table A7: Effects of Facebook Activity on Extremeness (Adjusted by 3G)

	(1) Extreme	(2) Extreme	(3) Extreme	(4) Extreme	(5) Extreme	(6) Extreme	(7) Extreme	(8) Extreme
Page	0.042	0.044*						
	(0.026)	(0.024)						
Likes			0.029***	0.026***				
			(0.009)	(0.008)				
Total					0.026***	0.024***		
					(0.008)	(0.007)		
Shares							0.040***	0.033***
							(0.009)	(0.008)
3G Share	0.107	0.081	0.103	0.081	0.103	0.081	0.117	0.096
	(0.077)	(0.066)	(0.073)	(0.063)	(0.072)	(0.063)	(0.072)	(0.064)
R^2	0.821	0.850	0.826	0.853	0.826	0.853	0.826	0.852
Obs.	1132	1124	1132	1124	1132	1124	1132	1124

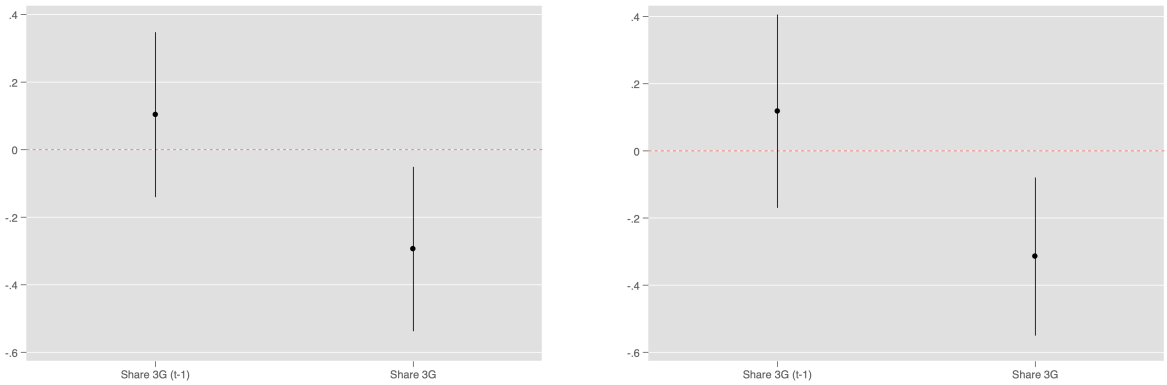
*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district-year level. The sample size includes politician*years between 2011 and 2018, the period covered by the 3G data. The outcome for all regressions is level of extremeness in congress. All models include politician*district and region*year fixed effects. Adjusted models control for 3G coverage, vote share, log of population, log of income, urban status, average age, and political coalition.

