Social Media and Press Freedom

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Abstract

As internet penetration rapidly expanded throughout the world, press freedom and government accountability improved in some countries, but back-slid in others. We propose a formal model that provides a mechanism which explains the observed divergent paths of countries. We argue that increased access to social media makes partial capture, where governments allow limited freedom of the press, an untenable strategy. By amplifying the influence of small traditional media outlets, higher internet access increases both the costs of capture and the risk that a critical mass of citizens will become informed and overturn the incumbent. Depending on the incentives to retain office, greater internet access thus either forces an incumbent to extend capture to small outlets, further undermining press freedom; or relieve pressure from others. We relate our findings to the cases of Turkey and Tunisia.

Keywords: internet, press freedom, social media.

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The color revolutions and the Arab Spring resulted in the optimistic belief that social media might substitute for traditional media as a watchdog on government wrongdoing (Diamond, 2010; Howard and Hussain, 2013). Citizens might hope to replace corrupt governments that are exposed as crooked, and the prospect of exposure would discourage misconduct (Bennett and Segerberg, 2012; Shirky, 2009). In some contexts, this assertion prevailed: greater internet access is indeed associated with better government accountability (Andersen et al., 2011; Lio, Liu, and Ou, 2011; Petrova, 2008). But in others, the internet has been no panacea. Whatever gains the internet helped achieve have been short-lived or far more limited than what earlier accounts suggested. Over the last decade, the hope that the internet would incite a sweeping wave that will overthrow corrupt, repressive regimes across the world has dwindled (Aday et al., 2013). Many countries instead experienced a deterioration of basic freedoms, such as freedom of the press.

In this paper, we study an incumbent's strategic response to new information technologies that can be used to amplify small voices. Without such technologies, communication between citizens is minimal and an incumbent can confine information to a few independent media outlets and their consumers. The advent of information technologies, in particular social media, enables opponents of the incumbent to spread damaging information to a broad audience. Containment thus becomes futile. An incumbent must then either release control completely, or suppress all criticism. Our model suggests that increased internet access leads to either higher or lower press freedom under different conditions. This is because the internet makes it impossible for incumbents to ignore smaller media outlets.

The core of the argument made in this paper is as follows. Social media catalyzes the transmission of information by acting as a conduit between citizens. This amplifies their voices, allowing them to reach much larger audiences at a fraction of the time and cost. The diffusion of the ability to distribute information makes control harder. This poses a threat to incumbents who rely on their control of the flow of information for their survival. In the context of government control of media, or media capture, social media makes capture harder in two ways. First, it increases the price of capture, by increasing the opportunity costs outlets face of suppressing news.

The incumbent must then provide stronger incentives to capture media outlets, whether in the form of sticks or carrots. Because such incentives are costly, both financially and reputationally, an increase in access to information technologies pushes the incumbent towards releasing some pressure from media. Second, social media makes containment harder. It increases the risk that damaging information will leak and reach a critical mass of citizens who may then overturn the incumbent. This pushes the incumbent towards intensifying pressure, suppressing smaller outlets he previously ignored so that there is no damaging information to spread on social media. Depending on which of these forces dominate, greater internet access may lead to more or less media capture.

This logic explains the pattern that high internet penetration is linked to more extreme press freedom outcomes. Data from 160 countries from 2000 to 2015 shows that there are few observations of countries with high internet penetration and intermediate levels of press freedom. This is in line with our argument that greater internet access makes partial capture, where the government accommodates some independent media, an untenable strategy. Instead, as internet penetration rapidly rose across the world between 2000 and 2015, countries moved towards either extreme: some experienced an improvement in press freedom outcomes as the costs of pressuring media outlets went up, while in others press freedom deteriorated further as incumbents shut down independent outlets, fearing their news would spread on social media. Controlling for a host of variables and country and year fixed effects, we see that in countries that had a "Free" press at the start of this period, higher internet penetration is associated with more press freedom.[1] In contrast, among the countries that were "Partly Free" in 2000, internet penetration is associated with less press freedom.[2] This is consistent with the intuition that when incentives to stay in office are strong enough relative to the costs of capture, the risk of overturning eclipses

[1]Freedom House denotes "Free" countries whose press freedom scores are less than 30, "Partly Free" those with scores between 31 and 60, and "Not Free" those with scores 61 and above. Throughout the paper we invert this scale so higher scores refer to more press freedom.

[2]The coefficient of internet penetration is negative for countries that were "Not Free" in 2000, but it is not statistically significant at conventional levels.

higher costs, and greater internet access leads to more capture.

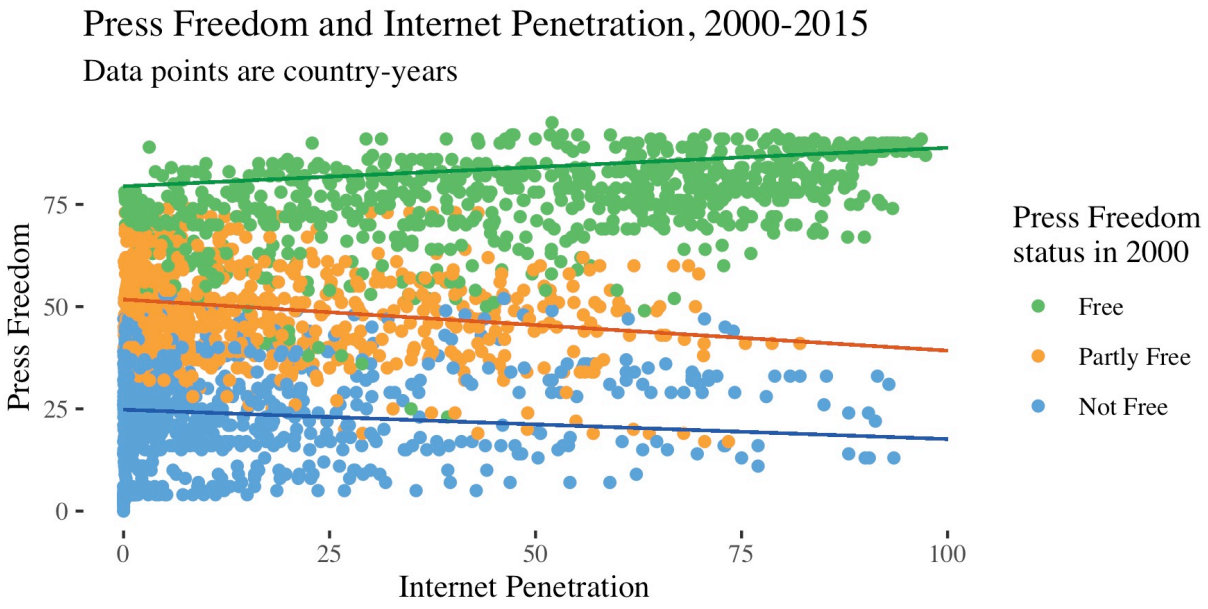

Figure 1: A scatterplot of internet penetration rates and press freedom scores in 160 countries over 16 years. Countries in green had a "Free" press in 2000, yellow "Partly Free", and blue "Not Free." Lines correspond to linear fits from regressions with controls and country and year fixed effects. The full set of regression results and details about datasets and empirical specifications are in the Appendix.

What explains this observed heterogeneity in the effects of the internet in different contexts? While we agree with the optimists' premise that the internet is a medium through which information can diffuse, we argue that it can also set off a cascade of counterbalancing forces. First, incumbents proved to be better able to respond to the new reality of the internet than anticipated. Much scholarly attention has focused on internet censorship (King, Pan, and Roberts, 2013; Tufekci, 2017). From blocking websites to deleting critical posts, incumbents devised a plethora of methods to subdue the revolutionary potential of social media (Morozov, 2012; Zhuravskaya, Petrova, and Enikolopov, 2020). Second, the prevalence of misinformation resulted in an unprecedented lack of trust online (Invernizzi and Mohamed, 2019). Although less control over content did make it easier for news critical of governments to spread, so it did for poorly researched or fabricated news. With low entry costs and little reputation concerns, many on the internet produced and propagated misinformation. This led to more skepticism, making it easier

for incumbents to dismiss damaging information as fake news.

In this paper, we start from these observations and present a model that investigates how the advent of the internet influences the interaction between the incumbent and the media. Our model follows the political agency literature (Barro, 1973; Besley and Prat, 2006; Ferejohn, 1986). There is an incumbent whose type is observed by the media outlets but not the voters. Voters want to overturn a bad incumbent, who wishes to remain in office. A bad incumbent may offer transfers to media outlets to suppress information about his type. Media outlets may accept or reject these offers. Their decisions determine what information their followers receive.

The novel contribution of our paper is to model how information can disperse among groups of voters with different signals. This allows us to offer a mechanism that explains the observed heterogeneity in press freedom outcomes. Our main focus is on the case where a minority of voters observe the incumbent's type. Here, the informed minority may choose to spread on social media the signal they received from an informative traditional media outlet. This mechanism is motivated by recent empirical work that shows social media is more effective at political persuasion when used to complement traditional media as a signal booster. For example, Reuter and Szakonyi (2015) find that the effect of social media on public awareness of electoral fraud in the 2011 Russian parliamentary election was larger in regions with more press freedom. State-run media—where a majority of Russians got their news from—avoided the issue entirely. Thus, coverage was exclusive to local news outlets with limited reach. Where they could, opposition activists fed more reliable information from these outlets into social media, magnifying their influence. Similarly, Aday et al. (2013) find that content generated by traditional news organizations dominated the online discourse during the Egyptian Uprising. More broadly, Druckman, Levendusky, and McLain (2017) find that "almost half the information that originates from the media passes to the masses indirectly via a diffuse intermediate layer of opinion leaders," consistent with the "two-step flow of communication" hypothesis which posits that media affects behavior mostly via personal influences of the intermediaries (Katz, 1957). We study the interaction of such activists or opinion leaders in a formal theoretical framework.

We show that an important parameter in determining the outcome of social media interaction is the level of "connectedness" (Jackson and Yariv, 2007). We take connectedness to be a measure of technological variables such as internet penetration, social media use, the prevalence of mobile devices or other telecommunication technologies; and sociological ones, such as social capital or political trust (Haciyakupoglu and Zhang, 2015). We find that an increase in the connectedness of a country serves to bring in line the information revealed by media outlets in equilibrium.

The level of connectedness determines in equilibrium two important parameters. The first is the costs of capture, defined as the expected loss in audience share of a media outlet from suppressing news. Our case studies of Turkey and Tunisia present real life examples of how consumers left uninformative media outlets for those with information, inflicting on them both monetary and reputational costs. The second important parameter is the probability that a bad incumbent will be overturned. Both Turkey and Tunisia experienced anti-government protests fueled by social media in early 2010s, and while Erdoğan managed to survive this episode, Ben Ali's 23-year reign of Tunisia came to end. To capture this range of possibilities, we model overturn as a stochastic event.

Another important parameter in our model is the incumbent's rents from office. This parameter covers a variety of benefits the incumbent can extract from holding office, such as monetary transfers in the form of wages for politicians or transfers to political parties (Persson and Tabellini, 2002, p. 8). In more corrupt regimes, political rents may also include benefits such as bribes or embezzlement of funds for public programs (Svensson, 2005). When more rents are available for extraction relative to costs of capture, the incumbent has stronger incentives to withstand the novel pressures stemming from the internet and keep the media captured.

As detailed in Lemma 2 and the following discussion, a comparison of the incumbent's rents from office to the costs of capture and the probability of overturn determines his optimal strategy. For sufficiently high rents, the incumbent prefers complete capture. At the other extreme, no capture is optimal. When this is the case, all media outlets can publish critical news about the government. For intermediate values of rents, the incumbent prefers partial capture. Here, as

connectedness increases, the chances that followers of a captured outlet learn that another outlet is more informative increases, as voters who follow the informative outlet share its reports on social media. This has two effects. First, higher connectedness increases the costs of suppressing for media outlets, which in turn increases the costs of capture for the incumbent. This may free media by making capture too costly relative to rents. Second, higher connectedness also results in a higher probability the incumbent will be overturned under partial capture. If the value of staying in office is sufficiently high, higher connectedness may instead lead the incumbent to also capture smaller media outlets to preclude any reports that could be shared on social media. This hinders the dissemination of information in the country completely. Thus, our model provides a novel explanation as to why censorship intensified in many regimes as internet use spread over the last few decades.

The rest of the paper is organized as follows. The next section reviews the related literature. This is followed by the presentation and analysis of our model. Finally, we relate our model to the cases of the Gezi Park protests in Turkey and post-Arab Spring Tunisia, and conclude.

Related Literature

The present paper contributes to the literatures on the political economy of media capture and authoritarianism. In a highly influential paper on the first topic, Besley and Prat (2006) assume that the incumbent can make transfers to media outlets to suppress a bad signal they may have about him. They find that plurality in the media can act as a safeguard against media capture. Egorov, Guriev, and Sonin (2009) investigate the relationship between press freedom and resource endowment. They argue that dictators in resource-poor countries rely on an efficient bureaucracy to generate revenue and that free media—while potentially hurting the incumbent—can help the incumbent provide stronger incentives to the bureaucracy. They find robust empirical support to their theory that oil reserves are associated with lower press freedom in non-democracies, whereas this relationship is flat for democracies. Trombetta and Rossignoli (2020) study a model

with rationally ignorant voters and show theoretically and empirically that greater competition in the media industry may make capture easier. Gehlbach and Sonin (2014) examine a setting in which capture can occur in two ways. In their model, the government can pay transfers to independent media, or seize control. The authors find that controlling for media ownership, higher commercial revenues lead to greater press freedom; but they may also induce the government to nationalize media outlets to save on costs of capture, which may cause a decline in press freedom. Our model contributes to this literature on the determinants of media capture by considering the role of the internet and social.

