

The Impact of Social Media on Political Elites*

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Abstract

The Internet and social media have significantly affected democracies around the world. Yet, little is known about their direct impact on political elites. In this article, I posit that the expansion of the internet and social media has increased elite ideological extremism through two channels: i) A growth in voter radicalism, affecting politicians who respond to their constituencies, and ii) a higher reward to extreme politicians on social media. I test these hypotheses in Chile, finding the following results: First, a positive effect of access to 3G mobile internet on politicians' Facebook activity; second, higher levels of Facebook interactions increase ideological extremism among politicians, especially in the initial years of Facebook penetration; and third, I found suggestive evidence that voters do not drive this effect. On the contrary, elite extremism is plausibly explained by the internal dynamics of social media, where extreme posts are clearly rewarded by consumers of politics online.

Keywords: Internet, Political Elites, Extremism, Latin America.

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Introduction

"The main problem with this new generation of politicians —an experienced Chilean legislator claims, during an anonymous personal interview— is their excessive attention to social media. They seem to believe that social media represents the real world, which is clearly not the case. Sooner rather than later, this will come back to hunt them". In his view, politicians who spend excessive time on social media become isolated, immersed in a world of toxicity, and kidnapped by their online followers; most importantly, their offline political activity becomes affected by the dynamics of the digital world.

This claim resembles an assertion commonly found among political commentators: Some politicians overreact to what is happening in social media, and as a result, they become more ideologically extreme. In other words, they could be confusing social media users with the general electorate and altering their positioning in a way that is not necessarily beneficial to them. But a key question remains: Why would politicians do that? Elected officials are strategic actors whose actions are oriented toward winning elections and remaining in office. It is hard to imagine that they will not be conscious of this potential bias or that they will act against their interests.

The unique characteristics of social media may shed light on this puzzle. What is distinctive about social media —compared to traditional media, such as radio, newspapers, and TV— is the *content* to which users are exposed and the type of *people* who use these platforms. These two characteristics create a specific type of *interaction* between politicians and the public, which could have an impact in the offline domain.

Regarding content, scholars in the early stages of the internet highlighted that discussions in political forums were usually civil and polite (Papacharissi, 2004). Recent evidence, however, portrays a very different picture. Scholars in the communication literature have focused on the notion of "toxicity" in political discussions, defined as the expression of disrespect through the use of insulting language, profanity, or name-calling, which can involve personal attacks and the employment of racist, sexist, or xenophobic expressions (Kim et al., 2021). Consistently, studies

have documented that toxic discourse is more prevalent online than in offline platforms (Sobieraj and Berry, 2011; Coe et al., 2014; Theocharis et al., 2016; Chen, 2017; Muddiman and Stroud, 2017; Oz et al., 2018; Kim et al., 2021; Ventura et al., 2021). Most importantly, exposure to this new content affects outcomes in the offline world. Studies have found that the Internet increases non-civic attitudes and skepticism toward democracy worldwide (Guriev et al., 2021), while others found that it increases polarization in the US context (Melnikov, 2021; Allcott et al., 2020).¹ The reasons for the prevalence of toxicity is related to exposure to extreme positions when people interact outside their local network (Bail et al., 2018; Törnberg, 2022). This, in turn, enables the expression of moral outrage, encouraging users to punish others, with subsequent effect on the degree of empathy towards people with different opinions (Crockett, 2017; Asker and Dinas, 2019).²

Regarding the type of people who interact on social media, the evidence consistently shows that they markedly differ from the average citizen. Online commentators have stronger partisan affiliations, consume more political news, discuss politics more frequently, vote more often, engage in other political activities more vigorously, employ a more toxic language, and finally, reward more extreme politicians with likes and shares (Smith, 2014; Settle et al., 2016; Weeks et al., 2017; Hong and Kim, 2016). Researchers in psychology have found that uncivil and hostile discussions are conducted by status-driven people, who see themselves as opinion leaders with the capacity to influence others (Bor and Petersen, 2022; Weeks et al., 2017).

Based on these characteristics described above, I argue that the penetration of social media in politics increases *ideological extremism* among political elites through two non-mutually exclusive mechanisms. In the first place, access to the internet can increase skepticism towards democratic institutions among voters by way of providing constant information about government affairs, as recent studies show (Guriev et al., 2021). If this is the case, there could be an increasing portion of

¹In the case of Allcott et al. (2020), they measure how exposure to Facebook affected polarization and subjective well-being

²Other scholars have painted a more positive picture of the impact of social media. Studies have shown that precise information transmitted through this medium can increase electoral accountability (Enriquez et al., 2022; Garbiras-Díaz and Montenegro, 2022), voter turnout, (Bond et al., 2012), political factual knowledge (Allcott et al., 2020), and protests against autocracies (Enikolopov et al., 2020; Steinert-Threlkeld, 2017)

voters skeptical of democracy that may be more willing to support extreme politicians. Importantly, these negative attitudes towards democracy may express themselves in social media, where voters have the opportunity to interact with politicians directly. This is a *extrinsic* mechanism, as the impact of social media on elites would be a response from politicians to a societal trend among voters.

The second channel through which social media may increase elite extremism relates to the *intrinsic* nature of the interactions between politicians and users of these platforms. Per the characteristics of social media commentators, a safe assumption is that they are aware of the offline behavior of their preferred politicians, ready to comment on any action that warrants a discussion. In this sense, politicians who thrive in social media may be afraid of bad publicity regarding their offline behavior, leading them to move to extreme positions. This is a *supply side* mechanism, as the potential effect of social media is directly exerted on politicians who may be excessively responsive to their online audience, even if such users do not represent a significant fraction of actual voters.

Within the framework of the intrinsic mechanism, I want to mention a different possibility related to political psychology. According to the New York Times best-selling author Mark [Fisher \(2022\)](#), social media has changed how we think and behave offline, with a pervasive impact on our politics. In particular, [Fisher \(2022\)](#) points out that the engaging algorithms of these platforms reward the expression of outrage and extremism, affecting behavior in the real world. The reason for that —Fisher claims— is because we internalize the social cue that outrage is going to be rewarded by our community in the world. If these effects are plausible among the public, why should politicians be immune to them? Even if we, as political scientists, tend to assume that politicians are strategic office-seeking individuals, they are also human beings, subject to the same impulses as average people.

The Chilean case during the 2010-2020 period is an intriguing one to study the relationship between access to the internet, social media consumption, and elite extremism. Since 2019, the country has undergone a severe political crisis, which has been interpreted as the product of in-

equality in different aspects of social life. One of the main consequences of this crisis was the high levels of distrust toward traditional institutions, including the traditional media, namely TV and printed newspapers. However, the opposite trend applies to social media. Indeed, an increasing number of Chileans seem to trust the information received from social media (Facebook and Twitter) more than other media outlets, which is probably reflected in the growing number of citizens who use these platforms to consume political news (see section 2)

In addition, since 2010, 3G mobile internet has greatly expanded in Chile, reaching almost universal coverage by the end of 2020. In this sense, Chile was one of the first Latin American countries where voters had access to high-speed internet at an early stage. Most importantly, Chileans became heavy users of social media as a medium to consume political news, which, in turn, greatly changed the way that politicians interact with voters. In fact, during this period (especially after 2014), most politicians opened a Facebook page and started to interact with the public through this platform. Later on, Twitter and Instagram also became important outlets, although without having the levels of penetration of Facebook.

I draw on multiple data sources, intending to capture the main concepts of interest, such as internet access, attention to social media, reactions, and elite extremism. Methodologically, I used several quantitative approaches, including two-way fixed effects regression models, instrumental variables, topic modeling with text data, and sentiment analysis of politicians' messages. The main hypothesis of this article —the relationship between social media exposure and elite extremism— is of causal nature; in this sense, I will attempt to identify the causal effect of politicians' exposure to social media, considering the difficulties associated with this task.

The empirical analyses suggest that access to 3G mobile internet increases politicians' attention to social media. Even if not surprising, this finding confirms that if voters use the internet, politicians will follow; put another way, there is a demand-side mechanism that induces politicians to focus their attention on social media when a higher proportion of voters have access to mobile internet. Importantly, the effect of 3G access on attention is concentrated in the first years of internet expansion and decreases once the internet is consolidated.

When analyzing the messages posted by elites during this period, I observe that increasingly, politicians use social media to communicate unidirectionally about the legislative process and not to gather information about the public's concerns. This aspect is not trivial since the promise of social media was to create a space for direct conversations, which does not happen anymore. On the contrary, nowadays, politicians utilize social media in a similar way to other media outlets, where there is not much dialogue between them and the public.

Most importantly, I found that exposure to social media increases elite ideological extremism; that is, as politicians receive more reactions to their Facebook messages, they become more extreme, as revealed by the latent ideology of their congressional voting patterns. Given my research design, this finding is striking because it means that politicians changed their offline behavior due to greater exposure to social media in a way that is plausibly harmful to Chilean democracy.

Similar to the case of 3G coverage and attention to social media, the effect on ideological extremism is concentrated in the initial years, although it remains positive and significant for the whole period, both at the beginning and at the end of the internet expansion. Moreover, there is some evidence that the politicians most affected by 3G are the ones elected with a smaller vote share. In general, the effect is driven by politicians with an excessively high number of reactions on Facebook—that is, above the 75th or the 90th percentile.

When exploring mechanisms, I found suggestive evidence that this effect is not driven by voters: there is no previous radicalization among the public that could plausibly explain the increase in elite extremism. On the contrary, I find that elite extremism is likely explained by the internal dynamics of social media, where extreme posts are clearly rewarded by consumers of politics. Interestingly, it is not the case that most Facebook posts made by politicians are negative. The point is that negative posts have more likes, total reactions, and shares. In other words, there is a reward for the negativity that may explain the observed effect.

Is it the case that politicians are afraid of their online followers? Or is it because politicians become extreme due to the engaging maximizing algorithms of social media, as [Fisher \(2022\)](#) claims? It is hard to tell. We can explore many things using social science tools, but we cannot

get into people's heads. However, throughout my analysis, I find robust evidence suggesting that the toxicity and negativity of social media discussions plausibly affect politicians' offline behavior, with a potentially lasting effect on the democratic process.