Figure A3: Sentiment Analysis Facebook Posts 2014-2020



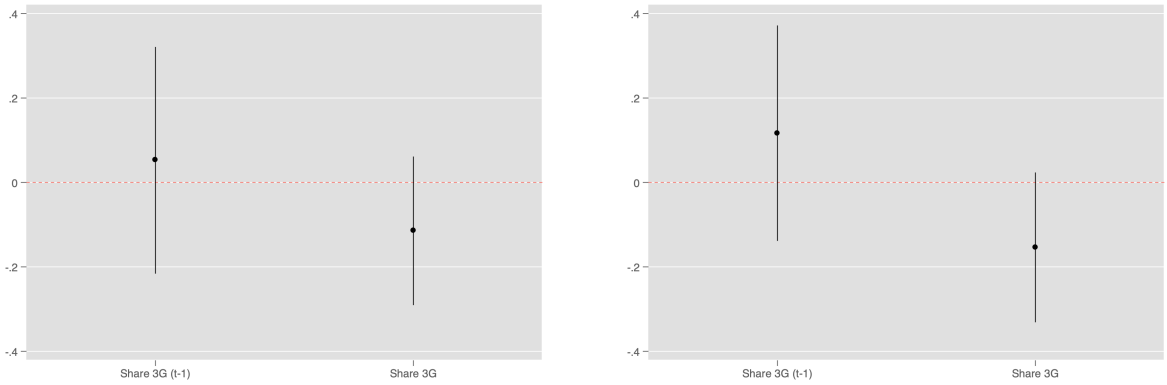
(a) Positive (b) Negative

Figure A4: Coefficient Plot Democracy Best



(a) Non-Adjusted (b) Adjusted

Figure A5: Coefficient Plot Confidence Elections



(a) Non-Adjusted (b) Adjusted

Table A8: Effects of 3G on Democracy Best Government

	(1) Support Democracy	(2) Support Democracy	(3) Confidence Elections	(4) Confidence Elections
Share 3G	-0.478	-0.478*	-0.414**	-0.443*
	(0.291)	(0.268)	(0.197)	(0.227)
Adjusted	No	Yes	No	Yes
R^2	0.0743	0.0987	0.0787	0.0907
Obs.	5516	4638	5710	4762

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the municipality-year level. The sample size for these regressions correspond to politician*municipality*years between 2015 and 2018. Adjusted models control for 3G coverage, log of population, log of income, urban status, average age, and political coalition.

Appendix B: Challenges to Identification

Certainly, 3G roll out in Chile was not randomly assigned, as more covered places are likely more populated and urban compared to less covered ones. In this sense, the mere comparison among localities will, most likely, yield biased results. To address this potential endogeneity problem, I applied several statistical techniques for observational data, with the purpose of approaching causal identification as best as possible.

First, I remind the reader that the two-way fixed effects model adjust for politician heterogeneity and for region-specific time trends. This implies that differences across politicians, and events affecting particular regions are already accounted for, as the source of the variation is within-politician over time. In this sense, any potential effect implies that a given politician changed their behavior concurrently with increases in 3G access.

Second, I estimate all the models with and without time-variant demographic and political controls. If the hypothesized effects are robust, I expect that the coefficients will not change dramatically after the inclusion of such controls; if a coefficient goes to zero it would mean that the independent variable of interest —for example, 3G internet— was capturing the effect of one of the included covariates.

Third, I included lead versions of the independent variable of interest in all the relevant models. If an effect exists, then the coefficient of the lead variables —that is, the same independent variable in future time— should be zero.

Finally, I conducted an instrumental variable specification (see Appendix E for a longer discussion about the validity of this estimator) to test hypotheses 4, using 3G access as an instrument of Facebook activity.

None of this strategies by itself would completely assure the validity of the causal estimates. However, finding the same result in all these different empirical strategies, regardless of the speci-

fication, increases the credibility of the results.

Appendix C: Data Building

To build the data set, I started with the shape files provided by Collin's Bartholomew, consisting in 1*1 grid cells indicating 3G coverage. Then, I follow the exact procedure done by Guriev et al. (2021), described in the README file located in https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/SMUOF7. Basically, I multiply the data indicating presence of absence of 3G coverage by the population density in a 1*1 grid cell in all the Chilean territory. For the 2010-2014 period, I use the population density of 2010 according with the NASA dataset; for the years beyond 2015, I used the density of 2015.

The resulting data shows how many people is covered in by 3G in Chile. Then, I sum up the number of people covered by municipality or district; finally, I divide number of people covered by the population, resulting in the share of chileans covered by 3G in the corresponding administrative unit. Based on this indicator, I created four different data sets:

1. The first data set is at the politician*year level, which includes share of 3G coverage, Facebook indicators and the extremeness measure. Before 2017, there were two legislators per district, meaning that the treatment variable —share of district population with access to 3G— covered two politicians. After 2017, there was a reform of the electoral system, which increased district size with a variable number. Thus, there were between five and eight politicians per district.

2. The second data set is at the politician*municipality*year level, which was used to analyze whether politicians responded more to municipalities with higher access to 3G within a district. Here, the treatment data varied by municipality*year.

3. Thirdly, for 2019 —the year of the crisis—, I created a data set at the politician-day level. The 3G variable was constructed at the district level.

4. Finally, I merged the 3G data at the municipality level to polling data from Lapop, to study the impact of access to internet on voter's support for democracy.

Along the paper, I will explain to the reader which data set I am using for a given analysis.