There are few papers on the question of the internet's effect on press freedom, and they provide conflicting findings. Petrova (2008) studies a model which suggests that higher internet penetration leads to greater media freedom, and more so in democracies. Using panel data up to 2004, she finds support for her claims in democracies, but not in autocracies. Our results corroborate her findings for democracies but suggest that social media may have an opposite, detrimental effect in other contexts. Also related is Lorentzen (2014), which studies press freedom in an autocratic context: He provides qualitative evidence that the central government in China allows investigative journalism in part to keep tabs on local politicians and replace those who are corrupt. The government weighs this benefit of press freedom against the risks it pose. Lorentzen also studies an extension on the effects of online media, assuming it acts as a substitute for traditional media. Because the government needs to keep constant the total amount of information citizens receive, it tightens control of traditional media as internet access increases. Thus, Lorentzen argues that higher internet penetration induces the government to restrict press freedom, and finds that citizens are equally informed before and after the advent of the internet in his particular setting. In comparison, the present manuscript investigates how across contexts greater connectedness may lead to higher press freedom or result in more capture. This allows us to recover the results of Petrova (2008) for countries with low rents relative to costs of capture, and Lorentzen (2014) for others, although our mechanism is distinct from both. We show that when fewer rents are available for extraction, press freedom may improve because capture

becomes prohibitively expensive. In contrast, with higher rents press freedom may fall because the government can extend censorship to media outlets whose influences grow as internet penetration goes up. Thus, our model finds that the advent of the internet leads to citizens who are politically more or less informed, depending on the incumbent's incentives to remain in office relative to the increased costs of capture.

Also related to our paper is the literature on authoritarianism and authoritarianization. Frantz (2018) defines authoritarianization as when the leaders, who came to power via democratic elections, abuse their power to "disadvantage and sideline opponents and consolidate control." She writes that in the post-cold war era, authoritarianizations make up 38% of all democratic collapses, second only to coups. In other words, democracies are increasingly falling apart through incumbent takeovers (Levitsky and Ziblatt, 2018). The mechanisms that lead to a decline in press freedom in our model are closely related to many such authoritarianization processes. Thus, our model provides a micro-foundation for media capture in autocracies.

In our model an incumbent wishes to keep uninformed a portion of the citizenry to remain in power. Implicit in this setup is the assumption that public opinion is of importance even in autocracies. Indeed, an important finding from the literature on authoritarianism is that many autocratic regimes today also integrate features of democratic governance in their system of rule (Gandhi and Lust-Okar, 2009). In modern dictatorships it is increasingly common to see multiparty elections that occur on a regular basis (Bratton and Van de Walle, 1997). While only 59% of all dictatorships held regular elections with multiple political parties in 1970, the rate increased to 83% in 2008 (Kendall-Taylor and Frantz, 2014). That such regimes are considered authoritarian despite holding elections is in no small part due to media capture, whereby incumbents preclude an informed electorate and hence tilt the playing field in their favor. Magee and Doces (2015) document the serious obstacles media typically faces in authoritarian regimes. The information they do release is often biased and intentionally inaccurate, even about basic information such as economic growth rates. In a time series, cross-country empirical analysis, Stier (2015) finds that autocracies have lower press freedom scores than democracies, and that within autocracies, elec-

toral autocracies tend to allow for more press freedom while communist regimes tend to have the least free press. Our contribution to this literature is to show how—despite early optimism—the effect of the internet on press freedom depends on the amount of rents available for the incumbent to extract.

Model

In this section, we introduce a two-period Bayesian game. Our model involves (i) an incumbent politician, I, whose type is private information, (ii) mainstream and the alternative media outlets M and A, and (iii) a unit mass of voters V, divided into two groups as (a) followers of the mainstream media (mainstream voters, V_M) and (b) followers of the alternative media (alternative voters, V_A).

In the first period, the incumbent is exogenously in power, facing a challenger. The incumbent needs the support of at least ζ fraction of citizens to retain office. For concreteness, we interpret citizens' support as voting and take $\zeta = 1/2$ as a simple majority; but our model encompasses other types of political action and different values of ζ.[3] Both the incumbent and the challenger can be one of two types, 'good' or 'bad.' A good politician produces a payoff of one to voters, and a bad politician produces a payoff of zero. The incumbent and the challenger are drawn independently from a common pool, and we denote by $\gamma \in (0, 1)$ the prior probability that a politician is good. At the start of the game, the incumbent and media outlets observe the type of the incumbent. The voters can only learn about the incumbent's type before their decision through the news reports of the media outlets.

For ease of exposure, we assume that there are two media outlets, *M*ainstream and *A*lternative. The media outlets are identical in their strategy sets and preferences. They only differ in their audience size, denoted by σ_k for $k \in \{M, A\}$. At the start of the game, the mainstream outlet

[3]Specifically, lower values of ζ may be more suitable in competitive authoritarian contexts where the playing field is tilted towards the incumbent, or a collective action from a larger group is required to replace the incumbent.

reaches a group of voters large enough for the incumbent to retain office but the alternative outlet does not, $\sigma_M \geq \zeta > \sigma_A$, and each voter follows exactly one outlet, $\sigma_M + \sigma_A = 1$. If the incumbent is good, the outlets have no verifiable news and publish the null signal, $s_k = \emptyset$ for $k \in \{M, A\}$. If the incumbent is bad, media outlets have a verifiable signal ($s_k = b$) that they can publish and inform their audience of the incumbent's type.[4] Before they make their editorial decisions, however, the incumbent can try to influence them.

Real-world incumbents have a broad set of tools to influence the editorial decisions of media outlets. These tools may be in the form of carrots to outlets who adopt editorial strategies in line with the incumbent's objectives (*e.g.* access, cash transfers, business contracts), and sticks against those who do not (*e.g.* fines, closures). To capture this wide range of possible strategies in a simple way, we model this interaction between the incumbent and the outlets as a bargaining game. After the outlets observe his type, the incumbent can make an offer of a transfer t_k to outlet $k \in \{M, A\}$ in exchange for them suppressing the verifiable signal. Here, a high t_k may correspond to larger monetary transfers paid out to outlets in the case of carrots, or to sparing them from shutting down in the case of sticks. For sake of generality, we impose no structure on the form of these transfers except requiring that stronger incentives to suppress are more costly for the incumbent to provide. This means that, for example, bigger bribes are more expensive to pay out, and shutting down a defiant outlet is more costly than fining it. The outlets observe the offers made to each. They then simultaneously decide whether to publish the news or to suppress them in exchange for transfers from the incumbent. The incumbent and the outlets observe what both outlets publish. If one outlet publishes the news about the incumbent's type while the other

[4]For an example of the mechanism described here, consider McMillan and Zoido (2004)'s account of Fujimori who fled Peru and resigned by fax in 2000 after a small TV channel started broadcasting a videotape of his secret police chief paying an opposition congressman bribes to support the president. Similarly, when Halk TV broadcast violent regime crackdowns against peaceful demonstrators in Turkey, the façade of democracy slipped to reveal the authoritarian tendencies of the regime behind the crackdown. In the Mexican state of Guerrero, governor Ruben Figueroa Alcocer resigned following the press coverage of his involvement in the cover-up of the Aguas Blancas Massacre, including a TV broadcast of a video of the massacre (Lawson, 2002).

one suppresses, the informed voters may share the news on social media, causing some fraction of the uninformative outlet's audience to switch to the informative outlet. This switch decreases the audience share of the uninformative outlet while increasing that of the informative outlet.[5]

Thus, an outlet facing an uninformative competitor chooses between the opportunity to steal some market share versus transfers from the incumbent; whereas an outlet facing an informative competitor chooses between holding on to their market share versus receiving transfers but losing some audience to their competitor. The offers to the two outlets are unobserved by the voters, as are whether the outlets accept the incumbent's offers. When indifferent, outlets accept the incumbent's offer. For ease of notation, we normalize the audience related profits of both outlets at the start of the game to zero.

If both outlets accept the offer, or if both reject, the game moves to the election stage. If one of the media outlets accepts the offer and the other does not, the followers of the informative outlet (informed voters, or IV) decide whether to share their signal via social media. In this decision, the benefits of sharing information about a bad incumbent is weighed against the potential costs of expressing political, anti-government opinions online. Depending on the fraction of IV who share the signal, $\nu \in [0, 1]$; and a variable we call connectedness, $\theta \in \mathbb{R}$, some uninformed voters switch to the informative outlet, observe the verifiable signal about the incumbent's type, and become informed. Specifically, the size of IV grows by $f(\nu, \theta) > 0$, where f is continuous and increasing in both arguments. The rest of the uninformed voters stay uninformed.

We use the term connectedness to refer to factors that influence the likelihood with which messages reach voters. These are both technological factors such as internet penetration, and

[5]In Fujimori's Peru, after Channel N started broadcasting around the clock a videotape of bribes being paid out to a congressman, many consumers switched to this more informative outlet. Larger media outlets on the government's payroll soon followed suit to stem the loss of their market share (McMillan and Zoido, 2004). Similarly in Mexico in the 1990s, when small, independent media outlets started publishing scandals surrounding the ruling party, this often led to a jump in their readership, such as the *Siglo 21* which became the second highest circulating daily in the state Guadalajara. Having discovered the public's appetite for informative news, many mainstream outlets, typically reluctant to confront the ruling party, nonetheless jumped on the bandwagon (Lawson, 2002).

social factors such as political trust and the prevalence of fake news. We take connectedness to be a random variable of the form $\theta = \mu + \psi$.[6] Since technological variables are measured relatively precisely, we interpret the expected level of connectedness, $\mu \in [0, 1]$, to be equal to the level of internet penetration. The error term, drawn from a normal distribution with zero mean and finite variance, can be interpreted as the uncertainty regarding other factors that influence information flows through the social network, and is unobserved.

The fraction of IV who shares the news is determined in equilibrium. The benefits of sharing may be in the form of material gain where more clicks correspond to larger advertisement revenue. They may also be in the form of expressive or glow utility derived from sharing one's political opinion with an audience, where a larger audience leads to more engagament such as "likes" and "comments." Regardless, when connectedness increases, an informed voter can reach a larger audience and therefore derives a larger utility from sharing. Because connectedness is positively correlated with internet access, in our model this means that all else equal, higher internet penetration implies larger expected benefits from sharing. For ease of notation, we further assume that this relationship is linear. That is, the expected benefit informed voters derive from sharing information via social media is linearly increasing in internet penetration, μ.

There are also expected costs associated with sharing the bad signal about the incumbent, given by the expression c. This captures the severity of the punishment and might range from zero (*e.g.* no punishment), to relatively low (*e.g.* getting fired from public service) to extremely high (*e.g.* death). The expected utility of sharing is thus $\mu - c$, and the expected utility of refraining is normalized to zero. When indifferent, informed voters choose to refrain. In the Appendix, we explicitly model coordination between informed voters within a global games framework. The equilibrium behavior of that model is qualitatively similar to the simple decision problem that we present in this paragraph. In the main text we stick with this simpler setup for ease of

[6]This measures the extent to which citizens can communicate with each other without having to go through channels controlled by the incumbent. At one extreme, each citizen is only connected to the incumbent and no communication can take place without his approval. At the other extreme, each citizen is connected to all the others. See Kim, Londregan, and Ratkovic (2019) for a detailed microfoundation.

presentation.

At the final stage of the game, voters choose between the incumbent and a challenger of unknown type. The incumbent retains office if and only if he receives the support of at least ζ fraction of citizens and receives office rents denoted by $r > 0$ regardless of his type. Thus the payoff of the incumbent is $r - \sum_{k \in K} t_k$ if stays in office and $- \sum_{k \in K} t_k$ if he does not, where K is the set of media outlets who accept the incumbent's offer. The payoff of an outlet k who publishes the signal about the incumbent is $\sigma_k f(v, \theta)$ if its opponent suppresses the news because of the growth in k's market share, and k's payoff is normalized to zero if its opponent also publishes. The payoff of an outlet k who chooses to suppress the news is equal to t_k if its opponent also suppresses, and it is $t_k - \sigma_{-k} f(v, \theta)$ when the opponent publishes because of the lost market share.

Discussion

Before proceeding to the analysis of the model, we discuss our modeling assumptions to clarify the scope conditions and limitations of our model. Most of our assumptions are made for purposes of clarity and convenience, and can be generalized to different settings. For those that cannot, we discuss why we believe the assumptions we make are justified, and what would change in our results if they did not hold.

Importantly, although throughout the paper we refer to voting and elections for the sake of concreteness, our model's scope expands beyond democracies and electoral autocracies. Our terminology should hence be interpreted more broadly. For example, in the context of autocracies, citizens may revolt to overthrow an autocrat they know to be corrupt. Our analysis would then follow through, with the only major difference being that media capture would serve the purpose of preventing a large enough protest to set off a revolutionary cascade, instead of a majority voting to replace the incumbent. The critical assumption we make is that the incumbent fears losing power if information about his type reaches a large enough subset of the population. Thus, he would prefer to keep the fraction of informed voters well below that threshold, subject to the constraints he faces. This preference may be driven by a desire to elude electoral defeat

or widespread protests; our model accommodates either interpretation. However, even a literal interpretation of the elections in our model applies to a wide range of contemporary regimes. This is because most contemporary authoritarian regimes integrate features of democratic governance, particularly elections, in their system of rule, and 39% of all authoritarian regime failures occur via electoral processes (Frantz, 2018).

In modeling how voters learn about politicians' types, we make four main assumptions. First, social media is not sufficient for voters to modify their beliefs about the incumbent, because unlike news reports published by media outlets, we assume that social media posts are not verifiable. Voters thus can only learn from social media that they are not getting all the news and must change their media consumption if they wish to be better informed. In other words, social media can only direct voters to media outlets that may have verifiable information. In reality, some voters may be convinced by social media alone, but without the reputation of traditional media outlets to back them up, a group of voters large enough to overturn the incumbent is unlikely to be persuaded.[7]

Relatedly, we follow Besley and Prat (2006) in assuming that outlets can only publish verifiable news. If we allowed traditional media outlets to publish "fake news," we would have to analyze a more complex signaling game where voters have to take into account the possibility that the incumbent is good despite a bad signal, a game with potentially multiple equilibria. Even in such a model, however, all of our substantive takeaways would remain unchanged in any equilibrium where bad signals are at least partly informative.