Context: Chile 2011-2020

From the return to democracy in 1989 until 2010, Chile was ruled by the center-left Concertacion coalition. This political alliance brought together the centrist Christian Democracy with a series of center-left parties. The main opposition to this alliance came from a rightist coalition formed by the traditional conservative party that existed before the 1973 coup (National Renewal) and the Independent Democratic Union, a party that emerged from the Pinochet regime. At the beginning of the 2010s decade, new parties —generally from the left— started to emerge, challenging the establishment of the post-authoritarian period. Many left-wing leaders gained national prominence after the massive student protests of 2011. Eventually, these new leaders who emerged from the protests created their own parties, obtaining seats in Congress in 2013 and becoming a relevant political force in 2017.

By the middle of the 2010s' decade, Chileans had become skeptical and disaffected by traditional institutions, including the government, political parties, the church, the media, and the police. According to polling data from the think-tank Centro de Estudios Públicos, trust in the government declined from nearly 60% at the beginning of the 2010s to below 10% by 2020 (see Figure B2), and trust in other institutions followed a similar pattern. Interestingly, there is one area that does not follow the same pattern of increasing distrust in institutions: Social media. Figure B3 shows the percentages of Chileans who trust different types of media outlets. 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 assigns credibility to the information received from these channels.

3G and Social Media

Mobile Internet services were launched in Chile in 2005, although they achieved little penetration until the first years of the 2010s. However, with the roll-out of 3G technology, access to mobile Internet expanded rapidly. As shown by Table [A1](#), the number of people covered by 3G greatly increased between 2010 and 2014. In 2014, 4G technology was introduced, resulting in practically universal coverage by 2019. Figure [B5](#) shows 3G coverage in 2011 and 2015 per municipality in the most populated parts of the country —the metropolitan region— where the darker spots represent a higher share of 3G.³

The expansion of 3G was conducted through a concession system. In 2008, the Chilean Subsecretaria de Comunicaciones called for a public tender of the radioelectric spectrum, which allowed the three incumbent telecommunications companies to participate, and promoted the entry of more competitors ([Reuters Staff, 2008](#)). The public tender ended in September 2009, resulting in a market of five competitors, as two new companies could operate in three available frequency blocks ([Chilean Government, 2009](#)). 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 directed by the central government and adjudicated based on transparent standards.

Certainly, Chilean politicians also started to pay attention to social media as a key source of political communication. Figure [1](#) shows the increase in Facebook pages⁴ and the yearly average number of likes made in response to politicians' posts. By 2011, only 11% of politicians had a Facebook page, but this had increased to 90% in 2019.

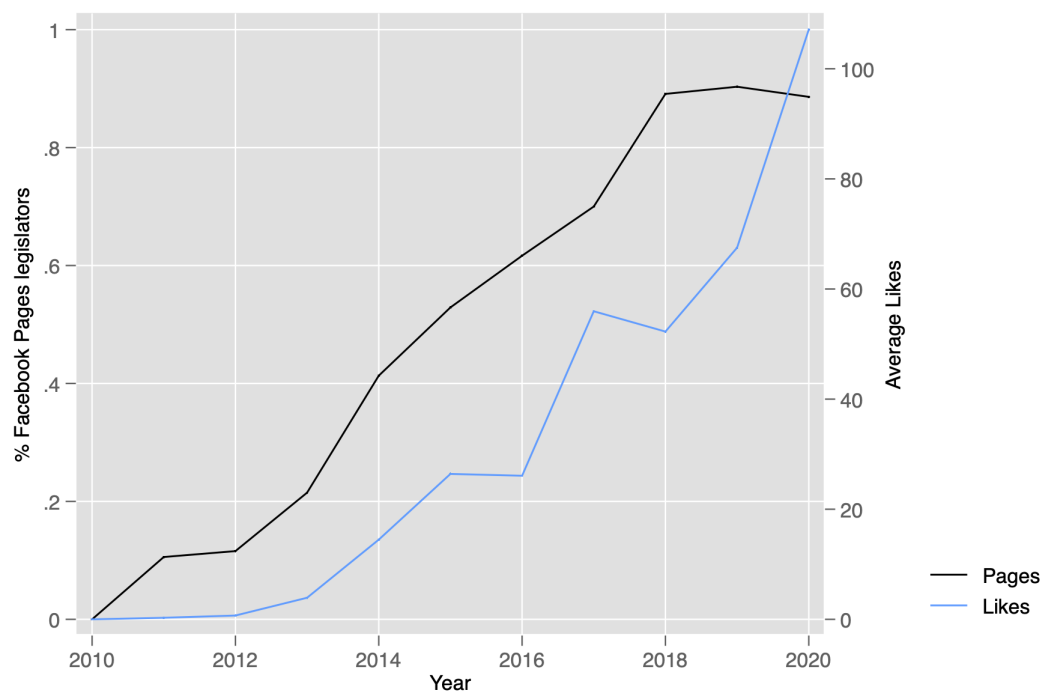
Who Are the Voters Consuming Social Media?

Who are the voters using social media? This is a key question that needs to be answered before the empirical analysis. As the reader may recall, one of the hypothesized mechanisms by which

³Note that compared to other Latin American countries today, Chile has the highest internet usage, comparable only to Argentina and Uruguay ([Internet World Stats, 2022](#))

⁴Facebook pages are used exclusively for political purposes. I did not include personal accounts.

Figure 1: Average Number of Facebook Pages and Likes by Year



Source: CrowdTangle

social media may affect elite extremism is constant exposure to politicized social media users, who may engage in uncivil discussions. Thus, it is important to establish whether these users differ from the average on key dimensions.

To explore this issue, I use data from the Centro de Estudios Públicos (CEP), a renowned Chilean think-tank, which conducts public opinion surveys. The key variable corresponds to the following survey question: "How frequently do you follow politics through social media platforms, such as Facebook and Twitter?" I present descriptive statistics for 2011 and 2020. In both cases, I compare those who answer "frequently" with the rest of the sample.

By 2011, only 4% of respondents consumed any social media platform frequently, 10% sometimes, and the rest never. When exploring the characteristics of this group, we see that it is formed by young people, generally male, from the middle of the upper class, with at least some higher education, and either from the left or from the center (see Table [A2](#)). Importantly, this group is more politicized than the rest of the sample, although only the left and the center are overrepresented. In 2020 (Table [A3](#)), the picture is quite different, especially regarding age. For instance, we now see that the age group between 45-54 is clearly overrepresented, meaning that there was a shift from younger cohorts to older ones. Moreover, there is some increase in consumption among the college-educated and in people identified with the right.

Data and Measures

Internet Access

My first hypothesis relates Internet access among the public to politicians' attention to social media. I define internet access as the share of citizens covered by 3G mobile internet in a given administrative unit—for example, a district—in a given year. This can be represented with the following formula:

$$Share\ 3G_{dt} = \frac{3G\ covered_{dt}}{Total\ pop_{dt}} \quad (1)$$

Which indicates the share of Chileans covered by 3G in given administrative unit, such as a district.

Social Media Attention

The second key concept is whether politicians pay attention to social media. I define attention to social media as having a Facebook⁵ page related to their job as legislators and utilizing it for their job. This is an indicator variable equal to one if the legislator has a Facebook page, zero otherwise. This is a basic measure of attention, as it reveals whether the politician is interested in interacting with voters on social media.

The other measures of attention are the number of reactions originating from politicians' Facebook posts. In other words, if a legislator posts a message on Facebook, his or her followers can react by liking, sharing, or expressing the other available emotions. I use three measures of reactions: the likes—which is the most traditional Facebook reaction—; the shares—the number of times that a Facebook user shares the message with his or her friends—; and the total number of interactions, which includes the sum of all the other emotions. Given the long tails of the distributions of these count variables, I used the formulas $\log(1 + likes)$, $\log(1 + shares)$, and $\log(1 + total)$.⁶ In Appendix 3, I further discussed the merits of these measures.

Ideological Extremism

Another key concept is ideological extremism. I define ideological extremism as the absolute deviation on the left-right dimension of legislator i , with respect to the average legislator in year

⁵See Appendix 3 for an explanation of why I decided to use Facebook and not Twitter.

⁶I assigned the value of zero to the period before the politician opened an account, as there were zero interactions on Facebook.

y. To measure this construct, I used the roll-call voting data of the Chilean Chamber of Deputies, which includes all votes from the 2011-2020 period. Then, I created a measure of extremism following this procedure: First, I computed the DW-nominate scores,⁷ which created a measure of politicians' ideal points on the left-right scale based on roll-call voting data in Congress. The algorithm uses the whole set of bills for the legislative sessions between 2011-2020, which includes 7953 votes, covering a myriad of areas.⁸ Second, based on the DW-nominate scores on the left-right dimension, I generated a measure consisting of deviations from the average ideological positioning in a given year, which can be described as follows:

$$Extreme = |(wnom_{iy} - wn\bar{o}m_y)| \quad (2)$$

This indicates the deviation of politician i in year y from the average ideological position of the congressional session of year y . The 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. Note that this measure was used by [Hong and Kim \(2016\)](#) to study the correlation between extremeness and Twitter audiences in the United States.

Sentiments and Emotions

Sentiment analysis is an important part of my argument, as one of my goals is to open the "black box" of the interactions between politicians and the public. Facebook messages contain both *sentiments* and *emotions*. For this analysis, I examine two sentiments, negative and positive; and two emotions, happiness, and disgust, where the former should be associated with positive

⁷For the calculation of DW-nominate scores, it is necessary to pick an extremist legislator before running the algorithm. For the sake of consistency, I always choose the president of the Communist Party, Guillermo Tellier, who is positioned on the far left.

⁸Table A9 shows the share of topics discussed in the 2011-2020 period. Note that the DW nominate package omits all unanimous bills, defining unanimous as when more than 97.5% of Congress agrees on a bill.

sentiments, whereas the latter should associate with negative sentiments.⁹

I define a Facebook message with high positive sentiment as a message with words that reveal optimism. In turn, a Facebook message with high negative sentiment corresponds to a message associated with pessimism. In the case of emotions, the definitions are identical: a message with disgust feelings is a Facebook post with several words associated with repugnance, while happy emotions contain words commonly linked to cheerfulness. In all cases, the definitions of sentiments and emotions are previously defined by a dictionary that pre-establishes the words associated with positivity, negativity, happiness, and disgust.

To calculate these sentiments and emotions, I created a data set of all the Facebook messages made by Chilean legislators in the included period. In this data set, I computed the sentiment and emotion score for each sentence, and then I collapsed the data at the politician*year level, resulting in an average sentiment and emotion score for every politician in a given year.