Appendix D: Topic Modeling

Table D1: Top 20 Words Policy Topic among High 3G

Policy			
5 Topics	**10 Topics**	**15 Topics**	**20 Topics**
Proyecto	Proyecto	Proyecto	Proyecto
Vecinos	Vecinos	Vecinos	Vecino
Gobierno	Gobierno	Gobierno	Gobierno
Trabajo	Comuna	Comuna	Comuna
Comuna	Trabajo	Trabajo	Trabajo
Pais	País	País	País
Años	Años	Años	Años
Nacional	Nacional	Nacional	Nacional
Ley	Región	Región	Región
Región	Ley	Ley	Ley
Educación	Educación	Educación	Cámara
Salud	Cámara	Cámara	Educación
Cámara	Salud	Sector	Sector
Reunión	Sector	Salud	Presidente
Nueva	Presidente	Reunión	Salud
Comisión	Reunión	Equipo	Nueva
Diputados	Nueva	Presidente	Reunión
Nuevo	Equipo	Nueva	Equipo
Parte	Diputados	Diputados	Vida
Sector	Nuevo	Nuevo	Diputados

As robustness check, I ran the topic model algorithm with different number of topics: 20, 15, 10 and 5. In each of the iterations, the results are very similar to the ones presented in the results section: among the high 3G group, there are two different topics that predominate in the period, which are distinguishable from each other. I called the first topic "Appeal", because its main words have the purpose to directly appeal voters to get in touch with politicians. The second topic — defined as "Policy— alludes to the legislative process, and became more prevalent over time. This suggests that communication in social media became more unidirectional. Table D1 shows the top 20 words of the Policy topic with varying number of k among the high 3G group, in the original language. Meanwhile, table D2 show the top 20 words of the Appeal topic in the high 3G group.

Both tables confirms that the themes are clearly identified regardless of the total number topics defined previously.

Table D2: Top 20 Words Appeal Topic among High 3G

Appeal			
5 Topics	**10 Topics**	**15 Topics**	**20 Topics**
Mejor	Mejor	Mejor	Mejor
Gobierno	Esfuerzo	Esfuerzo	Esfuerzo
Esfuerzo	Siempre	Siempre	Siempre
Ayudar	Ver	Ver	Ayudar
Siempre	Gente	Ayudar	Ver
Concepción	Ayudar	Gente	Piensas
Haré	Piensas	Piensas	Contáctame
Piensas	Contáctame	Contáctame	Haré
Contáctame	Haré	Haré	Apoyarte
Ver	Apoyarte	Apoyarte	Concepción
Atentamente	Concepción	Concepción	Sur
Apoyarte	Gobierno	Online	Gobierno
Gente	Online	Gobierno	Atentamente
Apoyo	Bío-Bío	Bío-Bío	Bío-Bío
Chiguayante	Atentamente	Atentamente	Online
Bío-Bío	Ley	Ley	Ley
Revisar	Chiguayante	Chiguayante	Chiguayante
Diputados	Sandra	Sandra	Dipuatdos
Online	Hermann	Hermann	Sandra
Ley	Diputados	Vida	Hermann

The subsequent tables shows the two main predominant topics among the low 3G group. The first topic is clearly related to policy, whose top 20 words are displayed in table D3.

Finally, table D4 shows the second most relevant topic according to the model. As explained the results section, this is difficult to identify, although most of their keywords relate to policy, such as "ley" and "proyecto". In this sense, among the low 3G group, it seems that the only one relevant topic, which is show in table D3.

Table D3: Top 20 Words Policy Topic among Low 3G

Policy			
5 Topics	**10 Topics**	**15 Topics**	**20 Topics**
Proyecto	Proyecto	Proyecto	Proyecto
Gobierno	Gobierno	Gobierno	Gobierno
Vecinos	Vecinos	Ley	Ley
Región	Ley	Vecinos	Vecinos
Ley	Región	Región	Región
Comuna	País	Comuna	Comuna
Años	Años	Años	Años
Ahora	Comuna	País	Trabajo
País	Ahora	Ahora	País
Trabajo	Trabajo	Trabajo	Ahora
Nacional	Educación	Nacional	Nacional
Educación	Nacional	Educación	Educación
Diputados	Diputados	Diputados	Diputados
Salud	Salud	Salud	Salud
Personas	Personas	Vida	Personas
Parte	Vida	Personas	Vida
Nuevo	Alcalde	Regional	Parte
Vida	Nuevo	Parte	Regional
Años	Regional	Nuevo	Nuevo
Todas	Parte	Alcalde	Alcalde