Third, we assume for simplicity that there are only two media outlets and that voters initially follow exactly one of them. One may easily extend this assumption to any number of media outlets from which the incumbent determines M and A endogenously, as in Trombetta and Rossignoli (2020). We could also allow for voters who follow multiple outlets or no outlets at all. Our

[7] As Marc Lynch said about the canonical case of social media leading to regime change, the Arab Spring: "They did not cause these events, but it's almost impossible to imagine all this happening without Al Jazeera." (Worth and Kirkpatrick, 2011)

substantive results would remain unchanged. We stick with this simpler setup for tractability.

Finally, voters in our model initially only observe the news reported by the media outlets they follow. As in Prat (2018), we assume that there is some rigidity in the media market, and voters do not change the outlet they follow unless they have sufficient reason to believe the other is more informative. This may be because of habit-formation or because voters consume media mainly for reasons other than informativeness, such as entertainment. Either way, we assume that voters do not seek out another media outlet just because they observed the null signal. But they may do so if they see the news shared on social media. If instead we allowed voters to switch media outlets until finding one that is informative even absent nudges from social media, the incumbent would always capture either both outlets or none. Both the existing empirical research on this topic, and the media capture strategies of incumbents from Turkey to Russia, however, imply that there is substantial persistence in media consumption (Gehlbach, 2010).

To model the spread of information on social media in a clean way, we abstract away from the possibility that the incumbent may shut down the internet or social media, which in our model would refer to $\mu = 0$. Such cases are beyond the scope of our model, but we note that even in the case of the Arab spring, where access to technology was at times quite restricted, shutting down the internet did not turn out to be a very viable strategy, and may actually have backfired (Hassanpour, 2014).

Relatedly, our specification of $\theta = \mu + \psi$ implies that technological and non-technological factors that make up connectedness are additively separable. While this simplifies the exposition of the model considerably, it is in principle possible to imagine alternatives. If in a country the non-technological factors such as political polarization or government manipulation of the internet are such that more internet penetration does not lead to an increase in connectedness, then our model no longer applies. For example, the online commentators recruited by the Chinese government since at least 2013, such as the so-called 50 Cent Army, may invert the relationship between internet penetration and connectedness, in which case post-2013 China would fall beyond the scope of our model (King, Pan, and Roberts, 2017). That said, we believe that it is

more likely the case that such actions by the regime may only attenuate the positive relationship between penetration and connectedness, but cannot invert it.

Another simplifying assumption we make in our model is that the expected benefits of sharing are equal to the level of internet penetration. We can easily generalize this functional form; our qualitative results still hold as long as the expected utility of sharing is increasing in internet penetration. While we believe that this assumption is reasonable—social media users typically enjoy having larger audiences— it is possible that this may not be universally true. In contexts where social media use is saturated and the limiting factor is attention rather than reach, further increases to connectedness may lead to a lower expected utility of sharing. Nonetheless, while this may be true for some users, especially in the political domain where there is "strength in numbers" and repeated exposure may prove more persuasive, we maintain that greater reach always leads to a larger expected payoff to most social media users.

Finally, we assume that the informed voters who share the signal on social media incur the costs of sharing before the election. Assuming that costs are incurred after the election and only if the incumbent stays in power would not qualitatively change any of our results.

Analysis

In this section, we solve the game step by step. We consider perfect Bayesian equilibria in undominated strategies. We start by solving for optimal voting behavior as a function of beliefs, followed by optimal sharing on social media, and the interaction between the incumbent and the media outlets respectively. Then, we summarize the unique equilibrium of the game and present comparative statics.

Equilibrium Voting Behavior

For a voter who observes that the incumbent is bad (*i.e.* $s_i = b$), the expected utility of reelecting the incumbent is zero; bad signals are verifiable and all voters who observe them believe that the

incumbent is bad with probability one. The expected utility of electing a challenger of unknown type is equal to the probability that the challenger is good, γ. Because we are looking at equilibria in undominated strategies, any voter who receives the signal that the incumbent is bad votes against the incumbent. On the other hand, if a voter observes no signal (*i.e.* $s_i = \emptyset$), she believes that the incumbent is good with probability weakly greater than γ. This is because observing the null signal is never *more* likely when the incumbent is bad. Thus, a voter who receives the null signal votes for the incumbent.[8]

Therefore, any voter who observes the signal that the incumbent is bad votes for the challenger, and any voter who does not observe any signal votes for the incumbent. The only means by which the voters can observe the incumbent's type is through the media outlets. Because $\sigma_M \geq \zeta > \sigma_M$, when they vote together, the votes of V_M are decisive in an election. Hence, the outcome of the elections ultimately boils down to whether V_M receive any signal about the type of the incumbent.

If the mainstream outlet publishes the news that the incumbent is bad, the incumbent loses the election with certainty. If neither M nor A publishes, then all voters vote for the incumbent and he wins the election. If only the alternative outlet publishes and the mainstream outlet suppresses, then the outcome of the elections depends on the outcome of the social media game. This is summarized in Table 1.

	A publishes	A does not publish
M publishes	Challenger elected	Challenger elected
M does not publish	Social media game	Incumbent reelected

Table 1: Media outlets' strategies result in different electoral outcomes.

[8]That the voter votes for the incumbent when the posterior belief after observing the null signal is strictly greater than γ is obvious. To see why in equilibrium she must also vote for the incumbent when the posterior on the incumbent is equal to the prior on the challenger, suppose that she votes for the challenger. Then the incumbent would have no incentive to offer positive transfers to the media outlets, which would mean that outlets would always publish the bad signal. Then, observing the null signal implies the incumbent must be the good type with probability $1 > \gamma$, a contradiction.

Equilibrium Information Sharing on Social Media

If only the voters who follow the mainstream outlet are informed, then whether news spread through social media does not affect the outcome of the elections. This is because the challenger always wins when at least ζ voters know the incumbent is bad. Thus, it is never optimal for the bad incumbent to only capture the alternative outlet, as this would mean paying transfers to the alternative outlet and losing the election. It follows that in equilibrium, it cannot be the case that V_M are informed and V_A are not. Therefore, we restrict attention to the inverse case where V_A are informed and V_M are not.

Informed voters prefer sharing the news that the incumbent is bad on social media if and only if the expected benefits from doing so exceed its costs. The benefit of sharing is equal to the level of connectedness, θ, whose expectation is equal to the level of internet penetration, μ. Thus, informed voters share on social media whenever μ is greater than c, the cost of sharing. In this case, we have $\nu = 1$. In contrast, when internet penetration is less than c all informed voters refrain from sharing and $\nu = 0$.

Given the level of internet penetration, μ, we denote by $p(\mu) = \Pr(\sigma_A(1 + f(\nu, \theta)) > \zeta|\mu)$, the probability that a subset of V_M large enough to overturn the bad incumbent is convinced to switch to the informative outlet and become informed themselves. In other words, $p(\mu)$ is the probability of overturning if the game reaches the social media stage, given that $\nu(\mu) = 1$ if and only if $\mu > c$. In the next subsection, we study the implications of this finding for press freedom.

In the Appendix we present an extension where we explicitly model the coordination problem informed voters face as a global game. There, we assume that the costs of sharing decrease in the fraction of informed voters who also share as this makes it harder for the government to punish each individual citizen. This setup leads to essentially the same results as the simple model presented here. One important difference in this extension is that the equilibrium fraction of informed voters who share the news, $\nu(\mu)$, is an interior solution instead of equal to either zero or one. The most important additional insight from the extension is that higher connectedness has a positive second-order effect on sharing due to strategic complementarity besides the first-

order effect of increasing the benefit of sharing. The interested reader can find the details in the Appendix.

Equilibrium Media Capture

The payoff of a media outlet depends not only on its action but also on whether the other outlet publishes or not. When both outlets publish or neither do, they receive a normalized payoff of zero. When one publishes and the other suppresses, the former's audience share grows by fraction $f(\nu, \theta)$ as a subset of the latter switch to it after being convinced on social media. The payoff of an outlet k that publishes is thus:

$$\mathrm{EU}_k(\text{publish}) = \begin{cases} 0, & \text{if } -k \text{ publishes} \\ \sigma_k q(\mu), & \text{if } -k \text{ suppresses} \end{cases}$$

where we let $q(\mu) \equiv \mathbb{E}[f(\nu, \theta)]$.

When instead an outlet suppresses, its payoff is the transfer offered by the incumbent minus some audience share lost if the other outlet publishes the news:

$$\mathrm{EU}_k(\text{suppress}) = \begin{cases} t_k - \sigma_{-k} q(\mu), & \text{if } -k \text{ publishes} \\ t_k, & \text{if } -k \text{ suppresses} \end{cases}$$

In equilibrium, when a media outlet is indifferent between accepting or rejecting an offer by the incumbent, it accepts. Thus, making an offer to an outlet that is strictly greater than its opportunity cost is strictly dominated for the incumbent. Moreover, capturing A only is a dominated strategy because it would lead to the incumbent paying transfers and still losing the election. Thus, the incumbent never makes such an offer in equilibrium. Finally, making an offer that an outlet would reject in equilibrium is equivalent to offering zero. These are summarized in the following lemma:

Lemma 1. *The incumbent's equilibrium strategy is equivalent to one of the following:*

1. *Offer* $t_M = \sigma_M q(\mu)$ *and* $t_A = \sigma_A q(\mu)$ *(complete capture)*
2. *Offer* $t_M = \sigma_A q(\mu)$ *and* $t_A = 0$ *(partial capture)*
3. *Offer* $t_M = 0$ *and* $t_A = 0$ *(no capture)*

When both media outlets are captured, the bad incumbent is reelected for certain, but he has to pay transfers to both outlets. When only M is captured, the transfers are lower and the incumbent is reelected with probability $1 - p(\mu)$. And when neither outlet is captured, the bad incumbent does not pay any transfers but is certainly overturned.

Lemma 2. *The expected second period payoff of the bad incumbent from the strategies described in Lemma 1 are:*

$$\begin{aligned} \mathrm{EU}_I(\textit{complete capture}) &= r - q(\mu) \\ \mathrm{EU}_I(\textit{partial capture}) &= r(1 - p(\mu)) - \sigma_A q(\mu) \\ \mathrm{EU}_I(\textit{no capture}) &= 0 \end{aligned}$$

Equilibrium

The equilibrium of the game is summarized here. We state it formally in the Appendix.

Any voter who observes the signal that the incumbent is bad believes it and votes for the challenger. Any voter who does not observe a signal about the incumbent's type believes that the incumbent is at least as likely to be good as a challenger, and votes for the incumbent. Voters who observe that the incumbent is bad may share their signal on social media. The informed voters share the news on social media whenever the expected level of connectedness is higher than the cost of sharing, and refrain otherwise. The expected level of connectedness thus determines the costs of capture and the expected probability of overturning. Given these, the incumbent chooses which outlets to capture, if any, maximizing his expected utility as described in Lemma 2. The media outlets accept any offer from the incumbent that is at least as high as the expected change in commercial revenues.

Comparative Statics

The equilibrium level of press freedom depends on the incumbent's payoffs summarized in Lemma 2. When the probability $p(\mu)$ that the signal about the incumbent's type spreads to a critical mass of voters is zero, complete capture is never optimal. Substantively, if the incumbent has little reason to fear his supporters switching to an antagonistic outlet, our model suggests that he prefers to confine pressure to the mainstream outlet only. This would be true when there are few means of communication between citizens or when such communications are often dismissed due to a lack of trust. Here, partial capture allows the incumbent to keep a greater share of extracted rents for himself. In contrast, when $p(\mu) \geq \sigma_M$, partial capture is never optimal because the risk of overturning is too high. When this is the case the incumbent effectively chooses between no capture and complete capture.

In between these two extremes when $0 < p(\mu) < \sigma_M$, all three strategies are viable. The incumbent's optimal strategy then depends on the relative costs of capture, $q(\mu)$; the probability of overturning under partial capture, $p(\mu)$; and office rents, r. Specifically, for sufficiently low rents from office, $r < \frac{\sigma_A q(\mu)}{1-p(\mu)}$, no capture is optimal for the incumbent, because the payoff of holding office does not cover the costs of capture. For sufficiently high rents, $r > \frac{\sigma_M q(\mu)}{p(\mu)}$, the incumbent prefers complete capture, because the payoff of holding office is too high to risk overturn. For intermediate values of rent, the incumbent prefers partial capture. Figure 2 shows these different regions of the incumbent's optimal strategies as a function of office rent.

Given the incumbent's equilibrium strategies, we can derive the primary comparative statics of our model: the effect of internet penetration on press freedom. It can be seen from Lemma 2 that the incumbent's payoffs from both complete and partial capture are decreasing in internet penetration. Intuitively, this is because the probability of news spreading via social media goes up when internet penetration rises, which increases both the risk of overturning and the costs of capture. This means that when rents from staying in office are low, an increase in internet penetration may free the media by making capture too costly for the incumbent.

The effect of a rise in internet penetration on the relative payoffs of complete capture versus

partial capture is less obvious. On the one hand, greater internet penetration pushes the incumbent towards complete capture because it increases the risk of overturning if the social media game is played. But it also makes complete capture less attractive because outlets' opportunity cost of suppressing increases as their potential market gain grows. Thus, it becomes more costly for the incumbent to capture both outlets. Whether the risk effect or the cost effect dominates depends on the following condition:

Condition 1. $\frac{d\frac{p(\mu)}{q(\mu)}}{d\mu} > 0$.

Condition 1 implies that the risk of overturning increases faster than the costs of capture as connectedness goes up. When this is the case, an incumbent who prefers partial capture may switch to complete capture as internet penetration increases. Thus, the set of rents for which the incumbent chooses partial capture shrinks as μ goes up, forcing an incumbent who previously preferred partial capture to either switch to complete or no capture. Figure 2 provides a visual representation of these forces at work.