I use the Spanish version of the R package "syuzhet," which contains the NRC Valence, Arousal, and the Dominance (NRC VAD) lexicon developed by (Mohammad, Saif M. , 2020). This dictionary is suitable for analyzing 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 depends on the number of words per message, while the minimum is zero. For my analysis, I focus on two emotions, disgust and happiness, and two sentiments, positive and negative, since my theoretical interest is to analyze whether clear negative emotions receive higher reactions on Facebook.

Voter Extremism

Another important part of my argument is whether voters could drive an increase in elite extremism. For this purpose, I use public opinion polls that include questions about attitudes toward

⁹The correlation between negative sentiment and feeling disgust is 0.87, whereas the correlation between happiness and positive sentiment is 0.86

authoritarian ideas and/or democratic institutions.

I define a survey respondent as having extreme ideas as someone with high skepticism towards basic democratic institutions and procedures. In concordance with this definition, I use two measures. 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 public opinion polls to measure attitudes towards authoritarianism, as distrust in democracy implies an openness towards other regimes. 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 answered either six or seven—that is, if they agreed with the statement—and zero otherwise.

The second 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 voting, to choose the main authorities. This variable also used a seven-point scale, where seven means "A lot of trust." Similarly to the support for democracy measure, I created a dummy variable equal to one if respondents answered either six or seven—that is, if they trust in elections.

As a data source, I use individual-level polling data from the LAPOP survey. In this case, I use the 2012, 2014, 2017, and 2019 waves.¹⁰ I merged this data with the 3G share variable at the municipal level over time, resulting in a repeated cross-sectional dataset, covering 119 of the 345 Chilean municipalities.¹¹

In Table 1, I summarize the operationalization described in this section, which can be used as a reference for the rest of the paper.

¹⁰As with 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 that the sample is most likely over-representing urban areas, as many rural locations are not typically reached by these types of polls.

¹¹Given that the 3G data covers until 2018, I merged the 2018 3G data with the 2019 LAPOP survey.

Table 1: Operationalization of the Main Concepts

Concept	Definition	Measure
Internet access	Share of people covered by 3G mobile internet	$3G\text{Covered}/Total\ pop$
Attention to social media	Having a Facebook page	1 if Facebook page, 0 otherwise
Social media reactions	Amount of likes, total reactions and shares	$\log(1 + reactions)$
Elite extremism	Absolute deviation left-right ideology	$Extreme = (DWnom_{iy} - \overline{DWnom_y}) $
Negative sentiment	Average negative sentiment score Facebook posts	Scale 0-15
Positive sentiment	Average positive sentiment score Facebook posts	Scale 0-15
Disgust emotion	Average disgust emotion score Facebook posts	Scale 0-15
Happiness emotion	Average happiness emotion score Facebook posts	Scale 0-15
Voter extremism 1	Attitudes towards democracy	1 if positive attitude, 0 otherwise
Voter extremism 2	Level of trust in elections	1 if trust, 0 otherwise

Road map of the Empirical Analysis

The empirical analysis is divided into three parts. First, I examine the relationship between 3G mobile internet and the attention politicians pay to social media. Second, I present the models relating 3G and Facebook activity with elite ideological extremism. Finally, I explore the intrinsic and the extrinsic channels, which could plausibly explain the findings displayed previously. In Appendix 5, I discussed the challenges for causal identification using observational data that arise in this analysis.

Does Access to the 3G Mobile Internet Makes Politicians Engage in Facebook?

Empirical Strategy

To identify the effect of access to the internet on Facebook activity, I estimated a two-way fixed effect model, where the main predictor indicates the share of 3G coverage at the district level. As a robustness check, I estimated models with lead versions of the 3G variable, which will indicate whether there was a pre-trend that might have challenged the validity of potential effects.

The econometric model can be described as follows:¹²

$$Y_{idrt} = \alpha + \beta(3G)_{drt} + \gamma_{idr} + \lambda_{rt} + \varepsilon \quad (3)$$

Where Y_{idrt} represents the outcome of interests of politician i , in district d , in region r in time t ; the predictor of interest corresponds to 3G, indicating the share of 3G coverage in district d . The parameter of interest is β , corresponding to the marginal effect of the share of 3G coverage on the outcomes of interest. The parameter γ represents politician*district fixed-effects, which

¹²To avoid excessive repetition, I did not include the equation using 4G as the predictor. It is equivalent to equations 3 but with a 4G variable instead of 3G.

adjust for heterogeneity across politicians*districts, which are constant over time. Moreover, λ_{rt} constitutes year*region fixed-effects, which account for over-time variation in a given region. This is particularly relevant, given the regional differences in 3G access.

The source of variation is within politicians in a given district over time; in other words, the estimated effects correspond to a change of behavior in a politician who became more exposed to 3G at some point in their tenure in office compared to other politicians who did not. Thus, potential effects cannot be a function of the entry of new politicians, given changes in internet access. In addition, I present models controlling for district and individual-level covariates: political coalition¹³, politicians' vote share, log of population, log of average income, the share of urban population, and the average age in the district.¹⁴

I am also interested in exploring heterogeneous effects to see which type of politician is more eager to pay attention to social media with increasing levels of 3G access. Unfortunately, given my empirical design, I cannot use time-invariant characteristics at the politician level, such as gender, party, or age when s/he was first elected. However, I can use two types of variables: a) those that exhibit variation within politicians, such as vote share—in the case of those who were reelected, and b) time-variant district-level variables, such as average income, and percentage of the rural population, among others. I am agnostic about the expected results of this analysis since the main variable should be access to 3G. Still, I incorporate this analysis to have a more complete picture of the phenomena and to see which group may be driving the effect.

3G Increases Attention

Internet access has a large effect on Facebook usage among Chilean politicians. Table 2 shows the impact of 3G access on different measures of Facebook activity. As all models adjust for politician*district fixed effects and for regional time trends, these results mean that changes in

¹³I was able to control for coalition because some politicians change parties over time; thus, it is not colinear with the fixed effects.

¹⁴The electoral and demographic data was obtained from Chilean Electoral Service, and from the CASEN survey (see Appendix 4)

Table 2: Effects of 3G Coverage on Facebook Activity

Outcomes:	(1) Pages	(2) Pages	(3) Likes	(4) Likes	(5) Total	(6) Total	(7) Shares	(8) Shares
Share 3G	0.46* (0.23)	0.45** (0.22)	1.57*** (0.54)	1.41** (0.59)	1.67*** (0.59)	1.51** (0.66)	0.59 (0.39)	0.44 (0.40)
Outcome mean	0.41	0.41	1.29	1.29	1.43	1.43	0.72	0.72
Outcome sd.	0.49	0.49	1.75	1.75	1.9	1.9	1.16	1.16
N Clusters	60	60	60	60	60	60	60	60
Obs.	826	814	826	814	826	814	826	814
Controls		✓		✓		✓		✓
R ²	0.76	0.76	0.78	0.78	0.78	0.79	0.78	0.79

*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. Controls include log of population, log of income, urban status, average age, vote share, and political coalition.

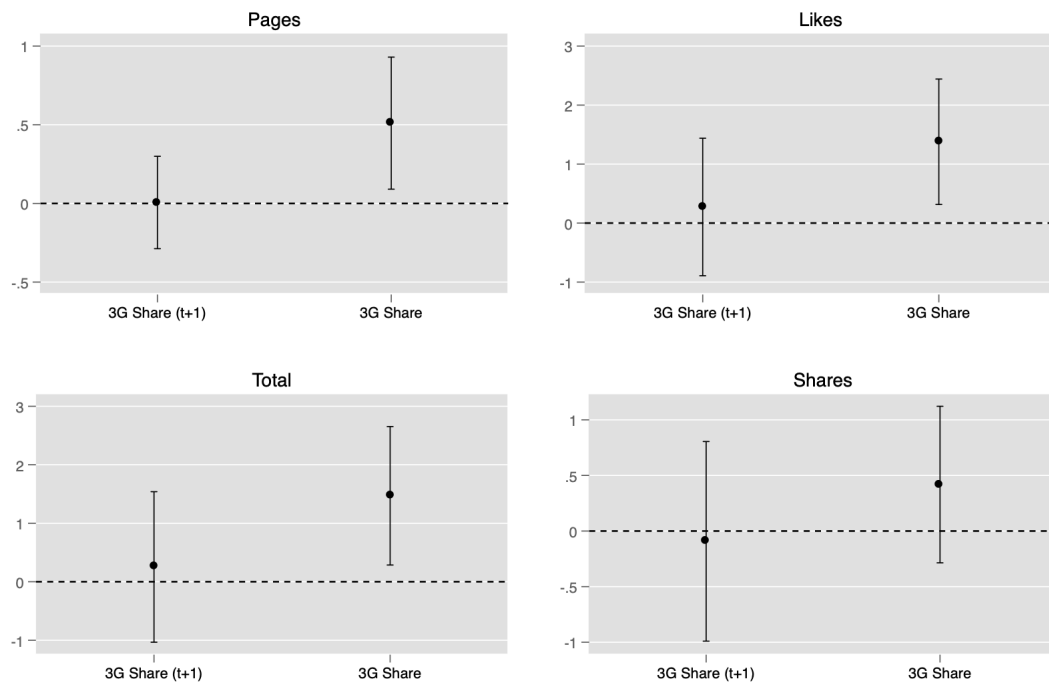
3G coverage within districts substantively increase Facebook interactions over time for the average politician. The most critical result refers to the opening of a Facebook page —displayed in columns 1 and 2 —since it is a clear behavioral outcome, whose interpretation is straightforward: An additional unit increase in 3G access augments the chance that a politician opens a Facebook profile page by 45 percentage points, a very substantial effect.¹⁵ Likewise, column 4 shows that the marginal effect of 3G access increases enormously the number of likes, which is not surprising considering the effect described before.

Figure 2 shows a visualization of the previous results, including the lead versions of 3G. The figure confirms that the impact of 3G is not explained by a previous trend in districts that gained access to 3G. On the contrary, the effect appears after the installation of 3G, which supports the robustness of these findings.¹⁶ Table A5 shows the model with two-lagged versions of the 3G variable. We see that the effect of 3G on opening a Facebook page is immediate, whereas the impact on interactions —likes, total interactions, and shares— appears the year after or even two

¹⁵The variable share 3G is coded between 0 and 1. Consequently, a one-unit increase means going from zero 3G to a 100%. Another way to interpret this coefficient would be to divide it by 10. In that case, it would read as "a 10 percentage-point increase in 3G increases the probability of opening a Facebook page in 4.5 percentage-points."