Table D4: Top 20 Words Second Most Relevant Topic among Low 3G

Undistinguishable			
5 Topics	**10 Topics**	**15 Topics**	**20 Topics**
Ley	Ley	Ley	Ley
Proyecto	Proyecto	Serena	Serena
Comisión	Serena	Proyecto	Proyecto
UDI	Reunión	Reunión	Reunión
Reforma	Rumbo	Rumbo	Rumbo
Serena	Modifica	Comisión	Coquimbo
Reunión	Comisión	Coquimbo	Comisión
Arica	Adultos	Constitución	Adultos
Nuñez	Sala	Adultos	Vicuña
Cámara	Votar	Modifica	Constitución
Linares	JJVV	Vicuña	Modifica
Rumbo	Constitución	Sala	Sala
Concejal	Club	Club	JJVV
Coquimbo	Establece	JJVV	Club
Maule	Actividades	Objeto	Votar
Gutierrez	Distrital	Votar	Siguientes
Candidatos	Vicuña	Siguientes	Objeto
Sala	Coquimbo	Establece	Establece
Entrevista	Vecinos	Proyectos	Actividades
Bachelet	Objeto	Actividades	Discutir

Appendix E: Instrumental Variable Estimation

As an additional robustness check, I instrument Facebook page, likes, and total interactions with access to 3G at the district level. The first stage of this model is the following:

$$Page_{idry} = \alpha + \mu(3G)_{dry} + \gamma_{idry} + \lambda_{ry} + \epsilon \tag{7}$$

Where $Page_{idry}$ of legislator i, in district d, in region r, in year y is instrumented by the share of the population in the district covered by 3G, adjusting for politician*district fixed effects and regional time trends. For the other indicators —likes and total interactions—, I run the same specification but changing the outcome variable in the first stage. The second stage can be described as follow:

$$Extreme_{imry} = \alpha + \hat{Page}_{idry} + \gamma_{idry} + \lambda_{ry} + \epsilon \tag{8}$$

Where the indicator of legislative extremeness is regressed on the predicted value $\hat{Page}$, adjusted by politician-district and country-region fixed effects.

It is worth discussing the main assumptions of instrumental variable specification. Regarding the first stage, the exclusion restriction requires that conditional on the fixed effects, the only path in which access to 3G internet affects elite extremeness is through its impact on Facebook activity. In other words, the identifying assumption is that changes in 3G within districts affect variation in extremeness due to increasing levels of activity on Facebook among elites.[33] To be completely transparent, I acknowledge that this assumption is problematic. Indeed, there are other ways in which internet access could affect politicians' behavior. For instance, as shown in table 8, changes

[33]The valid first stage assumption means that access to 3G affects Facebook consumption. This is proved on table 3.

in 3G could give voters more information about politics, ultimately changing their perception of government and democracy. As politicians may respond to voters, they may also alter their legislative behavior.

As I acknowledge this plausible violation, I include this analysis just as a robustness check. It is more empirically rigorous to prove my hypotheses using a two-way fixed effect model, making sure that there are no pre-treatment trends that threaten the validity of the results, as I do in the paper. Indeed, this model could be overestimating the intrinsic effect of social media on elite extremeness —precisely because there is an alternative path that could explain a fraction of the effect—, so I warn the reader to interpret these results with caution.

Table E1 shows the results of the instrumental variable estimator across the three outcomes. We see a positive effect of Facebook activity on elite extremeness, although only two coefficients are statistically significant. In general, the magnitude of the point estimates is larger than the ones displayed in table 6, although the standard errors are considerably higher than in such a model.

Table E1: Instrumental Variable Estimates. Outcome: Extremeness

	(1) Page	(2) Like	(3) Total	(4) Page	(5) Page	(6) Likes	(7) Likes	(8) Total	(9) Total
Share 3G	0.453**	1.414**	1.505**						
	(0.219)	(0.594)	(0.662)						
Page				0.118	0.085				
				(0.111)	(0.146)				
Likes						0.152***	0.033		
						(0.046)	(0.053)		
Total								0.139***	0.031
								(0.041)	(0.050)
Obs.	814	814	814	773	773	773	773	773	773
Adjusted				No	Yes	No	Yes	No	Yes

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*years between 2011 and 2018, the period covered by the 3G data. All models include politician*district and region*year fixed effects. Adjusted models control for log of population, log of income, urban status, average age, and political coalition.