When Condition 1 holds, the effect of social media on press freedom is ambiguous. Increased internet penetration may improve press freedom, as the risk of overturn becomes too high, and capture too expensive, for the incumbent to continue pressuring the mainstream outlet. But it may also have the opposite effect: It may induce incumbents to increase their hold on media by also capturing alternative outlets, to ensure news cannot spread via social media. Figure 3 presents a simulation that captures the relationship between internet penetration and press freedom when Condition 1 holds. The details of our simulations can be found in the Appendix.

In Figure 3, press freedom scores (25 for complete capture, 50 for partial capture, and 75 for no capture, with random noise added to enhance readability) on the vertical axis are plotted against internet penetration levels μ on the horizontal axis. Colors capture the tertiles of uniformly distributed office rents, r, for 160 simulated countries: blue refers to countries with high office rents, yellow to intermediate office rents, and green to low office rents. For each simulated country, we draw 16 values of internet penetration from a beta distribution. The simulations show that under Condition 1, as internet penetration increases, most low rent countries switch from partial

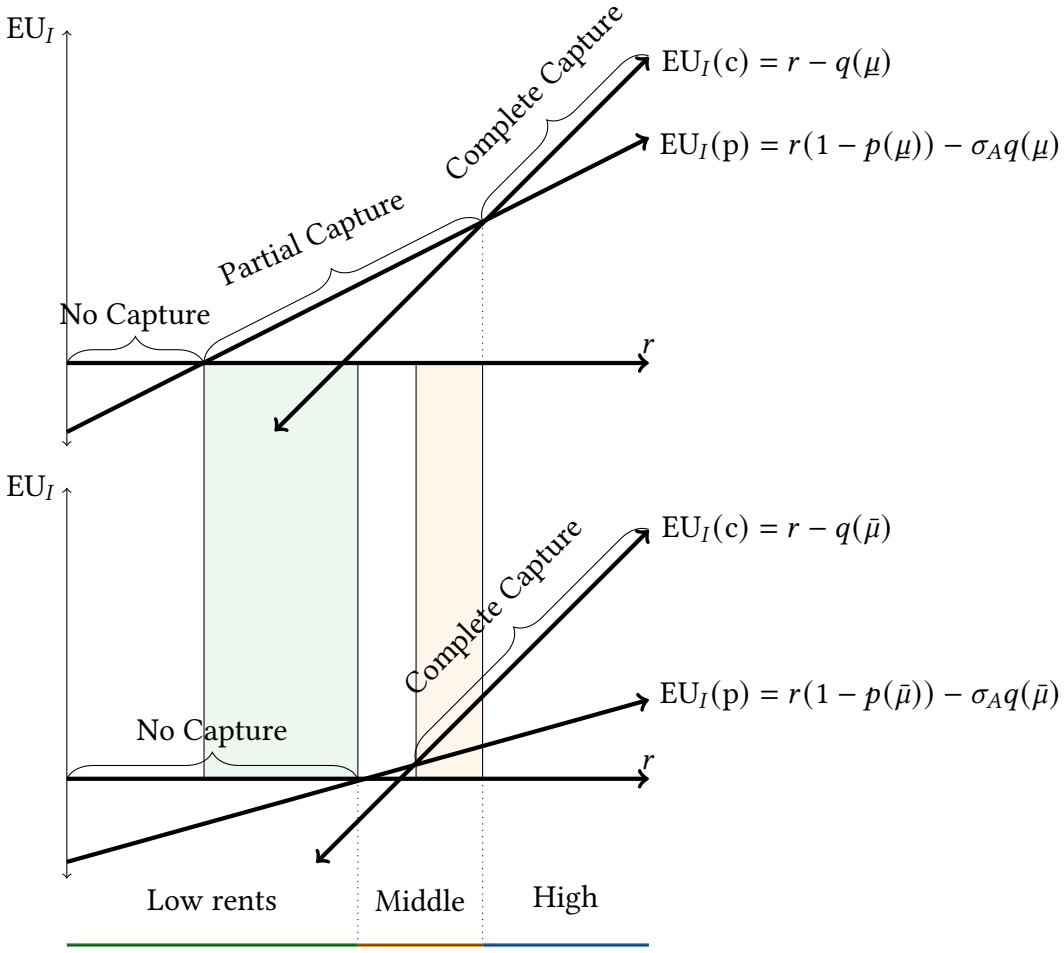

Figure 2: For two different levels of expected connectedness $\bar{\mu} > \underline{\mu}$, the expected utilities of the incumbent from his three equilibrium strategies are plotted against low, middle, and high office rents, when Condition 1 holds and $0 < p(\mu) < \sigma_M$. The best response of the incumbent is the upper envelope in each plot. The green (yellow) shaded region indicates levels of office rents such that the incumbent switches from partial capture to no (complete) capture when connectedness goes up.

capture to no capture. In contrast, most countries with intermediate levels of rent switch from partial capture to complete capture. Countries with high office rents remain in complete capture.

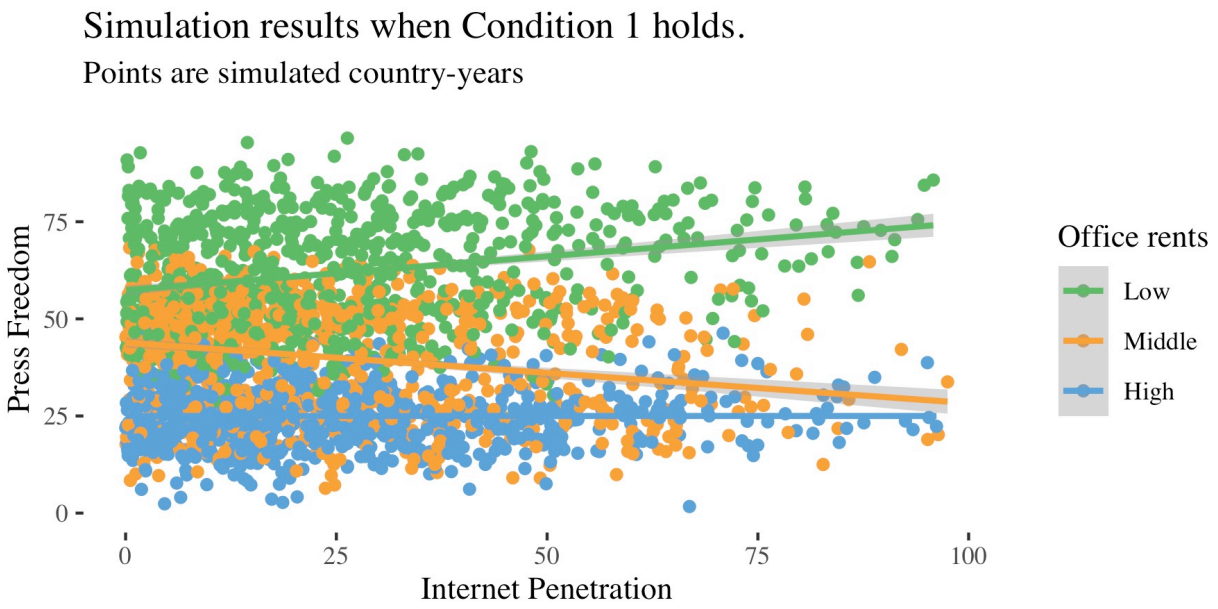

Figure 3: When Condition 1 holds, higher internet penetration may improve press freedom by making partial capture too costly and inducing incumbents to release mainstream outlets in low rent countries (green), or may hurt it by making partial capture too risky and inducing incumbents to capture alternative outlets in medium rent countries (yellow). High rent countries (blue) remain in complete capture.

In contrast, when Condition 1 fails, the cost of capturing both outlets grows faster than the risk of overturning. Then, internet penetration has the unambiguous effect of improving press freedom. This is because the transfers required to capture media outlets grows faster than the risk that a sufficiently high fraction of uninformed voters become informed and overturn the incumbent. Here, greater internet penetration cannot induce an incumbent to switch from partial to complete capture. The only possible change is that countries move towards more press freedom. Figure 4 presents a simulation of the relationship between internet penetration and press freedom when Condition 1 fails.

A comparison of our simulations with actual data can inform us about whether Condition 1 is justified for our model. By studying empirically whether increased internet penetration is

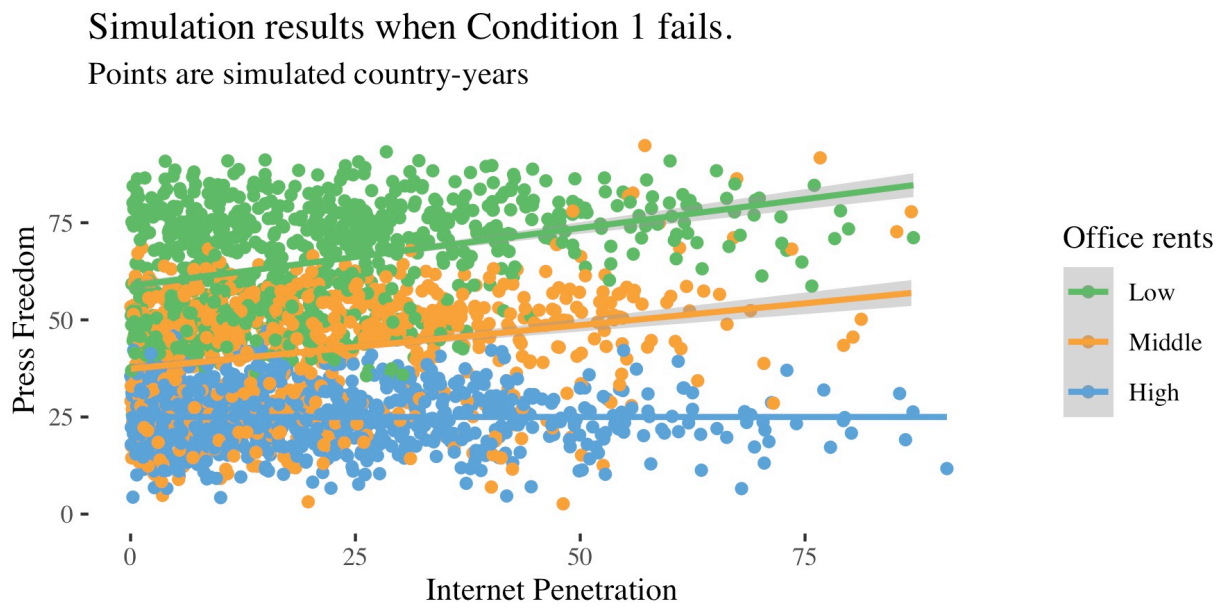

Figure 4: When Condition 1 fails, higher internet penetration improves press freedom by making both partial and complete capture too costly and inducing incumbents to move from partial to no capture (green), or move from complete to partial or no capture (yellow). High rent countries (blue) remain in complete capture.

universally associated with improved press freedom outcomes or not, we can get a sense of how the risk of overturn increases in μ relative to costs of capture. Our empirical analysis in the Appendix finds that internet penetration has a robust negative relationship with press freedom in countries that were "Partly Free" in 2000 according to Freedom House's Freedom of the Press report (Please see Tables 3-6 in the Appendix). These suggest that, at least in countries where there were serious concerns about press freedom prior to the advent of the internet, incumbents' fear of information spillovers may have risen faster than the costs they face in capturing the media.

As discussed above, office rents relative to costs of capture determine the incumbent's strategy in equilibrium. This in turn decides the country's level of press freedom. Thus, when comparing our simulations to data, we split our simulation by terciles of r to match countries' press freedom status in 2000.[9] This classification is supported by cross-country studies which find that press

[9]Partial Capture in our model corresponds to all of the "Partly Free" as well as some of the "Free" countries according to Freedom House's classification. The remaining "Free" countries correspond to No Capture and "Not

freedom is inversely related to office rents (Brunetti and Weder, 2003). This is because in countries with high levels of press freedom, it is harder for incumbents to extract rents relative to the costs of capturing media outlets. Similarly, Stier (2015) finds that democracies tend to have higher press freedom scores than autocracies, and among the latter group, electoral autocracies tend to have more free press than others.[10]

Overall, Condition 1 is consistent with the observed data because higher internet penetration is associated with better or worse press freedom depending on their status in 2000, rather than an unambiguous improvement as a failure of Condition 1 would suggest. Thus, we expect media in countries with high penetration to be generally either very free or not free at all. In contrast, media in countries with low penetration should have smaller cross-country variance. As internet penetration increases, countries that have intermediate levels of press freedom should move towards either extreme.

Greater press freedom leads to bad incumbents being identified and overturned more often. Therefore, voter welfare increases as press freedom goes up. These points are summarized in the following proposition:

Proposition 1. *When Condition 1 holds, an increase in internet penetration improves press freedom in some countries while deteriorating it in others, depending on rents for holding office. Voter welfare is increasing in press freedom.*

Free" to Complete Capture, respectively.

[10]Thus, we interpret democracies, electoral autocracies, and other autocracies as the archetypal low, middle, and high rent regimes, respectively. Another reason why the value of staying in office vis-à-vis being out of office tends to be higher in countries with low levels of press freedom—which are typically more autocratic—is that executive turnover rarely results in peaceful retirement for ex-dictators. This is in contrast to countries with high initial levels of press freedom, where executive turnover is often followed by the return of one's party to power after a few electoral cycles.

The Cases of Turkey and Tunisia

Throughout the text, we presented examples from around the world, including Turkey, Tunisia, Peru, Russia, China, and Mexico. In this section, we will discuss the first two countries in more detail and in relation to the assumptions and findings of our model. As will be detailed below, both Turkey and Tunisia experienced a change in media freedom in early 2010s as a result of a series of events in which a minority successfully used social media to amplify the voices of media outlets with otherwise limited reach. There are many similarities between Turkey and Tunisia. In spite of these similarities, in the years following the aforementioned events, media freedom decreased in Turkey while it increased in Tunisia. Hence, these two countries present a comprehensive pair of examples for the two opposite directions in which media freedom can move in our model after an increase in internet penetration.