¹⁶See Table A4 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 dataset begins in 2011, for many districts, I do not have more than two periods before the increases in 3G. Also, I could not include leads and lags in the same model due to the lack of observations.

Figure 2: Coefficient Plot Effects of 3G on Facebook Activity



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

years after. This makes sense since politicians need to build a group of followers before getting reactions to their messages.

Regarding the impact of 4G, we do not see a significant effect. Indeed, the introduction of 4G did not impact any of the measures of Facebook activity (see Table A6), probably because those districts that received 4G already had high access to 3G.

Heterogeneous Effects

Figures B8, B10, and B9, show that there are no clear heterogeneous effects either by income, average age, and population. Regarding the percentage of the urban population, Figure B11 suggests that the effect is higher in more urban areas, although the difference with less urban areas is not statistically significant. Moreover, there is some heterogeneity regarding vote share, as shown by Figure B7: Among politicians elected with a higher vote share, the effect of 3G mobile internet seems to decrease. When exploring whether attention varies by party affiliation, Table A7 shows that, in general, the effect is similar among right-wing, left-wing, and centrist politicians.

Table 3 displays the effect for the subset of observations before and after 2014. Clearly, the effect of 3G on social media activity is concentrated in the initial years; in other words, there is a clear initial response to increases in internet access, leading politicians to pay attention to social media. However, this effect dissipates over time, which is not entirely surprising, considering that the larger increases in 3G coverage occurred between 2011 and 2014.

Content Analysis: Topic Modeling

The models described in the previous section allow one to determine whether access to the internet at the district or municipality level affects the level of attention politicians pay 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 one to characterize the main topics present in a set of documents by identifying word patterns within them (see Appendix 6 for more details on topic modeling). In my case, the unit of

Table 3: Effects of 3G Coverage on Facebook Activity Before 2014

	(1) Pages	(2) Likes	(3) Total	(4) Shares
Share 3G	0.18 (0.27)	1.52*** (0.44)	1.49*** (0.48)	0.49 (0.30)
Outcome mean	0.17	0.39	0.43	0.15
Outcome sd	0.38	1.01	1.08	0.53
N of clusters	60	60	60	60
Obs.	427	427	427	427
Controls	✓	✓	✓	✓
R ²	0.76	0.69	0.69	0.55

Effects of 3G Coverage on Facebook Activity After 2014

	Pages	Likes	Total	Shares
Share 3G	0.16 (0.29)	-0.06 (1.24)	-0.17 (1.36)	-0.77 (0.82)
Outcome mean	0.73	2.67	3.02	1.77
Outcome sd	0.44	1.93	2.17	1.60
N of clusters	60	60	60	60
Obs.	354	354	354	354
Controls	✓	✓	✓	✓
R ²	0.85	0.86	0.86	0.86

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the district level. Controls include log of population, log of income, urban status, average age, vote share, and political coalition.

analysis are Facebook messages per year, separated by politicians in districts with high and low access to 3G, in order to compare the potential differences by level of internet access.¹⁷ Thus, the topic modeling results are differentiated by 3G access (high or low). Besides focusing on the main topics overall, I focus on the share occupied by each topic per document over time, which is also denominated "mean contribution."

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 interpret 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 one 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,¹⁸ and I analyzed their substantive meaning by looking at the most common words. Then, in the subsequent analysis, I reduced the number of topics because it was difficult to distinguish some topics from others. Every time, the results were fundamentally the same, with some slight variations. 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 emerging topics overrepresent the handful of legislators on Facebook. However, as shown in table 1, there has been a steady increase in Facebook pages over time, implying that the topics became more representative of all legislators after 2014.

Results: Unidirectional Messages

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 as follows: "contact me," "help," "sin-

¹⁷I define High 3G as being above the median.

¹⁸I selected a relatively low number of topics because there is not much variation in the type of Facebook messages sent by politicians, so it did not make sense to zoom in too much on specific themes.

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

cerely" and "support." 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—which I called "Policy"—is focused on the legislative process itself, highlighting what the legislators are doing on a daily basis in parliament. This is characterized by the words "bill," "project," "development," "reform", and importantly, "municipality". This implies that even if the focus is the legislative process, politicians are also mentioning local issues; in other words, legislators are communicating that they are legislating for bills that will benefit their constituencies. The translated keywords for each topic are displayed in Table 4.

Table 4: 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 B12 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 the most prevalent topic by 2014. Thus, politicians increasingly use Facebook to communicate about bills, votes, and projects but not to gather information about voters' demands. 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.

Regarding legislators in low 3G districts, the topic modeling algorithm finds just one relevant

topic —Legislative process. In other words, among low 3G districts, the "Personal appeal" topic is not observed. Panel b) in Figure B12 plots the mean contribution of the "Legislative process" topic by 3G status, showing that nowadays, in both types of districts, most politicians use Facebook to send messages about legislative issues.

Social Media and Elite Extremism

Empirical Strategy

After analyzing whether internet access increases politicians' attention to social media, we now turn to the question of elite extremism. As explained in the Data and Measures section, I define ideological extremism as the absolute deviation on the left-right scale of legislator i , with respect to the average legislator of year y .

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

$$Extreme_{imrt} = \alpha + \tau(3G)_{drt} + \gamma_{idr} + \lambda_{rt} + \varepsilon \quad (4)$$

Where the outcome $Extreme_{imrt}$ is regressed on 3G access, including politician*year and year*region fixed effects.²⁰

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 extremism, 3G should be a proxy for social media activity. However, we can estimate a model that tests this proposition more directly by including Facebook reactions as *independent variables*. With such a model, there is a risk of reverse causality since both measures —Facebook reactions and extremism— are yearly averages and, therefore, are computed practically simultaneously. Therefore, I used a lagged version of the independent variables; that

²⁰In Appendix 8, I estimate regression models separating the extremism measure by policy area.

is, I regressed extremism on year t on Facebook interactions in year $t - 1$.²¹ The model can be described as follows:

$$Extreme_{idrt} = \alpha + \mu(FB)_{drt-1} + \gamma_{idr} + \lambda_{rt-1} + \varepsilon \quad (5)$$

Where the variable FB accounts for Facebook interactions. In equation 5, the parameter of interest is μ , the effect of Facebook interactions in the previous year. Note that the models described in equations 4 and 5 adjust for politician-district fixed effects and region-specific time trends, implying that the source of the variation is within politicians.

As a robustness check, I estimated an additional specification. I instrumented Facebook pages, likes, and total interactions with access to 3G at the district level, conditional on district-level covariates (population, income, urban status, average age), individual controls (vote share and political coalition), and politician-district and region-year fixed effects.

The exclusion restriction of an instrumental variable specification requires that conditional on the fixed effects and in the control variables, the only path in which access to 3G internet affects elite extremism is through its impact on social media activity. In other words, the identifying assumption is that changes in 3G within districts affect variation in extremism due to increasing levels of activity on Facebook among elites.²² This assumption is voided if, for example, increases in 3G access change perceptions among voters, which in turn can lead politicians to alter their behavior.

This plausible violation of the exclusion restriction merits a longer discussion. The extrinsic channel, described in the introduction, actually suggests that access to the internet may have changed perceptions among voters, which could have had an effect on politicians. If this is true, the exclusion restriction would be violated because Facebook interactions would not be causing the effect; rather, the effect would originate from the instrument —access to 3G mobile internet— but

²¹In this model, I was able to use more years (until 2020) because I did not include the 3G variable, which covered until 2018. Thus, I incorporated more leads and lags than in the results of the previous Chapter. Results are displayed in Figure 3.

²²The valid first stage assumption means that access to 3G affects Facebook consumption. This is proven in table 2.

affecting the outcome through an alternative path: Voters. Unlike most scholars using instrumental variables, my aim is not to rule out this possibility, either by assumption or through a reasonable explanation. Instead, in the Mechanisms section, I explore the plausibility of the extrinsic channel, which precisely emphasizes the role of voters, so that the reader can form an informed opinion about the validity of the exclusion restriction then.

The other plausible violation is that 3G allocation across districts is not random, as, for example, urban areas have more connectivity than rural ones. To overcome this threat, I included a set of time-variant covariates at both stages of the IV model.

The first stage of this model is as follows:

$$FB_{idry} = \alpha + \mu(3G)_{dry} + \gamma_{idr} + \lambda_{ry} + \theta(cov)_{dry} + \varepsilon \quad (6)$$

Where FB_{idry} of legislator i , in district d , in the 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, regional time trends and demographic covariates. For the other measures —likes and total interactions— I ran the same specification but changed the outcome variable in the first stage. The second stage can be described as follows:

$$Extreme_{imry} = \alpha + \hat{F}B_{idry} + \gamma_{idr} + \lambda_{ry} + \theta(cov)_{dry} + \varepsilon \quad (7)$$

Where the variable of legislative extremism is regressed on the predicted value $\hat{F}B$, adjusted by politician-district fixed effects, regional time trends, and demographic covariates.²³

Facebook Increases Extremism

Table A10 shows the impact of 3G coverage on ideological extremism. Within the Table, I included a lead and a lagged term in columns 3 and 4. Although the coefficient is positive, it is not statistically significant at conventional levels, meaning that it is unclear whether access to the

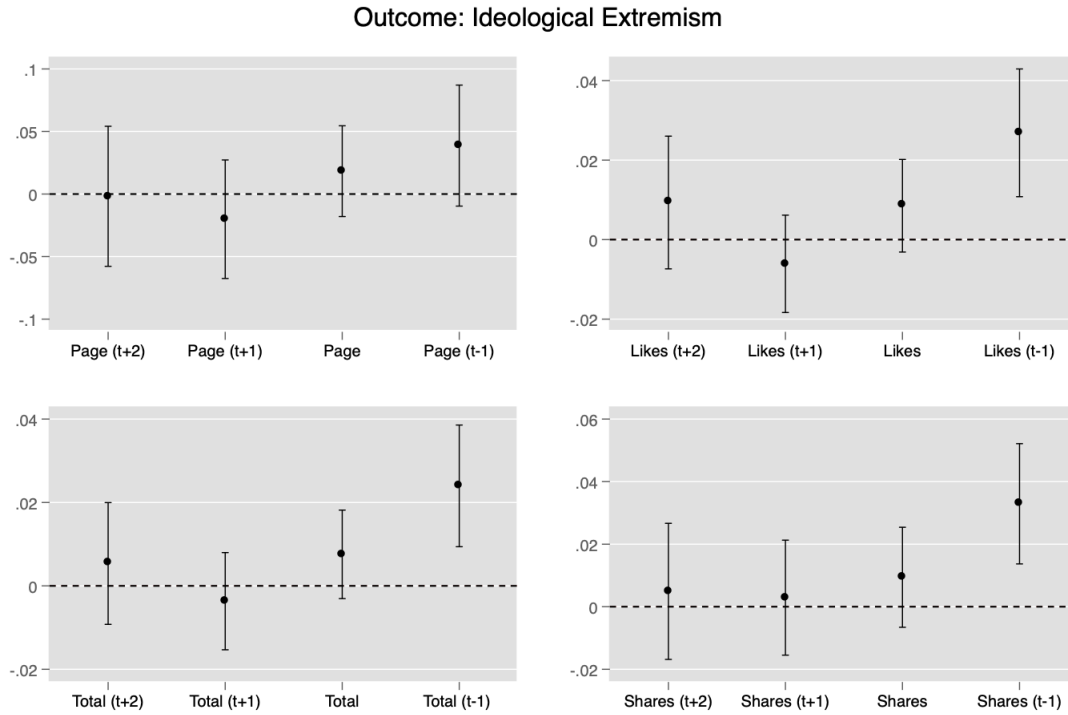
²³See Appendix 7 for a discussion of the meaning of extremism in the Chilean case.

internet induces elite extremism.