These results confirm the general trend of this paper: access to Facebook increases elite extremeness. This basic result is consistent across multiple specifications strengthens the article's conclusions.

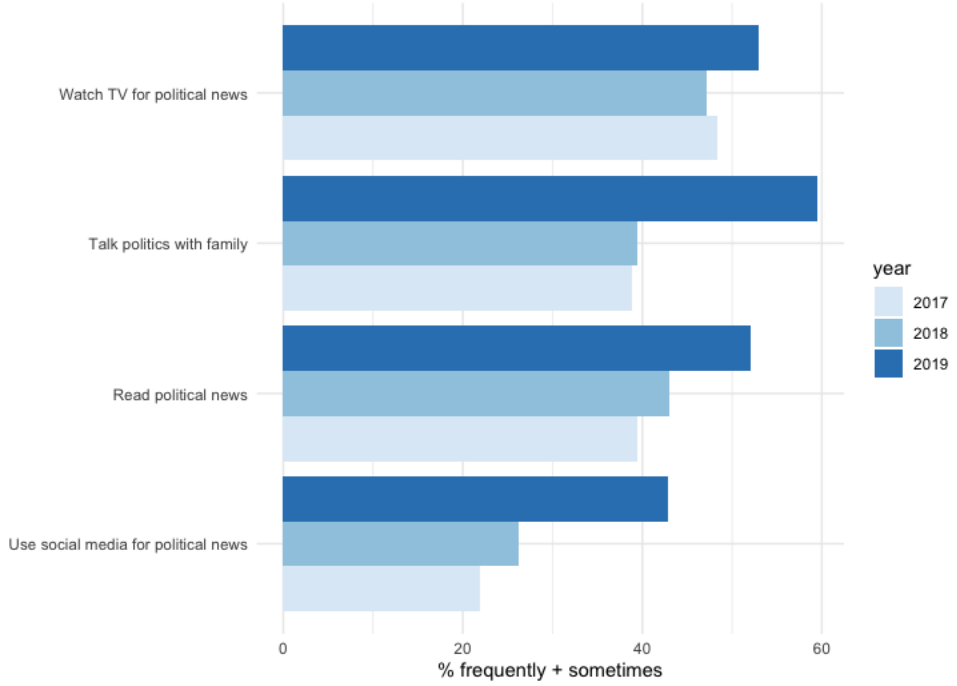
Appendix F: The October Revolt

In this appendix, I want to analyze the role of social media in the context of an acute and unexpected political crisis, which happened in October 19th, 2019. That evening, a wave of protests motivated by an increase in subway fares led to widespread street violence in Santiago, Chile's capital, including an attack on the subway system, arson, looting, and generalized vandalism. In the following days, hundreds of thousands of people took the streets to protest for what has been interpreted as discontent with inequality in different aspects of social life. A fraction of the movement pushed for a new constitution, as the current one was enacted under Pinochet's dictatorship. A week after the attacks on the subway, Santiago had one of the most massive protests in its recent history under military curfew and state of emergency.

I want to highlight three elements of this crisis. First, for several months, there was an overwhelming amount of political information that flooded the media. According to polling data from CEP, there was a substantial increase in the percentage of people who consumed political information frequently (see figure F1). Second, the political discussion became very belligerent and polarized, partly because of the unprecedented levels of street violence. Third, Chileans heavily use social media as a source of political information. Indeed figure F1 shows that the share of people who used Facebook for political news increased by 17 percentage points, whereas TV consumption increased in a lesser degree.

The Chilean crisis of 2019 represents a natural experiment about an unusual level of attention to politics among a large group of the population, and an important shift towards social media consumption. Thus, it is a good scenario to analyze attention to social media among political elites. As the crisis happened in a national scale, it is unclear whether politicians in districts with higher access to 3G would react differently than the ones in less connected districts.