When applicable, we detail below the specific form the components of our model take for Turkey and Tunisia, such as mainstream and alternative media outlets, tools incumbents use to influence the editorial decisions of media outlets, ways in which media outlets suppress information and how their audience shares respond to this, how voters use social media to share information provided by informative media outlets, and costs associated with sharing information on social media. Additionally, we discuss how these cases relate to our assumptions.

We start with the Turkish case. Before June 2013, when most citizens still did not have access to the internet, press freedom in Turkey resembled a partial capture equilibrium. Then incumbent prime minister Erdoğan focused his efforts on capturing mainstream media, overlooking smaller media outlets. As a result, a series of events damaging to the incumbent was covered solely by alternative media outlets with limited reach. Their market share surged after social media users started discussing and referring others to them. Erdoğan's government survived this tumultuous episode and subsequently extended capture to alternative media outlets, thus switching from partial to complete capture in response to rising connectedness. In their 2014 report, Freedom House moved Turkey from the "Partly Free" to "Not Free."

June 2013 was marked by violent clashes between the police and protesters trying to prevent

the demolition of a park in the heart of Istanbul. Propelled by widespread anger towards Erdoğan's authoritarian style, the so called "Gezi Park" protests multiplied across the country. The number and the broad scope of protesters, the government's response, and the use of extreme force by the riot police were unprecedented during Erdoğan's tenure. The protests made headlines all around the world. But in Turkey, the way mainstream media ignored the events took center stage instead. For example, while CNN International was live-streaming the hundreds of thousands of protesters in a mist of teargas, CNN's Turkish version, CNN Türk, was broadcasting a documentary about penguins. One channel was showing a beauty pageant, another a show about ethnic food. The mainstream media; TV stations, newspapers, and their websites, was remiss throughout the first few days of the protests.

In line with the predictions of the partial capture equilibrium of our model, the most accurate and extensive coverage of the events took place in a few alternative media outlets and social media (Chrona and Bee, 2017). People used social media to alert fellow citizens about a few TV stations and newspapers which reported on the events, channeling people to these sources for reliable information. An example of this is Halk TV, an obscure TV station that streamed the protests live with commentary in Turkish. Twitter users in Turkey soon started referring to the channel and Halk TV became a "trending topic." Soon, others flocked to the news channel to find out about the protests, rapidly tripling its audience size (Bonini, 2017; Farro and Demirhisar, 2014). Similarly, the anti-government daily Sözcü saw a 21% increase in sales during the week following the start of the protests. In terms of our model, these constituted lost audience shares for the competing, "mainstream" media outlets.

A probe into Turkish media yields why some outlets chose to cover these protests, whereas most others did not. Both Halk TV and Sözcü were universally acknowledged to be anti-government. Many of Sözcü's editors moved there when fired from their previous outlets, allegedly due to government pressure.[11] Most of Sözcü's readers also switched to the anti-government daily after

[11]One editor at Sözcü was removed from his post as editor-in-chief at one of the highest circulating dailies in Turkey after he defied Erdoğan's request to fire a columnist. While writing for Sözcü, he was elected as a member

their previous newspapers changed their stances to accommodate the government.[12] Eventually, Sözcü became a haven for the disillusioned secularists in an increasingly polarized society. Its staunch adherence to old Kemalist principles made it unlikely to appeal to anybody else: It was not a government target for capture. Instead, the government focused its attention and pressure on mainstream media outlets that can reach people whose votes can be influenced by the news they consume (Corke et al., 2014). Throughout his tenure, Erdoğan used a variety of sticks and carrots to capture these mainstream outlets.[13]

One carrot is preferential treatment in public procurement in Turkey's centralized economy. Most media outlets in Turkey are owned by large holding companies. Often, these companies earn the bulk of their profits from other interests, such as energy or construction. They buy media outlets, not for commercial revenues—which are limited in Turkey—but for a means to show their loyalty to the incumbent. Erdoğan was in charge of both the Privatization High Council (ÖİB), which gives the privatization approvals; and the Housing Development Administration (TOKİ), which distributes billions of dollars each year through construction contracts, as well as several other institutions that tender public sector contracts. Staying on good terms with the government was key to getting lucrative business contracts, and owning a sycophantic media outlet helped.

In contrast, critical mainstream media outlets were disproportionately subject to tax inspections. In one case, the government fined a media company a record $2.5 billion over tax irregularities. This equaled about four-fifths of the valuation of the entire parent holding. To settle its bill, its owner sold two of the highest circulating newspapers in Turkey to another holding company with strong ties to the government. Tax authorities promptly agreed to restructure the fine (Esen and Gumuscu, 2016).

In the backdrop of these developments and concurrently with the rest of the developing world,

of parliament for the main opposition party and subsequently sentenced to 25 years in prison for his journalism.

[12]Durante and Knight (2012) report a similar shift in Italy after Berlusconi's election in 2001, as voters changed their TV consumption habits in response to changes in outlets' coverage of news.

[13]Gehlbach (2010) documents that Putin adopted a similar strategy in Russia, consolidating control over the "commanding heights" of the media industry instead of trying to control all media.

internet penetration was rising in Turkey. Household surveys show that internet access went from about 30% in 2009 to about 50% in 2013 to just under 90% in 2019 (TurkStat, 2019). In terms of our model, the prior expectation of connectedness in Turkey was not high enough to induce complete capture before 2013. Under partial capture, people who consumed alternative media had a chance to take the news of widespread Gezi protests—and the ensuing violent police crackdown—to social media, and try to convince those who followed mainstream media to switch. Citizens flocked to social media to draw attention to what was happening in Taksim and elsewhere (Chrona and Bee, 2017). During the first three days of the protests, Twitter saw 10 million tweets that included the protest hashtags such as `#occupygezi` and `#direngeziparki` (Barbera, Metzger, and Tucker, 2013). Most of these tweets came from inside the country, with about half from Istanbul.

From hiring online commentators to spread pro-government messages to blocking access to social media platforms, the government took many steps to stem citizens' ability to inform one another via social media (Esen and Gumuscu, 2016). Soon after Erdoğan called Twitter a "menace to society," pro-government media outlets started targeting public figures for tweeting in support of the protests. More directly related to our model was the government's escalation of media capture. Halk TV was fined for "harming the physical, moral and mental development of children and young people" by broadcasting coverage of the Gezi Park protests (Hürriyet Daily News, 2013). Journalists were assaulted, jailed, and fired from their outlets after government henchmen—and sometimes Erdoğan himself—called their owners to complain about a piece they wrote (Hürriyet Daily News, 2014). 143 journalists lost their jobs in 2013 alone, followed by 339 more in 2014.

For a brief period in 2013, social media provided voters in Turkey with an opportunity to share the verifiable signal of Erdoğan's intolerance for opposition behind the veneer of democracy he presented until then. Many shared the news and were punished for it, implying that the expectation of connectedness was greater than the cost of sharing. However, Erdoğan managed to cling on to his job: He defied the protesters' wishes for his resignation and managed to win

2014's presidential election. In terms of our model, this means that although the informed voters persuaded some uninformed voters, they failed to persuade a sufficiently large group to switch to an informative outlet. Having survived this period, Erdoğan subsequently switched from a partial capture to a complete capture strategy by extending his reach to these previously informative outlets.

Similarly, the Tunisian media was under partial capture until the Arab Spring by the then incumbent President Ben Ali. In line with our model, during the Arab Spring social media users in Tunisia helped share news from outlets with comparatively smaller reach, resulting in Ben Ali's ouster. Afterwards, Tunisia gradually improved the state of its democracy as well as its press freedom scores, moving from the partial capture equilibrium of our model to no capture. Over the years, this improvement was reflected in a series of important landmarks including (i) a Nobel peace prize awarded to the Tunisian National Dialogue Quartet in 2015, (ii) Tunisia's support of the Information and Democracy Initiative in 2018, and (iii) the creation of the Press Council of Tunisia in 2020. We next discuss these developments in greater detail.

On 18 December 2010, the Arab Spring was sparked in Tunisia by the first protests that occurred in response to Mohamed Bouazizi's self-immolation in protest of police corruption and ill treatment. The demonstrations quickly spread to other Arab countries and soon ended the 23 year reign of president Ben Ali. It has been widely argued that social media had a significant effect on the Arab Spring, enabling the public to circumvent state-controlled media channels, and facilitating swift spread of information to raise awareness about alleged crimes against humanity (Mellen, 2012). The Ben Ali government tried a range of strategies to suppress the spread of information on social media: They hired censors to block or filter social media sites, and tried to hack into Facebook and steal user passwords. Such efforts, however, had little success. Web-savvy Tunisians employed a range of strategies to bypass government restrictions and the sheer volume of sharing by protesters on the internet made it virtually impossible for the Ben Ali regime to suppress information short of shutting down the internet (Schraeder and Redissi, 2011).[14] Ac-

[14]The use of social media platforms more than doubled in almost all Arab countries during the protests. As of

tivists also interacted with international media and news organizations, such as Al Jazeera or BBC News Arabic (Bossio, 2014). Since the domestic media was regarded as biased, such international broadcasters that are harder for the incumbent to capture became the trusted sources of news (Hänska-Ahy and Shapour, 2013). Howard et al. (2011) emphasizes the importance of satellite TV coverage during the Arab Spring and notes that Al Jazeera TV enjoyed the highest profile and the most influence regionally as a key information broker, partially due to its innovative new-media team that converted its traditional news product for use on social-media sites. Schraeder and Redissi (2011) note that Al Jazeera was the first international news outlet to run the story of the initial protests in Sidi Bouzid. Hence, in relation to our model, the Tunisian experience shows that sometimes international media can also take the role of the "alternative outlet."

Since the Arab Spring, the political life in Tunisia has been transitioning, though slowly, towards constitutional democratic governance, marking Tunisia as the success story of the Arab Spring.[15] A 2011 decree by the Ministry of the Interior banned the "political police." In the same year, the Ennahda Movement, formerly banned under the Ben Ali regime, came out of the election as the largest party, and former dissident and veteran human rights activist Moncef Marzouki was elected president. The post-revolution government in Tunisia institutionalized several changes that enabled the emergence of a pluralism of opinion in the media. A number of new newspapers and reviews published since the beginning of the revolution were granted authorization in 2011. Since then, foundations have been laid for the Tunisian media's transformation into professional, free, autonomous and impartial entities. In 2018, Tunisia, along with 11 other states at the Paris Peace Forum, undertook the Information and Democracy Initiative, promoting democratic

April 2011, the number of Facebook users in the Arab world had surpassed 27.7 million. Facebook, Twitter, and other major social media played a particularly key role in throughout the region (Clarke and Kocak, 2020; Stepanova, 2011). In a survey of Facebook users in Tunisia, 87% of respondents said that they used Facebook to organize protests and to spread awareness (Mourtada and Salem, 2011).

[15]While this paper was being revised for publication, on July 25, 2021 Tunisian president Kais Saied declared a state of emergency and suspended the parliament for 30 days.

principles and freedom of information in the online public arena. Most recently, September 2020 marked the creation of the Press Council of Tunisia, the first independent press council in the MENA region.

The effect of such developments is also visible in the significant increase in Tunisia's international press freedom scores. According to Reporters Without Borders, Tunisia's press freedom ranking improved dramatically between 2011 and 2020 from 164 to 72, making it the country with the most free press in the MENA region. Similarly, in Freedom House's press freedom ranking Tunisia went from 185 to 115 between 2011 and 2017.

When comparing the Turkish and the Tunisian experiences, our model points to two important parameters. The first is connectedness. Although internet penetration was higher in Turkey in 2013 than in 2011's Tunisia, we argue that connectedness was lower in Turkey, because social trust was lower and political polarization higher. Thus, despite both countries being under a partial capture regime and informed voters in both countries choosing to share news on social media, the opposition in Tunisia had much better success in persuading others and eventually replacing the incumbent. In support of this claim, Angrist (2013) notes that in Tunisia's case, masses of citizens from diverse socioeconomic classes and political divisions were able to cooperate in sustaining physical protests across most of the state's territory for a significant period of time.[16] Perhaps more importantly, the secularists, the Islamists, and the widely respected Tunisian labor federation worked in collaboration to support the opposition. Even the Tunisian army and the members of Tunisia's long ruling hegemonic political party refused to stand with Ben Ali. In contrast, many Turks continued believing that Gezi Protests were a foreign conspiracy intended to weaken Turkey, a propaganda message that was widely circulated in mainstream media (Yilmaz and Shipoli, 2021). As a result, voters in Turkey remained bitterly divided: A survey of Turkish citizens in the spring of 2014, only a few months after the Gezi Protests, found that Erdoğan had a job approval of 59%. He won 2014's presidential election with 52% of the vote.

[16]Protesters included high school and university students and other youth under the age of 30, women, members of Tunisia's biggest labor union, lawyers, business owners, urbanites as well as rural dwellers.

The second important dimension of comparison that helps explain the divergent paths of the two countries is rents from office relative to the costs of capture. In 2013, Turkish GDP was around 21 times that of Tunisia (957.8 to 46.25 billion USD) and Turkish government spending was around 16 times (134.27 to 8.63 billion USD), implying that rents from office were likely higher in Turkey. Furthermore, the prevalence of international media outlets in Tunisia that broadcast in Arabic, such as Al Jazeera and BBC News Arabic, likely made complete capture prohibitively expensive in Tunisia. In contrast, there were no international traditional media outlets that broadcast or print in Turkish, and most Turkish voters did not consume news media in other languages, making complete capture easier in comparison. Overall, with increased internet penetration the incumbent's equilibrium strategy switched to complete capture in Turkey, and to no capture in Tunisia.

Conclusion

The recent proliferation of social media altered the way people across the world receive and share news. People increasingly go online to follow news and organize. Governments have caught up with this trend and are trying to find ways of discouraging the public from sharing news on social media. Autocrats censor websites, arrest social media users for critical posts, imprison bloggers, spread fake news, and hire pro-government commentators to manipulate online discussions. As such, while information technologies continue to spread across the globe, the rise in connectedness lags behind.