Regarding heterogeneous effects, there is a potentially positive effect among candidates elected with a small vote share —less than 35%—, although it disappears as vote share increases (see Figure B14). Moreover, Figure B16 shows no clear heterogeneous effect by demographic covariates.

Table A12 shows the effects of Facebook activity on extremism. Across the two-way fixed effect models, Facebook reactions seem to increase elite extremism. For instance, column 2 shows that opening a Facebook page in year $(t - 1)$ increases a politician's extremism levels by 0.045 units; similarly, column 8 shows that the marginal effect of a 1% growth in shares causes a 0.032 increment in extremism, approximately 0.2 standard deviations.

Figure 3: Coefficient Plot Effects Facebook Activity on Extremism



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

The coefficient plot displayed in Figure 3 confirms the findings presented above. The effect of Facebook activity on extremism becomes significant a year after the exposure and not in the year

before. Therefore, we can discard the notion that a previous trend explains the results. Moreover, the effects are greater regarding the number of likes, shares, and total interactions, compared to just having a page, suggesting that the reactions to politicians' posts are the most relevant factor.

The results of the instrumental variable specifications (Table 5) are consistent with the previous findings. We see a positive effect of Facebook activity on elite extremism, especially with regard to likes, total interactions, and shares; on the other hand, we do not observe a significant effect of having a Facebook page.

Table 5: Instrumental Variable Estimates

Outcome:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ideological Extremism							
Page (t-1)	0.118 (0.111)	0.077 (0.102)						
Likes (t-1)			0.109*** (0.040)	0.076** (0.033)				
Total (t-1)					0.139*** (0.041)	0.068** (0.030)		
Shares (t-1)							0.254*** (0.071)	0.137*** (0.048)
Outcome mean	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Outcome sd	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
N clusters	60	60	60	60	60	60	60	60
Obs.	773	773	780	773	773	773	773	773
Controls		✓		✓		✓		✓

*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. The adjusted models control for log of population, log of income, urban status, average age, vote share, and political coalition.

Now, let us turn to heterogeneous effects. Similarly to what I found in the previous chapter, Table A13 suggests that the effect is concentrated in the initial years. The top panel reveals a positive effect of likes, total interactions, and shares before 2014, which is larger in magnitude than the effect after 2014 (bottom panel). Thus, the effect also corresponds to an initial response that diminishes as time passes, although it does not disappear.

Regarding the heterogeneous effects by vote share (Figure B15), we see that the effect of

Facebook activity on extremism seems to hold across the margin of victory. Moreover, Figures [B17](#), [B18](#), [B19](#), and [B20](#) show heterogeneous effects of page, likes, total interactions, and shares by a myriad of demographic covariates. The only meaningful result is that the effect of Facebook interactions on extremism seems to be consistently larger among higher-income districts; plausibly, in these districts, there could be more voters active on social media.

As an additional analysis, I computed three indicator variables equal to one if the number of likes, total interactions, and shares is higher than the 50th, 75th, and 90th percentile, respectively, and zero otherwise. The purpose of this analysis is to analyze whether the effects are driven by higher percentiles. In Table [A14](#), we see that being above the 50th percentile has a null effect on ideological extremism, implying that a moderate number of likes does not explain the effect on extremism. However, when looking at Tables [A15](#) and [A16](#), the effects are considerably larger, especially considering the 90th percentile as an independent variable. Thus, I confirm that the effect is driven, to a large extent, by politicians experiencing an excessively high number of reactions to their messages.

Why Social Media Increases Elite Extremism?

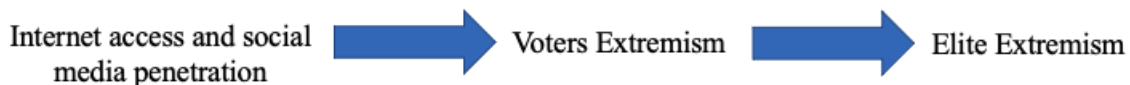
Along this manuscript, I have demonstrated that internet access affects politicians' attention to social media, and, in turn, that exposure to Facebook increases elite ideological extremism. Why do we observe this effect? Is it because the internet is causing an increase in extremism among voters, and politicians are adjusting their positions accordingly? Or is it because excessive exposure to social media negativity induces an increase in extremism, considering that social media users may reward extreme politicians? In this section, I present empirical evidence to explore these two hypothesized mechanisms.

Extrinsic Channel

In this section, I explore the possibility of the extrinsic channel: Voters who might be increasingly skeptical of democratic institutions would be the driving force behind elite extremism. Thus, I examine a plausible increase in voter radicalism among districts with higher access to 3G.

The idea that the expansion of the Internet could affect skepticism towards democracy has been explored by [Guriev et al. \(2021\)](#) in 116 countries, finding that citizens in more covered areas exhibit more distrust in key institutions, such as government, the judiciary, and congress. Other research has established a connection between internet access and non-civic attitudes ([Falck et al., 2014](#); [Gavazza et al., 2019](#)). Even though these research questions are relevant in their own merit, my goal is to establish credible evidence that an effect of the internet on voters may plausibly impact (or not) politicians. Figure 4 shows the rationale of the channel I am trying to prove in this section.

Figure 4: Extrinsic Channel



I first provide descriptive evidence of trends in these variables, separated by high and low 3G access (above or below the median), to see if, in districts with high 3G, there were higher levels of voter radicalism that may have eventually led politicians in high covered areas to acquire extreme positions.

Then, I estimate two econometric models, using municipality and year-fixed effects, to analyze whether changes in 3G at the municipality level correlate with changes in voters' radicalism, measured as support for democracy and trust in elections, as explained in Chapter 3. The first regression equation, which relates internet access with skepticism towards democracy, can be written as follows:

$$Y_{imy} = \alpha + \omega(3G)_{my} + \gamma_m + \theta_y + \varepsilon \quad (8)$$

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. Crucially, I estimate this model before and after at least one legislator covering such a municipality created a Facebook page. If we observe an effect before any politician creates a Facebook account, then they might influence subsequent elite behavior; if not, we can call into question the possibility that politicians move to extreme positions in response to voters.

Secondly, as a robustness check of the previous regression, I use an individual indicator of internet consumption as the main independent variable. The LAPOP survey asks respondents how often they consume the Internet. The alternatives were the following: daily, some times per week, some times per month, or never. I create an indicator variable equal to one if respondents consume the internet every day, or sometimes per week, zero otherwise. The estimated econometric model is the following:

$$Y_{imy} = \alpha + \omega(internet)_{imy} + \gamma_m + \theta_y + \varepsilon \quad (9)$$

Where the variable *internet* indicates whether respondent i consumes the internet frequently.

Results 3G and Public Opinion

Do voters drive the connection between Facebook activity and elite extremism? The evidence suggests a negative answer. Figure 5 shows that in municipalities with both high and low levels of 3G access, there is an important decline in trust in democracy and confidence in elections. Moreover, in the last wave of the survey (2018), there was an increase among the places with

Table 6: Effects of 3G on Democracy Best Government (Whole Sample)

Outcome:	(1) Support Dem.	(2) Support Dem.	(3) Conf. Elections	(4) Conf. Elections
Share 3G	-0.272** (0.111)	-0.274*** (0.103)	-0.123 (0.077)	-0.116 (0.076)
Outcome mean	0.45	0.45	0.29	0.29
Outcome sd	0.50	0.50	0.45	0.45
N clusters	71	71	71	71
Obs.	5516	4638	5710	4762
Controls		✓		✓
R ²	0.078	0.10	0.06	0.07

Effects of 3G on Democracy Best Government (Before Facebook Page).

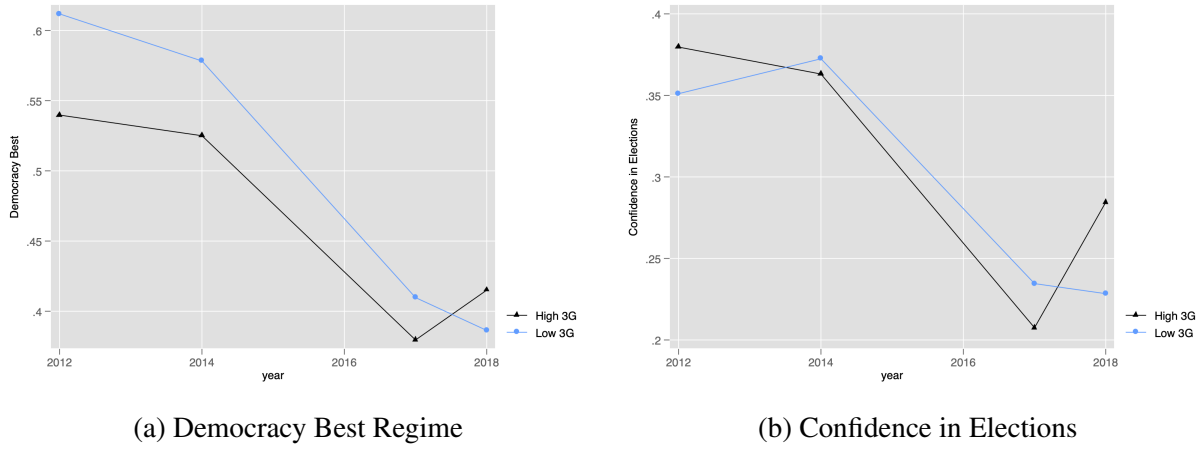
Outcome:	(1) Support Dem.	(2) Support Dem.	(3) Conf. Elections	(4) Conf. Elections
Share 3G	-0.278 (0.238)	-0.284 (0.295)	-0.324 (0.243)	-0.163 (0.242)
Outcome mean	0.52	0.52	0.34	0.34
Outcome sd	0.49	0.49	0.47	0.47
N clusters	71	71	71	71
Obs.	1737	1450	1840	1504
Controls		✓		✓
R ²	0.189	0.217	0.148	0.177

Effects of 3G on Democracy Best Government (After Facebook Page).