Figure F1: Media and Political Consumption Chile December 2017 - 2019 (source: CEP)



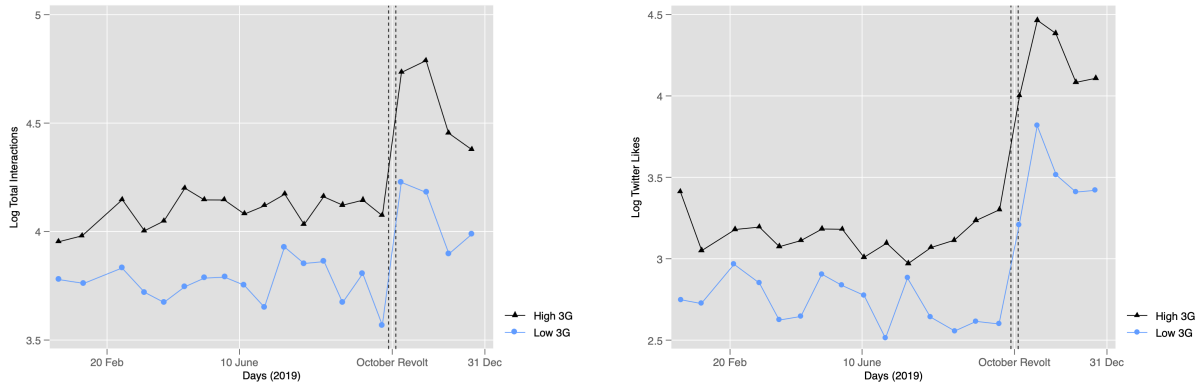
Data, Measures and Empirical Strategy

To analyze whether access to the internet impacts attention during the crisis, I create a data set at the politician-day level for 2019, exploiting the significant shock that occurred on October 18th. I follow the logic of an event study, analyzing, in the first place, how such events impact attention and then estimating the impact of internet access. In addition to the Facebook measures used previously, I added outcomes scrapped from Twitter, such as $log(1 + retweets)$ and $log(1 + likes)$. By looking at the daily average of Facebook and Twitter interactions in figure F2, we can tell that there was a large increase in the week of the events.

The statistical model can be described as follows:

$$Y_{id} = \alpha + \tau_1(revolt)_d + \tau_2(3G)_i + \tau_3(3G * revolt)_i + \gamma_i + \epsilon \tag{9}$$

Figure F2: Daily Total Interactions Facebook and Twitter 2019



(a) Facebook

(b) Twitter

Where activity in social media of politician i on the day d is regressed on an indicator variable equal to one after the revolt, zero otherwise, and on an indicator of being above the median in access to 3G. The term γ accounts for politician fixed effects. The parameter τ_3 is the main quantity of interest, as it represents the difference in social media interactions between high and low access to 3G.[34] Given that I adjust for politician fixed-effects, I cannot control for district-level variables because they do not change over time. Due to the data structure, I will be able to present more leads and lags to confirm the validity of the results.

Results

Table F1 shows the effect of the revolt on Twitter interactions at different levels of 3G access. Clearly, we see that the increase in likes and retweets was 34% higher in both cases among politicians of high 3G districts compared to low 3G (see the interaction coefficient in column 2 of table F1), a very substantial amount. Regarding Facebook, we also see a significant effect (see table F2). Figure F3 shows a visualization of these results, as it calculates the average daily interactions net of politician fixed effects. As we see, the increase in Facebook and Twitter interactions was

[34] I could not include a continuous variable for 3G access because it varies at the district level, and therefore is colinear to politician fixed-effects.

considerably higher for politicians with more internet access.

Table F1: Event Study October Revolt (Twitter)

	(1) Log Retweet	(2) Log Retweet	(3) Log Likes	(4) Log Likes
Revolt	0.801***	0.570***	0.842***	0.615***
	(0.092)	(0.140)	(0.096)	(0.141)
Share 3G		0.305***		0.304***
		(0.023)		(0.024)
Revolt*Share 3G		0.343*		0.337*
		(0.181)		(0.186)
R^2	0.637	0.638	0.694	0.695
Obs.	12597	12597	12597	12597

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*days for 2019.