Previous research has focused on these trends to explain the internet's failure to bring about a new wave of democratization. In this paper, we focus on incumbents' efforts to expand control over traditional media as a direct result of the internet. Our model reiterates that press freedom is a significant tool for political accountability; and suggests that social media may serve as a complement to traditional media. However, contrary to earlier accounts, we find that press freedom and political accountability do not necessarily improve as a result of increased access to

the internet. Governments whose survival depends on their control of information find means to counteract its potential. Indeed, despite initial optimism about the wave of democratization social media might bring, many autocratic regimes thrived after the advent of the internet.

In this paper, we propose a model of political agency where a subset of voters who follow independent media outlets can spread verifiable information via social media to others. Some consumers who learn their outlet is captured switch to an independent media outlet and become informed. This results in revenue loss for captured media and revenue gain for independent media. Thus, the prevalence of social media increases both the compensation the incumbent must provide for capture, and the risk independent media pose to the incumbent. If the costs of capture are high relative to office rents, the cost effect dominates, and greater internet access leads to more press freedom. Otherwise, the increased risk induces the incumbent to extend capture to outlets he previously ignored, and greater internet access leads to less press freedom. Our model thus provides a mechanism that explains the divergence in press freedom outcomes over the last two decades as internet penetration rose rapidly across the world.

Our goal with this model is to present this divergence in a simple way. There are a number of directions in which our model could be extended. For example, one could consider a fully dynamic model where in every period voters receive signals from social media on how informative their outlet is, and decide whether to switch accordingly. In such a model, both the incumbent and the media outlets can update their beliefs about connectedness over time, which may give rise to interesting dynamics. Another possible extension regards the complementarity between social media and traditional media. This currently appears in a stylized fashion: a news story that originates with traditional media is then spread on social media to a broader audience. In real life, there is a richer complementarity: Content that is generated in social media is frequently picked up by traditional media, whose reputation allows it to spread further. This could be captured in an extension as follows. Instead of media outlets observing the type of the incumbent with certainty as they do in the baseline model, this could be modeled a stochastic process: as more citizens are connected, the probability that a citizen produces evidence of incumbent's type is

higher. We conjecture that this would reinforce the mechanisms that are at play in the current model.

Two simplifying assumptions we make in our model are that the media environment and connectedness are both exogenous. Of course, more realistic would be to allow the incumbent to choose what measure of the media market to capture. Further research may focus on endogenizing the media environment and the ownership structures within. Another possible future extension is allowing the incumbent to manipulate θ by taking a costly action to interfere with connectedness by blocking or censoring websites, or hiring pro-government commentators that spread misinformation and fake news online. In our model, we take such actions by the incumbent as exogenous and subsumed under the error term ψ. Explicitly modeling the incumbent's manipulation of connectedness is a promising avenue for future research.

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Appendix A Social Media Game

In this section, we model the interaction between informed voters as a coordination game and show that the results are essentially the same as the simplified model presented in the main text. Suppose there are complementarities in the sharing decision of informed voters: that the costs associated with sharing the bad signal about the incumbent is given by the expression $c(1-\nu)$. In other words, the costs of sharing are decreasing in the ratio of IV who share the news. Substantively, this is because even though the regime can plausibly scale up monitoring citizens' social media activity easily, it still faces constraints in how many social media users it can arrest or imprison in a given period, and so the probability that any given user is singled out for punishment falls as more people take an action.

As in the main text, we take connectedness to be of the form $\theta = \mu + \psi$, where μ is interpreted as the level of internet penetration. The error term, drawn from a normal distribution with mean zero and precision α (*i.e.* variance $1/\alpha$), is the uncertainty regarding social factors that influence information flows through the social network. Here, to capture the different online experiences individuals have depending on their social networks, we assume that each IV i receives a private signal regarding the level of connectedness. This can be interpreted as the volume and content of activity they observe on their social media feeds and the inferences they make from them about overall connectedness in the society. This signal is of the form $x_i = \theta + \epsilon_i$, where ϵ_i is a random draw from a normal distribution with mean zero and precision β. Conditional on θ, the signals are independent and identically distributed across voters, and μ, α, and β are all common knowledge. We assume that the incumbent and the media outlets rely on the common prior when they make decisions.[17]

Consider an informed voter $i \in V_A$ who has learned via the alternative outlet that the incumbent is bad. Given the prior distribution of connectedness, the distribution of private signals,

[17] This assumption is sufficient to avoid the multiplicity of equilibria that would arise because of the informativeness of equilibrium strategies of the incumbent and media outlets if they had information that voters do not. See Angeletos, Hellwig, and Pavan (2006) for a discussion on signaling in global games.

and the signal x_i informed voter i has received, her posterior belief is such that θ is distributed normally with mean: $\rho_i = \mathbb{E}[\theta|x_i] = \frac{\alpha\mu+\beta x_i}{\alpha+\beta}$ and precision $\alpha + \beta$ (DeGroot, 2005).

The informed voters' decision on whether to share the news or not depends on the relative payoffs of the two. Within the social media game, the expected utility gain of sharing for an IV is $\text{EU}_i(\text{share}|x_i) - \text{EU}_i(\text{refrain}|x_i) = \rho_i - c(1 - \nu)$.

There are three intervals in which we examine the best response of an informed voter:

- When $\rho_i < 0$, the expected utility of sharing is negative regardless of the actions of the other IV. Thus, refraining is a strictly dominant strategy.

- When $\rho_i \in [0, c]$, neither strategy is strictly dominant. The optimal strategy depends on players' beliefs on the value of connectedness and other players' strategies.

- When $\rho_i > c$, the expected benefit of sharing is always greater than its cost regardless of what the other IV do. Thus, sharing is a strictly dominant strategy.

A pure strategy for an IV in the social media game is a function specifying an action for each possible posterior, that is to say, $s_i(\rho_i) \in \{\text{share},\ \text{refrain}\}$ for all ρ_i. Because the benefit of sharing is monotonic in the posterior on connectedness, threshold strategies are natural candidates for an equilibrium. Here, if an IV shares the news at posterior expectation $\hat{\rho}$, she should share it at any $\rho \geq \hat{\rho}$. As shown below, in equilibrium each informed voter shares when their posterior expectation of connectedness is higher than some threshold ρ^* and refrains when it is lower.

Because the preferences of informed voters are identical, when they use a threshold strategy their thresholds must be equal. We show this is indeed the case, and that such a strategy profile is the only profile that survives iterated elimination of strictly dominated strategies. Consider an IV whose posterior expectation is exactly equal to ρ^*, the threshold. This means that she must be indifferent between sharing and refraining. This holds only when the expected benefit of sharing equals its expected cost, and so $\rho_i = c(1 - \nu)$. To find the threshold, we must first calculate the expected value of ν in equilibrium: the expected proportion of IV who share the news on social media conditional on the posterior expectation ρ^*.

Lemma A.1. *An IV i with posterior ρ_i believes that a fraction $1 - \Phi\left(\sqrt{\eta}(\rho_i - \mu)\right)$ of other IVs share the news on social media in equilibrium, where Φ denotes the cumulative distribution function of the standard normal distribution and $\eta = \frac{\alpha^2(\alpha+\beta)}{\beta(\alpha+2\beta)}$.*

By the above lemma, for an IV whose posterior is equal to the threshold ρ^*, it must be that $\mathbb{E}[\nu] = 1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)$. This means that the equilibrium threshold must satisfy $\rho^* = c\left(1 - \left[1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)\right]\right)$, or equivalently:

$$\rho^* = c\Phi\left(\sqrt{\eta}(\rho^* - \mu)\right). \tag{1}$$

Note that both sides of the above equation are increasing in ρ^*. For there to be a unique threshold where the IV choose to share if and only if their posterior is greater, the two sides of the above equation must cross exactly once. The slope of the left-hand side is one. The slope of the cumulative distribution function of the standard normal distribution is maximized when the probability distribution function is evaluated at its mean, at $\frac{1}{\sqrt{2\pi}}$. Thus, the slope of the right-hand side is at most $\frac{c\sqrt{\eta}}{\sqrt{2\pi}}$. We henceforth assume this is less than one, a sufficient condition for the uniqueness of ρ^*.

Proposition A.1. *When $\frac{c\sqrt{\eta}}{\sqrt{2\pi}} < 1$, there is a unique equilibrium of the social media game. In this equilibrium, every IV shares the information on social media if and only if their posterior is greater than the threshold ρ^* that solves the indifference condition in Equation (1).*

In the unique equilibrium of the social media game, every IV whose posterior is greater than ρ^* share the news on social media, and every IV whose posterior is below refrain from sharing. It is clear from Equation (1) that ρ^* is increasing in c, meaning that greater the costs associated with sharing anti-government news on social media, fewer informed voters do so. This is not very surprising. The more important observation from Equation (1) for our purposes is that ρ^* is decreasing in μ. This means that a larger fraction of informed voters share the news on social media as internet penetration goes up, holding everything else constant. Thus, in addition to the first-order effect of increasing the value of sharing for each informed voter, higher connectedness

has a positive second-order effect on sharing due to strategic complementarity (Granovetter, 1978; Jackson and Yariv, 2007).

Since θ is distributed normally with mean μ and precision α, we can write this as:

$$p(\mu) = 1 - \Phi\left(\left(f^{-1}\left(\frac{\zeta - \sigma_A}{1 - \sigma_A}\right) - \mu\right)\alpha\right). \tag{2}$$

Because both $p(\mu)$ and $q(\mu) \equiv \mathbb{E}[f(v(\theta), \theta)|\mu]$ are increasing in μ, the rest of the analysis in the main text follows.

Appendix B Formal Statement of the Equilibrium

Before we present the formal proposition summarized in the analysis section, we first define the following to simplify the notation. Let us denote by $r_{pn}(\mu)$ the critical value of r at which the incumbent is indifferent between partial capture, and no capture given μ. Formally:

$$r_{pn}(\mu) = \frac{\sigma_A q(\mu)}{1 - p(\mu)} \tag{3}$$

Further denote by $r_{cp}(\mu)$ the critical value of r at which the incumbent is indifferent between complete capture and partial capture. Formally:

$$r_{cp}(\mu) = \frac{\sigma_M q(\mu)}{p(\mu)} \tag{4}$$

Finally, denote by $r_{cn}(\mu)$ the critical value of r at which the incumbent is indifferent between complete capture and no capture:

$$r_{cn}(\mu) = q(\mu). \tag{5}$$

Note that $r_{pn}(\mu) > r_{cp}(\mu)$ if and only if the probability of overturn is large, in particular $p(\mu) > \sigma_M$. When this is the case for all μ, partial capture is never optimal for the incumbent. Throughout, we assume that $p(\mu) < \sigma_M$ for some μ so that all three strategies are optimal for

some values of connectedness.

With that, we are ready to formally state the main proposition of the paper.

Proposition B.1. *The following constitutes an equilibrium:*

a) Beliefs of Voters:

The audience of M believe:

$$\Pr(\textit{incumbent is good}|s_M) = \begin{cases} 0 & \textit{if } s_M = b \\ \hat{\gamma}_M & \textit{if } s_M = \varnothing \end{cases}$$

where

$$\hat{\gamma}_M = \begin{cases} \gamma & \textit{if } r \geq \max\{r_{pn}(\mu), r_{cp}(\mu)\} \\ \frac{\gamma}{\gamma+(1-\gamma)(1-\mathbb{E}[q(v,\theta)|\rho])} & \textit{if } r_{cp}(\mu) > r \geq r_{pn}(\mu) \\ 1 & \textit{if } r < r_{pn}(\mu), \end{cases}$$

and the audience of A believe:

$$\Pr(\textit{incumbent is good}|s_A) = \begin{cases} 0 & \textit{if } s_A = b \\ \hat{\gamma}_A & \textit{if } s_A = \varnothing \end{cases}$$

where

$$\hat{\gamma}_A = \begin{cases} \gamma & \textit{if } r \geq \max\{r_{pn}(\mu), r_{cp}(\mu)\} \\ 1 & \textit{if } r < \max\{r_{pn}(\mu), r_{cp}(\mu)\}. \end{cases}$$

b) Strategies of Informed Voters:

When $\frac{c\sqrt{\eta}}{\sqrt{2\pi}} < 1$*, each informed voter i shares if* $\rho_i > \rho^*$*, and refrains otherwise, where* ρ^* *is the unique solution to:*

$$\rho^* = c\Phi\left(\sqrt{\eta}(\rho^* - \mu)\right).$$

c) Strategies of Voters:

Voter i votes for the challenger if and only if she observes the signal the incumbent is bad. Otherwise she voters for the incumbent.

d) Strategies of the Incumbent:

Incumbent offers:

$$(t_M, t_A) = \begin{cases} t_M = \sigma_A q(\mu) \text{ and } t_A = \sigma_M q(\mu) & \text{if } r \geq \max\{r_{cn}(\mu), r_{cp}(\mu)\} \\ t_M = \sigma_M q(\mu) \text{ and } t_A = 0 & \text{if } r_{cp}(\mu) > r \geq r_{pn}(\mu) \\ t_M = 0 \text{ and } t_A = 0 & \text{if } r < r_{pn}(\mu). \end{cases}$$

e) Strategies of Media Outlets:

Outlet k accepts offer t_k if $t_k \geq \sigma_{-k} q(\mu)$ and $-k$ suppresses, or if $t_k \geq \sigma_k q(\mu)$ and $-k$ publishes. Otherwise it rejects.

Appendix C Proofs

Proof of Lemma A.1. Note that the proportion of IV who share is equal to the probability that any individual shares. Since each IV uses ρ^* as the cutoff rule, the probability that any one of them shares is equal to the probability that she has a posterior greater than ρ^*.