Outcome:	(1) Support Dem.	(2) Support Dem.	(3) Conf. Elections	(4) Conf. Elections
Share 3G	-0.310* (0.168)	-0.349** (0.165)	-0.161 (0.115)	-0.133 (0.116)
Outcome mean	0.45	0.45	0.29	0.29
Outcome sd	0.50	0.50	0.45	0.45
N clusters	71	71	71	71
Obs.	3779	3188	3870	3258
Controls		✓		✓
R ²	0.0766	0.110	0.0562	0.0775

*p<.1; **p<.05; ***p<.01. Standard errors are clustered at the municipality level. Controls include income, education, urban status, and gender.

Figure 5: Descriptive Trends Public Opinion



high 3G, which does not happen among the low 3G. In this sense, it is unlikely that politicians in covered areas have been following voters since there is not a distinct shift in extremism in these areas.

The results from Table 6 corroborate the previous insight. The top panel suggests that 3G access decreases confidence in elections and in democracy in the whole sample, in line with the findings of Guriev et al. (2021). When looking at whether the effects appear before or after any politician in the district opens a Facebook page, we see that the effect is similar in the two periods. Most likely, it is statistically significant in the bottom panel (the "after" a period) because of the larger sample size.

When looking at the model with internet consumption as the main independent variable, we see—in general—a similar result as the one described above. The top panel of table A17 shows internet consumption have a negative effect on support for democracy and confidence in elections, although the coefficients are more unstable compared to the ones in Table 6. The bottom panel suggests that the effect appears after a politician opens a Facebook page. In this sense, it looks like politicians who move to the extreme are not following public opinion.²⁴

²⁴With the conclusions of this analysis, we can discard this particular violation of the exclusion restriction in the IV model presented in table 5, because it looks unlikely that voters would have driven the effect of either internet access or Facebook interactions on politician's extremism.

Intrinsic Channel

If the effect of Facebook interactions on elite extremism is not driven by voters, why do we observe this effect? In this section, I explore the intrinsic mechanism by analyzing whether negativity is rewarded on social media and whether extreme politicians are more likely to post negative messages. As Figure 6 suggests, I aim to establish a connection between social media interactions and elite extremism, regardless of the position of voters.

Figure 6: Intrinsic Channel



To this end, I analyze the sentiments of Facebook messages made by politicians over time to see whether negativity is actually rewarded and if extreme politicians —as measured by their behavior in Congress — are more likely to engage in negativity. I use the Spanish version of the R package "syuzhet," which contains the NRC Valence, Arousal, and the Dominance (NRC VAD) lexicon developed by [Mohammad, Saif M. \(2020\)](#). This dictionary is suitable for analyzing 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 depends on the number of words, while the minimum is zero. For my analysis, I focus on two emotions, disgust, and happiness, and two sentiments, positive and negative, since my theoretical interest is to analyze whether clearly negative emotions receive higher reactions on Facebook.²⁵

In my analysis, I correlate the average number of total reactions of politician i , likes, and shares on the average sentiment (emotion) score, estimating a regression of the following form:

²⁵Note that a sentence can have both negative and positive scores, as both variables are not mutually exclusive.

$$\text{Log}(1 + \text{total})_{iy} = \alpha + \beta_1(\text{negative})_{iy} \quad (10)$$

$$\text{Log}(1 + \text{total})_{iy} = \alpha + \beta_2(\text{positive})_{iy} \quad (11)$$

The idea is to compare β_1 and β_2 ; if the former coefficient is significantly larger than the latter, it means that negative posts have more circulation on Facebook than positive ones. Note that I do not include either politician or year fixed effects because my purpose is to see whether posts with higher reactions receive more negative sentiments *across* politicians; in other words, my interest here is not to correlate sentiment and reactions within politicians over time.

Moreover, I analyze the correlation between ideological extremeness and the negative sentiment of Facebook posts, estimating the following regressions:

$$\text{Extreme}_{iy} = \alpha + \beta_3(\text{negative})_{iy} \quad (12)$$

$$\text{Extreme}_{iy} = \alpha + \beta_4(\text{positive})_{iy} \quad (13)$$

If negative posts correlate with higher extremeness and positive posts do not, I expect $\beta_3 > 0$ and $\beta_4 = 0$.

Results of Facebook Sentiments

Before presenting the regressions, I will show some descriptive statistics about the sentiment and emotion scores of Facebook posts. The first thing to notice is that the average positive score, and the happiness emotion, are higher than the negative sentiment and the disgust emotion, respectively (Table 7). In this sense, most of the things that politicians say are optimistic and cheerful.

In terms of the average sentiments over time, we see a similar trend among the two sentiments and the two emotions considered (7). The most aggressive jump corresponds to the negative

Table 7: Sentiment Scores by 3G Access

Variable	(1) Low 3G	(2) High 3G	(3) Difference
Negative	1.299 (0.790)	1.441 (0.890)	0.143** (0.065)
Disgust	0.380 (0.296)	0.422 (0.311)	0.041* (0.023)
Positive	2.773 (1.431)	2.886 (1.315)	0.112 (0.105)
Happiness	0.938 (0.521)	0.966 (0.525)	0.028 (0.040)
Observations	289	408	697

* $p < .1$; ** $p < .05$; *** $p < .01$. Standard Deviations in Parenthesis.

sentiment between 2017 and 2020, where it almost doubled its magnitude.

Let us turn now to the regression models. The results from the sentiment analysis confirm that negative and angry posts are rewarded on social media, even if these sentiments are not predominant. The top panel of Table 8²⁶ shows a clear positive correlation between reactions —total, likes, and shares— negative sentiment, and, in particular, the disgust emotion. Indeed, column 1 shows that an additional unit of negativity increases total reactions by 38.6%. In the bottom panel, even if there is also a positive correlation, the magnitude is considerably lower, both in positive sentiment and in the happiness emotion. Figures 8 and B22 present a visualization of these results.

Table A18 confirms the positive correlation between ideological extremism and negative sentiments, and extremism and disgust emotion. Indeed, there is a positive and statistically significant relationship between negativity in social media and ideological extremism, whereas there is no relationship between positive sentiment and extremism. Figure 9 visualize these findings.

Taken together, these correlations suggest that a) a premium is associated with being negative and exhibiting disgust, as these posts achieve higher engagement, and b) extreme politicians are more likely to post negative messages.

²⁶The sample size is lower than, for example, in Table A12 because I am not counting politicians-years without Facebook pages.

Table 8: Correlation Between Negative Sentiments and Facebook Reactions

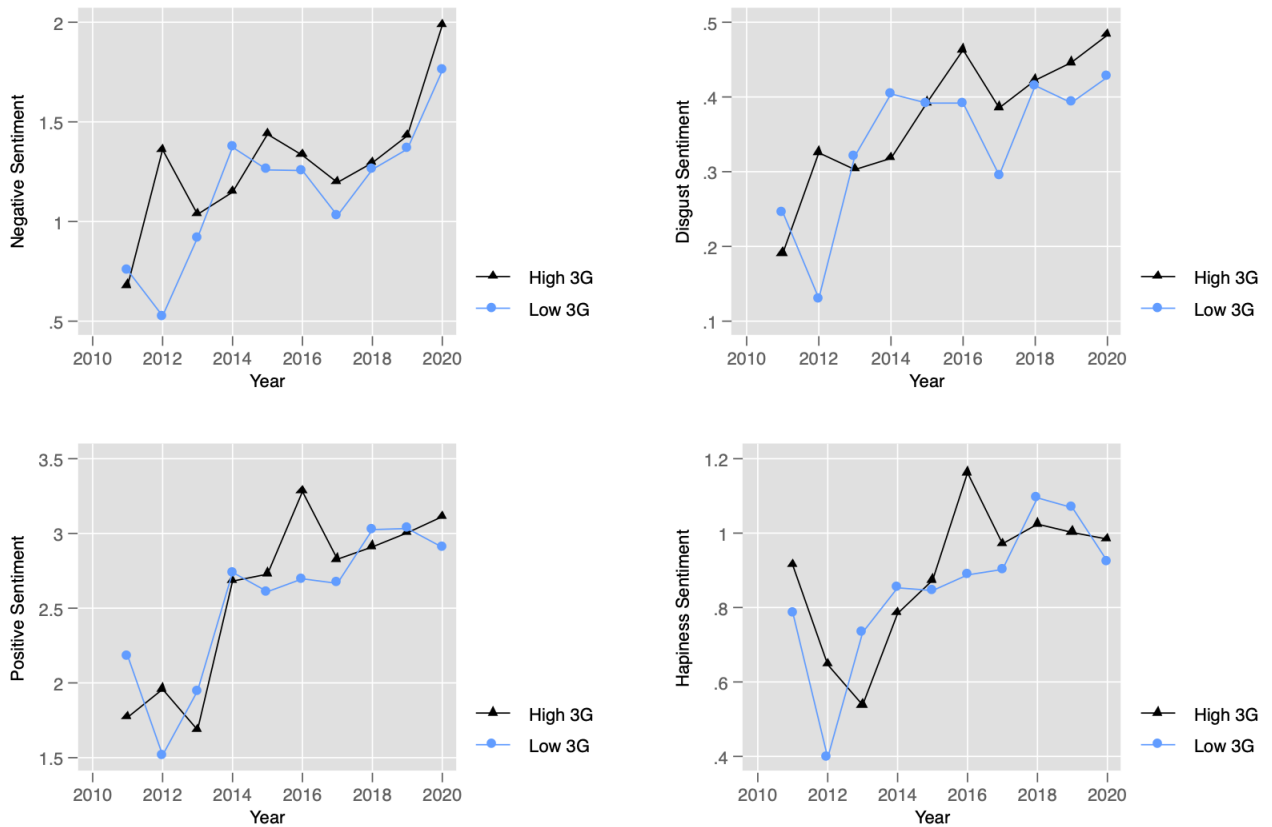
Outcomes:	(1) Total	(2) Total	(3) Likes	(4) Likes	(5) Shares	(6) Shares
Negative	0.386*** (0.114)		0.294*** (0.092)		0.408*** (0.120)	
Disgust		0.804** (0.336)		0.631** (0.273)		0.758** (0.342)
Outcome Mean	3.92	3.92	3.46	3.46	2.21	2.21
Outcome sd	1.47	1.47	1.32	1.32	1.43	1.43
N Clusters	56	56	56	56	56	56
Obs.	697	697	697	697	697	697
R^2	0.05	0.03	0.03	0.02	0.06	0.03

Correlation Between Positive Sentiments and Facebook Reactions

Outcome:	(1) Total	(2) Total	(3) Likes	(4) Likes	(5) Shares	(6) Shares
Positive	0.118*** (0.043)		0.101*** (0.038)		0.058 (0.040)	
Happiness		0.214* (0.113)		0.208** (0.100)		-0.080 (0.104)
Outcome Mean	3.92	3.92	3.46	3.46	2.21	2.21
Outcome sd	1.47	1.47	1.32	1.32	1.43	1.43
N Clusters	56	56	56	56	56	56
Obs.	697	697	697	697	697	697
R^2	0.01	0.01	0.01	0.01	0.003	0.001

*p<.1; **p<.05; ***p<.01.