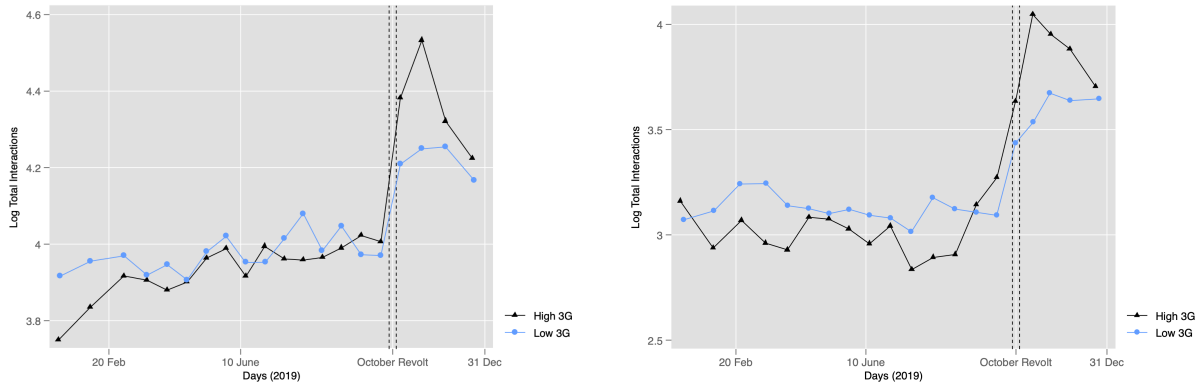
Table F2: Event Study October Revolt (Facebook)

	(1) Log Total	(2) Log Total	(3) Log Shares	(4) Log Shares
Revolt	0.414***	0.314***	0.405***	0.260***
	(0.041)	(0.055)	(0.044)	(0.059)
High 3G		0.951***		1.109***
		(0.015)		(0.016)
Revolt*High 3G		0.180**		0.259***
		(0.080)		(0.085)
R^2	0.521	0.522	0.428	0.429
Obs.	24119	24119	24119	24119

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. The sample size includes politician*days for 2019.

When analyzing pre-trends, table F4 shows the revolt coefficient, adding pre and post trends, defined as dummy variables indicating five, ten and fifteen days before and after the event. For Facebook (panel a), we see that for both high and low 3G, the effect appears immediately after the revolt, although it is higher for the former group. In the case of Twitter (panel b), we see a

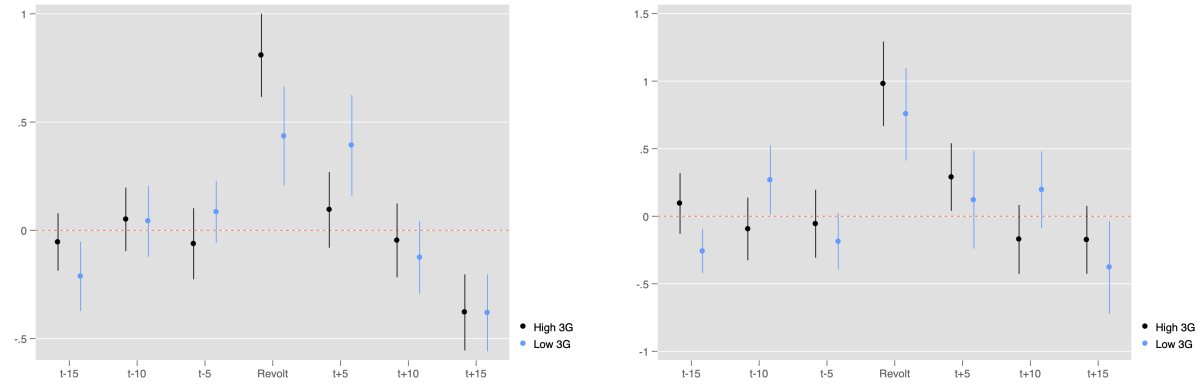
Figure F3: Daily Total Interactions Facebook and Twitter 2019 (Politician Fixed Effects)



(a) Facebook (b) Twitter

substantive effect of the revolt, for both types of legislators. Probably, Twitter interactions —as opposed to Facebook— are more affected by national events and less influenced by district-level access to the internet.

Figure F4: Coefficient plot October Revolt Twitter and Facebook



(a) Facebook (b) Twitter

Overall, we see that the October revolt caused a very substantial increase in social media elite interactions. In the case of Facebook, there is a marked difference between high and low access to the internet, suggesting that elite attention —even in a national crisis— is conditioned by voter's access to the internet.