Recall that voter i believes that θ is distributed normally with mean ρ_i and precision $\alpha + \beta$. Symmetrically, voter j has posterior:

$$\rho_j = \frac{\alpha\mu + \beta x_j}{\alpha + \beta}$$

where $x_j = \theta + \epsilon_j$. Voter i's expectation of x_j is then normally distributed with mean ρ_i, and variance $\frac{1}{\alpha+\beta} + \frac{1}{\beta}$. Hence we write:

$$\rho_j > \rho_i \iff \frac{\alpha\mu + \beta x_j}{\alpha + \beta} > \rho_i \iff x_j > \rho_i + \frac{\alpha}{\beta}(\rho_i - \mu)$$

Voter i believes that voter j has a posterior expectation ρ_j greater than ρ_i with probability:

$$1 - \Phi\left(\sqrt{\frac{\beta(\alpha+\beta)}{\alpha+2\beta}}\left(\rho_i + \frac{\alpha}{\beta}(\rho_i - \mu) - \rho_i\right)\right) = 1 - \Phi\left(\frac{\alpha}{\beta}\sqrt{\frac{\beta(\alpha+\beta)}{\alpha+2\beta}}(\rho_i - \mu)\right)$$

where Φ denotes the cumulative distribution function of the standard normal distribution. Defining $\eta = \frac{\alpha^2(\alpha+\beta)}{\beta(\alpha+2\beta)}$ we can rewrite the expression above as:

$$1 - \Phi\left(\sqrt{\eta}(\rho_i - \mu)\right)$$

□

Proof of Proposition A.1. Denote by $u(\rho, \hat{\rho})$ the expected utility of an informed voter with the posterior expectation ρ of sharing when all other informed voters use the cutoff $\hat{\rho}$. The expected proportion of informed voters who refrain is equal to:

$$\Phi\left(\sqrt{\eta}\left(\hat{\rho} + \frac{\alpha}{\beta}(\hat{\rho} - \mu) - \rho\right)\right) = \Phi\left(\sqrt{\frac{\alpha(\alpha+\beta)}{(\alpha+2\beta)}}\left(\hat{\rho} - \mu + \frac{\beta}{\alpha}(\hat{\rho} - \rho)\right)\right)$$

Hence:

$$u(\rho, \hat{\rho}) = \rho - c\Phi\left(\sqrt{\frac{\alpha(\alpha+\beta)}{(\alpha+2\beta)}}\left(\hat{\rho} - \mu + \frac{\beta}{\alpha}(\hat{\rho} - \rho)\right)\right)$$

When $\theta \leq 0$, sharing is weakly dominated. Let $\rho_1 = 0$. Then, any IV with $\rho \leq \rho_1$ refrains since $u(\rho_1, \rho_1) = c\Phi\left(\sqrt{\frac{\alpha(\alpha+\beta)}{(\alpha+2\beta)}}(\rho_1 - \mu)\right) < 0$. This gives us the first round of elimination of dominated strategies for low values of ρ. But notice that if everyone who has posteriors lower than ρ_1 refrain, sharing can never be optimal for an IV whose posterior is lower than ρ_2, where ρ_2 solves $u(\rho_2, \rho_1) = 0$.

The above equality implies that ρ_2 is the best response threshold strategy to ρ_1. Since u is increasing in its first argument and decreasing in the second, and $u(\rho_1, \rho_1) < 0$, it must be that $\rho_2 > \rho_1$. This and the fact that payoffs are symmetric means that the proportion of IV who refrain

is higher than that implied by the cutoff strategy at ρ_1. The expected utility of sharing decreases in the expected proportion of IV who refrain, hence for any value $\rho < \rho_2$, sharing is dominated. This gives us the second round of elimination of dominated strategies for low values of ρ. By iterating, we have a sequence:

$$\rho_1 \leq \rho_2 \leq \ldots \leq \rho_k \leq \ldots$$

where sharing is eliminated for values of posterior $\rho < \rho_k$ in period k of iterated elimination of dominated strategies. The lowest posterior ρ_m which solves $u(\rho_m, \rho_m) = 0$ is the least upper bound of this sequence.

A symmetric argument for high values of ρ establishes a similar sequence:

$$\rho^1 \geq \rho^2 \geq \ldots \geq \rho^k \geq \ldots$$

where refraining is eliminated for values of posterior $\rho > \rho_k$ in period k of iterated elimination of dominated strategies. The largest posterior ρ^m which solves $u(\rho^m, \rho^m) = 0$ is the greatest lower bound of this sequence.

Finally, our assumption $\eta \leq \frac{2\pi}{c^2}$ ensures that there is a unique value of ρ such that $u(\rho, \rho) = 0$, and therefore $\rho_m = \rho^m$. The discussion in the paper following Lemma 1 shows that this unique cutoff must satisfy $\rho^* = c\Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)$, which concludes our proof. □

Proof of Lemma 1. The first strategy ($t_M = \sigma_M q(\mu)$ and $t_A = \sigma_A q(\mu)$) leads to the capture of both outlets. This is because when one outlet suppresses the news, the other chooses between publishing and taking some audience share from its competitor and repressing and receiving transfers from the incumbent. The incumbent's offers in this strategy exactly correspond to the expected increase in audience related revenues if an outlet were to publish while its competitor suppresses. Because we assumed that when indifferent outlets accept the offer from the incumbent, here both outlets accept their offers and suppress the news. More precisely, if A suppresses but M were to

deviate and publish, its audience would grow by $\sigma_M q(\mu)$. The incumbent must transfer an equal amount in equilibrium in order to capture M. Symmetrically, if A deviates and publishes while M suppresses, A's audience would grow by fraction $q(\mu)$ of its audience, and the incumbent must transfer an equal amount to A to capture it as well. Note that any larger offer is dominated by $\{\sigma_M q(\mu), \sigma_A q(\mu)\}$, as they are also accepted but more expensive.

The second strategy ($t_M = \sigma_A q(\mu)$ and $t_A = 0$) leads to M's capture, but since $t_A = 0$, A rejects the offer and publish the bad signal. In this case the mainstream outlet loses some fraction of its audience to the alternative outlet, and the incumbent must compensate M for the lost audience share, which is equal to $\sigma_A q(\mu)$. Note that these offers lead to the same outcome as any other offer that A rejects, but we focus on this one for ease of notation.

In the third strategy ($t_M = 0$ and $t_A = 0$) the expected payoff of publishing is normalized to zero for both outlets; this is when both publish and keep their respective audiences. This is strictly greater than the payoff of accepting the incumbent's offer of zero and losing some audience to the other outlet. Again, this is in effect the same as any offer that is rejected by both outlets, but for ease of exposition we suppose that the incumbent offers zero whenever he does not intend to capture an outlet.

Note that the strategy $t_M = 0$, $t_A = \sigma_M q(\mu)$ is dominated by $t_M = 0$, $t_A = 0$. When only A is captured the audience of M still learn the incumbent's type, and their votes are enough to overturn the incumbent. □

Proof of Lemma 2. Since the voters can base their votes only on the information they have, and we have that $\sigma_M > \sigma_A$, the strategy of V_M are decisive on the outcome of the election. Hence, whenever the mainstream outlet is not captured and publishes the bad signal about the incumbent, the incumbent is overturned with certainty. In this case the expected utility of the incumbent is zero.

If the incumbent chooses to capture both outlets by offering $t_M = \sigma_M q(\mu)$ and $t_A = \sigma_A q(\mu)$, then there is complete capture, and the incumbent is reelected for sure. His expected utility in this case is $r - q(\mu)$. Finally, if only the mainstream outlet is captured, the incumbent is reelected

with probability $1 - p(\mu)$, and therefore his expected utility is equal to $r(1 - p(\mu)) - \sigma_A q(\mu)$. □

Proof of Proposition B.1. **a)** Any voter who observes the bad signal believes that the incumbent is good with probability zero because bad signals are verifiable. A voter who observes the null signal believes that the incumbent is good with probability one if the outlet she follows is never captured in equilibrium, with probability γ if her outlet is always captured in equilibrium and she has no chance of being informed via social media, or with some intermediate probability if her outlet is captured in equilibrium but there is a positive probability that she is informed via social media. In any case, her posterior belief that the incumbent is good is at least as high as her belief that the challenger is good when she observes no signal.

b) Follows from Proposition A.1.

c) We assume that voters use undominated pure strategies. If a voter observes $s = b$ and therefore deduces that the incumbent is good with probability zero, then the expected payoff of reelection is also zero, whereas the expected utility when a new challenger wins the election is γ. Therefore a voter who observes $s = b$ strictly prefers the challenger and votes against the incumbent.

If a voter observes $s_k = \varnothing$ for $k \in \{M, A\}$, she believes that the incumbent is good with probability $\hat{\gamma}_k \geq \gamma$. If $\hat{\gamma}_k$ is strictly greater than γ, then the expected utility of voting for the incumbent is also $\hat{\gamma}_k > \gamma$, and the voter votes for the incumbent.

To see why a voter who observes $s_k = \varnothing$ votes for the incumbent when $\hat{\gamma}_k = \gamma$, assume for a contradiction that she votes against. Then the bad incumbent has no incentive to pay a transfer to media outlet k, because the audience of k vote against the incumbent even when the signal $s_k = \varnothing$. Therefore the incumbent offers $t_k = 0$ and the outlet k publishes the bad signal whenever the incumbent is bad. But then, outlet k is never captured in equilibrium, and it must be that $\hat{\gamma}_k = 1$, a contradiction.

It follows that all voters vote for the incumbent if and only if their posteriors of the incumbent are at least as high as their priors on the challenger, γ. Then, every voter who observes the signal

that the incumbent is bad votes for the challenger and every voter who does not observe any signal votes for the incumbent.

d) Recall that the incumbent must choose from one of the three strategies in Lemma 1.

When rents are sufficiently high so that $r \geq \max\{r_{cp}, r_{cn}\}$, the incumbent's expected utility is maximized when there is complete capture. If rents are in an intermediate range, namely $r_{cp}(\mu) > r > r_{pn}(\mu)$, then the incumbent's expected utility is maximized when only M is captured. This happens when the probability of overturning the incumbent via the social media game is sufficiently small and rents are not high enough to justify capturing both outlets. On the other hand, when $r < r_{pn}$, the incumbent's optimal strategy is to capture neither outlet because the rents from office are not high enough to cover the expenses of capture.

e) If $-k$ publishes, k receives zero if it publishes, and $t_k - \sigma_{-k}q(\mu)$ if it suppresses. Therefore, k accepts any offer $t_k \geq \sigma_{-k}q(\mu)$ whenever $-k$ publishes, and rejects any offer below.

If $-k$ suppresses, k receives $\sigma_k q(\mu)$ if it publishes, and t_k if it suppresses. Therefore, k accepts any offer $t_k \geq \sigma_k q(\mu)$ whenever $-k$ suppresses, and rejects any offer below. □

Proof of Proposition 1. Suppose $p(\mu) < \sigma_M$ so that partial capture is optimal for some μ. Recall Condition 1: $\frac{d\frac{p(\mu)}{q(\mu)}}{d\mu} > 0$. When this is true, it follows from Equation 4 that $\frac{\partial r_{cp}(\mu)}{\partial \mu} < 0$. Thus, the level of office $r_{cp}(\mu)$ that leaves the incumbent indifferent between complete and partial capture is decreasing in internet penetration. This means that for some levels of office rent, increased internet penetration causes incumbents to switch from partial capture to complete capture.

Note also from Equation 3 that $\frac{\partial r_{pn}(\mu)}{\partial \mu} > 0$. Thus, the level of office $r_{cp}(\mu)$ that leaves the incumbent indifferent between partial and no capture is increasing in internet penetration. Thus, for some levels of office rent, as internet penetration goes up incumbents switch from partial capture to no capture.

It follows that for a fixed value of office rents r, an increase in μ can change the incumbent's optimal strategy from partial capture to complete capture, leading to less press freedom; or from

partial capture to no capture, leading to more press freedom.

More press freedom allows voters to recognize bad incumbents and overturn them more often. The voter's expected payoff is 2γ under complete capture, $2\gamma + p(\mu)\gamma(1-\gamma)$ under partial capture, and $2\gamma + \gamma(1-\gamma)$ under no capture. Thus, voter welfare is higher, more press freedom there is. □

Appendix D Empirics

In this section we describe our data and empirical specifications. Our primary dependent variable is the Freedom of the Press index by Freedom House (`freedomhouse.org`) between 2000 and 2015. Each year every country is given a score from 0 (best) to 100 (worst) according to various questions and indicators. We invert this scale so that higher values correspond to more press freedom. After our inversion, countries that have scores between 70 and 100 are regarded to have "Free" press; 40 to 69, "Partly Free" press; and 0 to 39, "Not Free" press. We believe that the Freedom of the Press index is a good measure for this analysis because the scores are based on a range of factors, including indirect forms of repression. Figure 5 shows the cross-country distribution of this score through our period of study. The median Freedom of the Press score shows remarkable stability around 50 between 2000 and 2015. The largest changes occurred in Thailand and Venezuela, both of which observed dramatic declines in press freedom over this period (48 and 47 points respectively, almost half the entire range of possible scores), followed by Libya and Tunisia whose press freedom scores improved significantly after regime changes during the Arab Spring. The countries that had the minimum variation in their press freedom scores in this period were Belgium, Ireland, and Sweden.