Figure 7: Sentiment of Facebook Posts Over Time

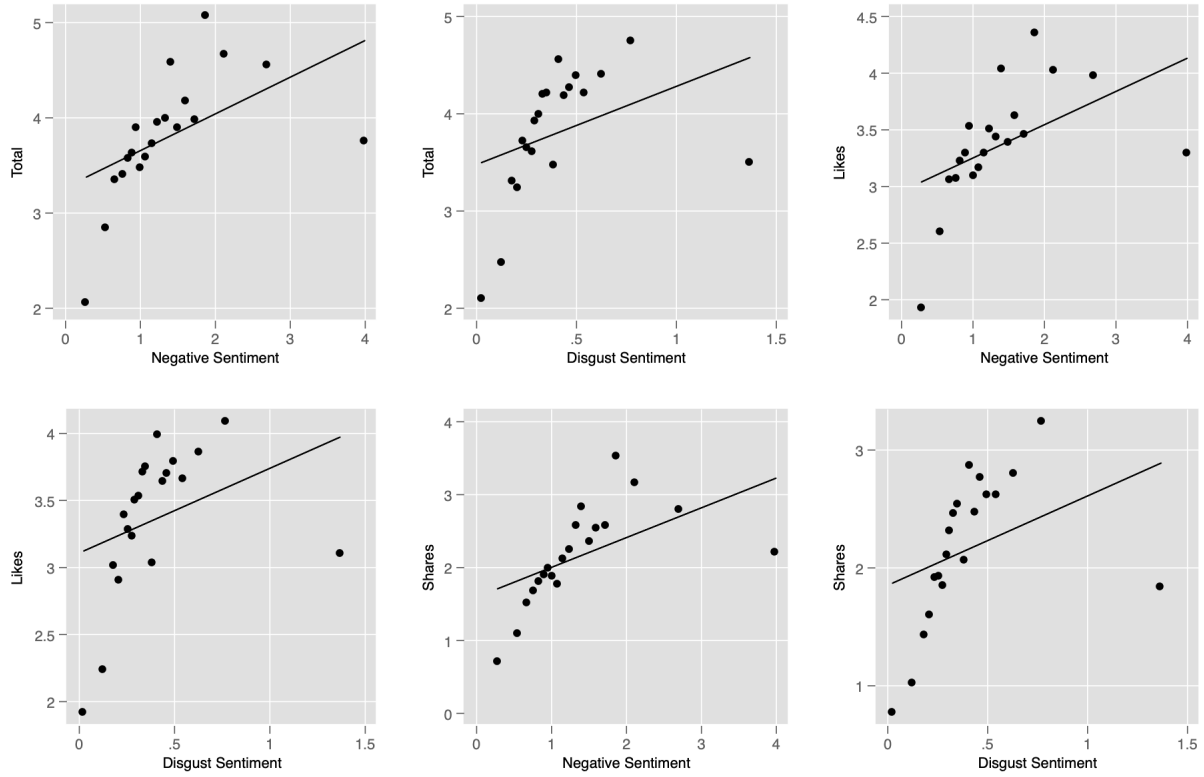


Conclusion

Mr. Perez's assessment of the impact of social media on politicians seems warranted. In fact, excessive attention to social media has detrimental effects, altering the dynamic of the political process and reaching far beyond the digital world. Throughout this article, I opened the "black box" of how politicians interact with voters in social media, focusing on some plausible real-world consequences. My findings seem to be consistent with grimmer narratives assigning responsibility to social media for some of the problems with today's democracies

In the first place, I show that Chilean politicians pay considerably more attention to social media as internet coverage expands in their districts. This finding is consistent with previous scholarship analyzing the impact of media penetration on elite behavior, in the sense that politicians

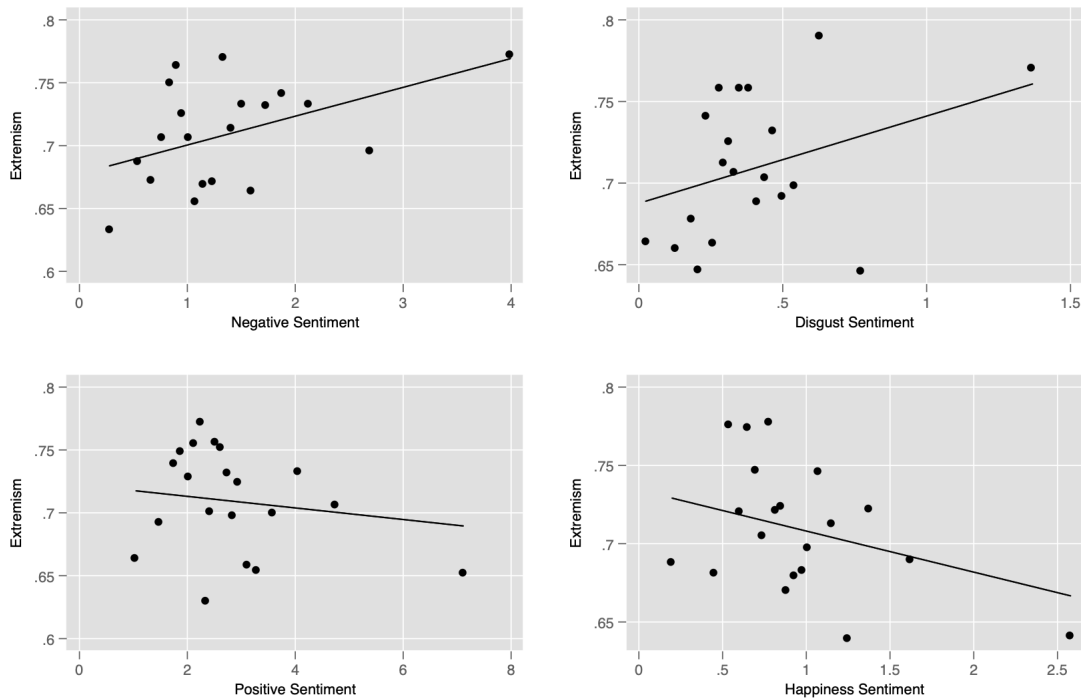
Figure 8: Correlation Between Negative Sentiments and Facebook Reactions



are eager to pay more attention to places with higher media coverage ([Besley and Burgess, 2022](#); [Stromberg, 2004](#); [Eisensee and Stromberg, 2007](#); [Snyder and Strömberg, 2010](#); [Durante and Zhuravskaya, 2018](#); [Raffler, 2019](#); [Bessone et al., 2019](#)). However, given the particularities of social media and its differences from other media outlets, it is important to mention the way in which politicians now use these platforms. Despite the possibility of interacting directly with voters, and receiving concrete feedback, Chilean legislators now use social media to communicate unidirectionally with voters, as is the case with any other media outlet. In this sense, there is a degree of similarity between social media, radio, newspapers, and TV, especially today, when Facebook and Twitter have been around for more than a decade. However, even if they just communicate messages, they can still see the reactions to their posts, which are a very straightforward and easy-to-analyze indicator of success.

The core findings of this study are that Facebook interactions increase ideological extremism

Figure 9: Correlation Between Sentiments and Extremism



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 one of the hypothesized channels—the intrinsic channel. Descriptive evidence suggests that messages with negative sentiments and disgust emotions have much more circulation than joyful and positive ones and that extreme politicians are more likely to post negative messages. This confirms the notion that Facebook users who interact with politicians do reward negativity and the expression of outrage.

That said, it is important to note that social media's influence on politicians' attention and extremism was especially acute before 2015—during the initial phase of 3G expansion in Chile. A reasonable explanation for this finding is the learning of new technology. In the initial stages, politicians could have given excessive importance to what people were saying on Facebook, overreacting in the offline domain. As social media became a regular platform for political discussion, politicians may have paid less attention to such communication tools.

Meanwhile, I do not find evidence of the extrinsic channel: There is neither an increase in extremist positions among voters nor an effect of internet access in such positions that precedes the observed effect on politicians' extremism.

What does it mean that Facebook interactions increase ideological extremism among elites? Is it the *reaction* per se, the active component, that may induce politicians toward extremism? Or the likes and shares are just a proxy of *exposure* to social media? This question is hard to answer with the information at our disposal. However, it is relevant to delve deeper into each of the possibilities.

If the actual reactions are what matters, then my findings can be interpreted through the lenses of political psychology. Essentially, what I am showing is a positive reaction (for example, more likes) towards some type of behavior (a negative Facebook message made by a politician). This suggests that the politician will generalize that type of behavior in the offline domain. This resembles the argument that (Fisher, 2022) made in the case of the public's reaction to social media, extending it to politicians.

If the number of reactions is a proxy of exposure, my findings mean that excessive exposure to political discussions on Facebook, where toxicity and aggressiveness are likely to be prevalent, induces politicians to move to the extreme in the offline domain. This behavior would result from politicians' desire to conform with their online followers, who may be eager to monitor the behavior of their political representatives in several other areas.

Even if it is hard to disentangle these two plausible pathways, the evidence provided in this dissertation is more consistent with a more literal interpretation of the reactions. In fact, I do not have enough evidence to assert that politicians were exposed to toxicity, or that they spent time seeing the negative Facebook messages posted by the public. However, I do have evidence to assert that a stronger reaction (shares) has a larger effect than a weaker one (likes). Likewise, the effect is driven by higher percentiles, implying that the number of reactions actually matters.

My main contribution to the literature is to establish specific ways in which social media affects political elites in domains beyond the digital world. 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](#)). By building on this scholarship, 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 extremism, implying that social media could have a real impact on the capacity of the political system to solve issues through consensus.

Besides the effects on elites, my article contributes to scholarship about social media exposure and negative outcomes in the offline world, such as its detrimental effects on mental health and subjective well-being ([Braghieri et al., 2022](#); [Allcott et al., 2020](#)). Even if I focus on a particular group of politicians, the documented effects are arguably detrimental, and perhaps a manifestation of a long-lasting addiction to social media.

A third relevant body of literature that my article speaks to is the old discussion about whether politicians lead or follow the public ([Lenz, 2012](#)), in this case, regarding extremism. The evidence suggests that an increase in extremism is not driven by a majority of voters; rather, I show that relatively few politicized and active social media users have the capacity to influence elites by capturing their attention and by constantly reacting to their messages. In other words, my findings imply that there could be an elite-driven polarization, with the risk of deteriorating the democratic system and permeating to voters.

References

- Allcott, H., L. Braghieri, S. Eichmeyer, and M. Gentzkow (2020, March). The Welfare Effects of Social Media. *American Economic Review* 110(3), 629–676.
- Asker, D. and E. Dinas (2019, November). Thinking Fast and Furious: Emotional Intensity and Opinion Polarization in Online Media. *Public Opinion Quarterly* 83(3), 487–509.
- Bail, C. A., L. P. Argyle, T. W. Brown, J. P. Bumpus, H. Chen, M. B. F. Hunzaker, J. Lee, M. Mann, F. Merhout, and A. Volfovsky (2018, September). Exposure to opposing views on social media can increase political polarization. *Proceedings of the National Academy of Sciences* 115(37), 9216–9221.
- Barberá, P., A. Casas, J. Nagler, P. J. Egan, R. Bonneau, J. T. Jost, and J. A. Tucker (2019, November). Who Leads? Who Follows? Measuring Issue Attention and Agenda Setting by Legislators and the Mass Public Using Social Media Data. *American Political Science Review* 113(4), 883–901.
- Besley, T. and R. Burgess (2022). The Political Economy of Government Responsiveness: Theory and Evidence from India. *The Quarterly Journal of Economics* 117(4), 1415–1451.
- Bessone, P., F. Campante, C. Ferraz, and P. C. Souza (2019, January). Internet Access, Social Media, and the Behavior of Politicians: Evidence from Brazil.
- Bond, R. M., C. J. Fariss, J. J. Jones, A. D. I. Kramer, C. Marlow, J. E. Settle, and J. H. Fowler (2012, September). A 61-million-person experiment in social influence and political mobilization. *Nature* 489(7415), 295–298. Number: 7415 Publisher: Nature Publishing Group.
- Bor, A. and M. B. Petersen (2022, February). The Psychology of Online Political Hostility: A Comprehensive, Cross-National Test of the Mismatch Hypothesis. *American Political Science Review* 116(1), 1–18. Publisher: Cambridge University Press.

- Braghieri, L., R. Levy, and A. Makarin (2022, November). Social Media and Mental Health. *American Economic Review* 112(11), 3660–3693.
- Catalinac, A. (2016, January). From Pork to Policy: The Rise of Programmatic Campaigning in Japanese Elections. *The Journal of Politics* 78(1), 1–18.
- Chen, G. M. (2017, June). *Online Incivility and Public Debate: Nasty Talk*. Springer. Google-Books-ID: gbwpDwAAQBAJ.
- Chilean Government (2009, July). GOBIERNO INTRODUCE MÁS COMPETENCIA EN TELEFONÍA MÓVIL 3G. Section: Noticias.
- Coe, K., K. Kenski, and S. A. Rains (2014). Online and Uncivil? Patterns and Determinants of Incivility in Newspaper Website Comments. *Journal of Communication* 64(4), 658–679.
_eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/jcom.12104>.
- Crockett, M. J. (2017, November). Moral outrage in the digital age. *Nature Human Behaviour* 1(11), 769–771. Number: 11 Publisher: Nature Publishing Group.
- Durante, R. and E. Zhuravskaya (2018, June). Attack When the World Is Not Watching? US News and the Israeli-Palestinian Conflict. *Journal of Political Economy* 126(3), 1085–1133.
- Eisensee, T. and D. Stromberg (2007, May). News Droughts, News Floods, and U. S. Disaster Relief. *The Quarterly Journal of Economics* 122(2), 693–728.
- Enikolopov, R., A. Makarin, and M. Petrova (2020). Social Media and Protest Participation: Evidence From Russia. *Econometrica* 88(4), 1479–1514.
- Enriquez, N., H. Larreguy, A. Simpser, and J. Marshall (2022). Mass Political Information on Social Media: Facebook Ads, Electorate Saturation, and Electoral Accountability in Mexico. pp. 94.
- Falck, O., R. Gold, and S. Heblich (2014, July). E-lections: Voting Behavior and the Internet. *American Economic Review* 104(7), 2238–2265.

- Fisher, M. (2022). *The Chaos Machine: The Inside Story of How Social Media Rewired Our Minds and Our World*. Quercus.
- Garbiras-Díaz, N. and M. Montenegro (2022, August). All Eyes on Them: A Field Experiment on Citizen Oversight and Electoral Integrity. *American Economic Review* 112(8), 2631–2668.
- Gavazza, A., M. Nardotto, and T. Valletti (2019, October). Internet and Politics: Evidence from U.K. Local Elections and Local Government Policies. *The Review of Economic Studies* 86(5), 2092–2135.
- Grimmer, J. (2010). A Bayesian Hierarchical Topic Model for Political Texts: Measuring Expressed Agendas in Senate Press Releases. *Political Analysis* 18(1), 1–35.
- Guriey, S., N. Melnikov, and E. Zhuravskaya (2021, November). 3G Internet and Confidence in Government*. *The Quarterly Journal of Economics* 136(4), 2533–2613.
- Hong, S. and S. H. Kim (2016, October). Political polarization on twitter: Implications for the use of social media in digital governments. *Government Information Quarterly* 33(4), 777–782.
- Internet World Stats (2022, June). South America Internet Usage Stats, Population Statistics and Facebook Reports.
- Kim, J. W., A. Guess, B. Nyhan, and J. Reifler (2021, December). The Distorting Prism of Social Media: How Self-Selection and Exposure to Incivility Fuel Online Comment Toxicity. *Journal of Communication* 71(6), 922–946.
- Lenz, G. S. (2012, October). *Follow the Leader?: How Voters Respond to Politicians' Policies and Performance*. Chicago Studies in American Politics. Chicago, IL: University of Chicago Press.
- Melnikov, N. (2021, October). Mobile Internet and Political Polarization. SSRN Scholarly Paper ID 3937760, Social Science Research Network, Rochester, NY.
- Mohammad, Saif M. (2020). NRC Word-Emotion Association Lexicon.

- Muddiman, A. and N. J. Stroud (2017). News Values, Cognitive Biases, and Partisan Incivility in Comment Sections. *Journal of Communication* 67(4), 586–609. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/jcom.12312>.
- Oz, M., P. Zheng, and G. M. Chen (2018, September). Twitter versus Facebook: Comparing incivility, impoliteness, and deliberative attributes. *New Media & Society* 20(9), 3400–3419. Publisher: SAGE Publications.
- Papacharissi, Z. (2004, April). Democracy online: civility, politeness, and the democratic potential of online political discussion groups. *New Media & Society* 6(2), 259–283. Publisher: SAGE Publications.
- Raffler, P. (2019, January). The Impact of Media Markets on Political Accountability Under Majoritarian and PR Rules.
- Reuters Staff (2008, July). Operadoras móviles podrán participar de licitación 3G en Chile. *Reuters*.
- Settle, J. E., R. M. Bond, L. Coviello, C. J. Fariss, J. H. Fowler, and J. J. Jones (2016). From Posting to Voting: The Effects of Political Competition on Online Political Engagement*. *Political Science Research and Methods* 4(2), 361–378. Publisher: Cambridge University Press.
- Smith, A. (2014, November). Cell Phones, Social Media and Campaign 2014.
- Snyder, J. M. and D. Strömberg (2010, April). Press Coverage and Political Accountability. *Journal of Political Economy* 118(2), 355–408.
- Sobieraj, S. and J. M. Berry (2011, February). From Incivility to Outrage: Political Discourse in Blogs, Talk Radio, and Cable News. *Political Communication* 28(1), 19–41. Publisher: Routledge _eprint: <https://doi.org/10.1080/10584609.2010.542360>.
- Steinert-Threlkeld, Z. C. (2017, May). Spontaneous Collective Action: Peripheral Mobilization

- During the Arab Spring. *American Political Science Review* 111(2), 379–403. Publisher: Cambridge University Press.
- Stromberg, D. (2004, February). Radio's Impact on Public Spending. *The Quarterly Journal of Economics* 119(1), 189–221.
- Theocharis, Y., P. Barberá, Z. Fazekas, S. A. Popa, and O. Parnet (2016). A Bad Workman Blames His Tweets: The Consequences of Citizens' Uncivil Twitter Use When Interacting With Party Candidates. *Journal of Communication* 66(6), 1007–1031. _eprint: <https://onlinelibrary.wiley.com/doi/pdf/10.1111/jcom.12259>.
- Törnberg, P. (2022, October). How digital media drive affective polarization through partisan sorting. *Proceedings of the National Academy of Sciences* 119(42), e2207159119. Publisher: Proceedings of the National Academy of Sciences.
- Ventura, T., K. Munger, K. McCabe, and K.-C. Chang (2021, April). Connective Effervescence and Streaming Chat During Political Debates. *Journal of Quantitative Description: Digital Media* 1.
- Weeks, B. E., A. Ardèvol-Abreu, and H. Gil de Zúñiga (2017, June). Online Influence? Social Media Use, Opinion Leadership, and Political Persuasion. *International Journal of Public Opinion Research* 29(2), 214–239.