As our main independent variable, we use the the internet penetration data provided by International Telecommunication Union (ITU) (`itu.int`). ITU aggregates data collected by national telecommunication regulatory authorities or statistical offices. Figure 6 shows that internet use expanded dramatically over our period of study. According to ITU, the median internet pene-

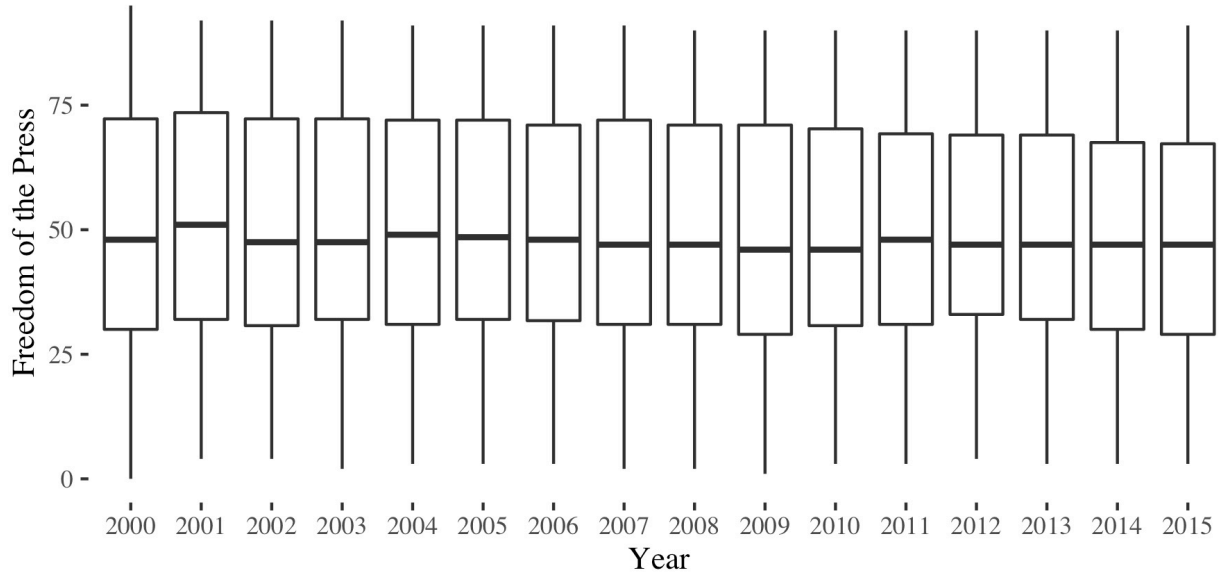

Figure 5: Distribution of Freedom of the Press scores across time. The thick horizontal bars correspond to the median Freedom of the Press score in each year, and the boxes cover from the 25% to 75% percentiles.

tration was barely above 1% in 2000, but increased to 45% in 2015. The country with the highest internet penetration in 2000 was Norway with 52%, which gradually increased to 97% in 2015. In contrast, Eritrea went from 0.1% in 2000 to only 1.1% in 2015. The largest change occurred in Qatar, which went from 5% in 2000 to 93% in 2015. Summary statistics are presented in Table 2.

Our empirical specifications are

$$PressFreedom_{it} = \delta_i + \delta_t + \beta InternetPenetration_{it} + X'_{it}\gamma + \varepsilon_{it}$$

$$PressFreedom_{it} = \delta_i + PressFreedom_{it-1} + \beta InternetPenetration_{it} + X'_{it}\gamma + \varepsilon_{it}$$

where $PressFreedom_{it}$ is the press freedom score of country i in year t. δ_i and δ_t correspond to country and year fixed effects respectively. $InternetPenetration_{it}$ is our independent variable of interest and is equal to internet penetration in country i in year t. The time varying controls X'_{it} are the number of checks on the executive, logarithm of GDP, and logarithm of population. The number of checks on the executive comes from the Database of Political Institutions by the World Bank

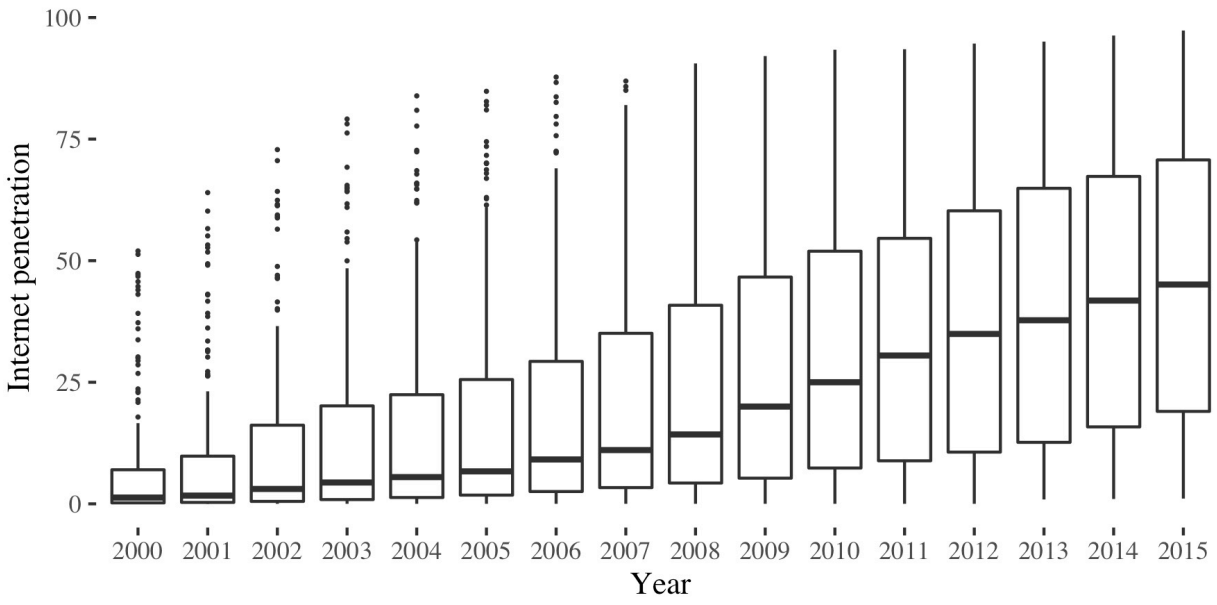

Figure 6: Distribution of internet penetration across time. The thick horizontal bars correspond to the median internet penetration in each year, and the boxes cover from the 25% to 75% percentiles. Dots refer to countries whose internet penetration is more than 1.5 times the interquartile range above the box.

Table 2: Mean, standard deviation, and the quartiles of variables.

	Mean	Std. Dev.	Min	1st	2nd	3rd	Max
Internet penetration	25.43	27.27	0.00	2.66	13.55	43.62	97.33
Freedom of the Press	50.67	23.87	5.00	29.00	53.00	69.00	100.00
Press Freedom Index	31.06	24.23	0.00	12.43	26.53	42.00	142.00
Media self-censorship	0.73	1.33	-3.27	0.00	0.98	1.69	3.28

(Beck et al., 2001), democracy scores from the Polity IV dataset (Marshall, Gurr, and Jaggers, 2016), and GDP per capita and population data from the World Bank (`data.worldbank.org`). All standard errors are clustered at the country level.

As can be seen in Table 3, with country fixed effects there is a statistically significant negative relationship between internet penetration and press freedom scores. This relationship is robust to inclusion of controls, year fixed effects, or a lagged dependent variable.

In Table 4, we run the full specification with controls and country and year fixed effects on the subsamples of countries with different press freedom status in 2000. Column 1 shows that

Table 3: There is a robust negative association between internet penetration and press freedom scores.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Internet penetration	-0.090***	-0.070***	-0.059**	-0.040	-0.027***	-0.022**
	(0.016)	(0.023)	(0.029)	(0.029)	(0.007)	(0.009)
Checks		0.829***		0.858***		0.225***
		(0.310)		(0.311)		(0.083)
ln(GDP per capita)		-0.828		0.637		-0.248
		(0.767)		(1.245)		(0.293)
ln(Population)		-0.879		2.094		-0.331
		(2.702)		(2.678)		(0.943)
Lagged DV					-0.750***	-0.741***
					(0.024)	(0.025)
Num.Obs.	2521	2406	2521	2406	2364	2257
R2	0.067	0.097	0.010	0.035	0.656	0.649
R2 Adj.	0.003	0.031	-0.064	-0.042	0.631	0.622
Country FE	✓	✓	✓	✓	✓	✓
Year FE			✓	✓		
Lagged DV					✓	✓

Standard errors are clustered at the country level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

among the countries that had a "Free" press (i.e. press freedom scores between 70-100) in 2000, internet penetration is associated with more press freedom. In contrast, internet penetration has the opposite sign in countries that had a "Partly Free" press in 2000 (i.e. scores between 40-69). Finally, Column 3 shows that internet penetration is associated with less press freedom in countries that had a "Not Free" press in 2000, but the relationship is not statistically significant at conventional levels.

In the last two columns we split the dataset by countries' Polity scores. Polity scores are a composite indicator that measure where a country in a given year falls on a scale between +10 (strongly democratic) to -10 (strongly autocratic). Due to the potential of reverse causality, we use Polity scores in 2000; the start of our dataset.[18] We split the dataset by countries whose Polity scores are below and above 6. Sub-sample analysis shows that for countries whose Polity scores were above 6 in 2000 the coefficient of internet penetration is positive and statistically significant. The opposite holds for countries whose Polity scores were below 6 in 2000. There, the coefficient of internet penetration is negative and statistically significant.

Out of concerns about Freedom House's methodology (Solis and Waggoner, 2020), in Tables 5 and 6 we repeat our regressions in Table 3 using the Press Freedom Index released annually by Reporters Without Borders (`rsf.org`) (Reporters Without Borders, 2016) and the media self-censorship indicator from the Varieties of Democracy Dataset (Coppedge et al., 2021).[19] Our findings are robust to the use of these alternative indicators.

[18]Because internet penetration was very low in almost all countries in 2000, internet penetration is unlikely to have driven Polity scores in 2000. Our results are unchanged when we use Polity scores in each year instead.

[19]Varieties of Democracy has another indicator on government censorship effort of the media whose definition is closer to media capture as defined in our paper. Unfortunately, the ordering of this indicator is somewhat ambiguous, and as such we elect to use the self-censorship indicator which is similar and whose values are clearly ordinal.

Table 4: Subgroup analysis reveals that the negative relationship between internet penetration and press freedom scores is driven by countries with Partly Free press in 2000, and countries whose Polity scores were less than 6 in 2000.

	Free	Partly Free	Not Free	Polity > 6	Polity ≤ 6
Internet penetration	0.094**	-0.125*	-0.072	0.105**	-0.090***
	(0.044)	(0.074)	(0.051)	(0.052)	(0.034)
Checks	0.661	0.707**	1.197	0.420*	1.294**
	(0.429)	(0.327)	(0.832)	(0.221)	(0.519)
ln(GDP per capita)	0.503	6.724**	-4.611**	2.765	-2.334
	(1.583)	(2.607)	(2.319)	(1.732)	(1.854)
ln(Population)	0.515	-11.921	-1.061	-17.302*	-0.915
	(7.824)	(8.782)	(4.236)	(9.335)	(3.629)
Num.Obs.	826	743	837	1021	1361
R2	0.063	0.109	0.085	0.124	0.076
R2 Adj.	-0.025	0.023	-0.006	0.047	-0.006
Country FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓

Standard errors are clustered at the country level.
* p < 0.1, ** p < 0.05, *** p < 0.01

Appendix E Simulations

For our simulations, we assume that the fraction of uninformed voters who switch to the informative outlet is drawn from the inverse logit function: $q(\mu) = \frac{e^{\mu}}{1+e^{\mu}}$. We set $\sigma_A = 1/4$. Office rents r are drawn from the standard uniform distribution and internet penetration μ across observations come from a beta distribution with shape parameters 1 and 5. We draw 2560 values of μ, corresponding to 160 countries over 16 years. We draw 160 values of r, one for each simulated country.

For Figure 3, to ensure Condition 1 holds for all μ, we assume $\psi \sim \mathcal{N}(0, 1/2)$; and we shift internet penetration so that $\mu \in [-0.8, -0.2]$. That is, we let $\mu \sim B(1,5)(0.6) - 0.8$. To ensure Condition 1 fails for all μ for Figure 4, we assume $\psi \sim \mathcal{N}(0, 2)$, and we let $\mu \sim (B(1,5) - 0.4)(2)$ so that $\mu \in [-0.8, 0.6]$.

Given the parameter σ_A, the distribution of ψ, and randomly drawn values of r and μ, we

Table 5: The negative association between internet penetration and press freedom is also present when Reporters Without Borders' Press Freedom Index is used.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Internet penetration	-0.243***	-0.166***	-0.075	-0.053	-0.155***	-0.127***
	(0.026)	(0.037)	(0.049)	(0.052)	(0.022)	(0.027)
Checks		0.996***		1.056***		0.940***
		(0.340)		(0.373)		(0.242)
ln(GDP per capita)		-2.609*		1.045		-0.481
		(1.558)		(1.779)		(1.051)
ln(Population)		-7.624		1.541		-7.167**
		(5.328)		(5.224)		(3.255)
Lagged DV					-0.369***	-0.352***
					(0.039)	(0.039)
Num.Obs.	1998	1906	1998	1906	1838	1754
R2	0.097	0.125	0.004	0.015	0.222	0.240
R2 Adj.	0.018	0.043	-0.090	-0.084	0.148	0.162
Country FE	✓	✓	✓	✓	✓	✓
Year FE			✓	✓		
Lagged DV					✓	✓

Standard errors are clustered at the country level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6: The negative association between internet penetration and press freedom is also present when the media self-censorship indicator from Varieties of Democracy is used.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Internet penetration	-0.002*	-0.004**	-0.005**	-0.004**	-0.001***	-0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.000)	(0.001)
Checks		0.058***		0.059***		0.011
		(0.020)		(0.021)		(0.007)
ln(GDP per capita)		0.037		0.000		-0.022
		(0.054)		(0.100)		(0.021)
ln(Population)		0.291		0.264		0.059
		(0.188)		(0.220)		(0.070)
Lagged DV					0.797***	0.775***
					(0.024)	(0.030)
Num.Obs.	2522	2407	2522	2407	2366	2259
R2	0.008	0.042	0.016	0.040	0.648	0.620
R2 Adj.	-0.059	-0.027	-0.058	-0.036	0.623	0.590
Country FE	✓	✓	✓	✓	✓	✓
Year FE			✓	✓		
Lagged DV					✓	✓

Standard errors are clustered at the country level.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

calculate the incumbent's optimal strategy for capture. We order observations in increasing press freedom: 0 refers low press freedom or complete capture, 1 is intermediate press freedom or partial capture, and high press freedom/no capture is denoted by 2. We add jitter drawn from a normal distribution with mean zero and standard deviation 0.3 to enhance readability. Our simulated plots have μ on the horizontal axis and press freedom on the vertical axis. We color observations by which tercile of r they fall in: blue for high office rents, yellow for intermediate office rents, and green for low office rents.

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