THE EFFECT OF SOCIAL MEDIA ON PRESS FREEDOM AND GOVERNMENT ACCOUNTABILITY

by

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Abstract

We analyze a political agency model in which the voters can only observe the type of the incumbent through the signals published by the media outlets. The incumbent may offer transfers to media outlets in order for them to suppress the news about him. When not every outlet is captured, the voters who follow the informative outlet may choose to spread the news via social media in a global game setting. We show that this model has a unique equilibrium in which press freedom and voter welfare are in general increasing in social connectedness (which we define as a combination of internet usage rate and social capital). The exceptions arise when an incumbent who would otherwise only capture some media outlets is forced by the risk of news spreading via social media to capture all of them. We then examine a dataset that includes indices of press freedom and corruption for 172 countries to test our hypotheses.

SOSYAL MEDYANIN BASIN ÖZGÜRLÜĞÜ VE HESAP SORULABİLİRLİK ÜZERİNDE ETKİLERİ

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Özet

Bu tezde, seçmenlerin hâlihazırda görevde olan iktidatın tipini ancak basın tarafından yayınlanan sinyaller aracıyla gözlemleyebildiği bir model incelenmektedir. Görevdeki iktidar, basın organlarına kendisi hakkındaki haberleri gizli tutmaları için transferler teklif edebilir. Bu teklifleri kabul etmeyen basın organları varsa, bu organları takip eden ve böylece iktidarın tipinden haberdar olan seçmenler sosyal medyayı kullanarak bu bilgiyi yaymaya çalışabilir. Bu modelin bir tek dengesi olduğunu ve bu dengede basın özgürlüğü ve seçmen refahının (internet kullanımı ve sosyal sermayenin bir kombinasyonu olarak tanımladığımız) sosyal bağlanmışlık ile genellikle doğrudan ilişkili olduğunu gösteriyoruz. İstisnalar, kısmi basın özgürlüğü olan durumlarda iktidarın sosyal medya tehdidinden dolayı basının tamamını susturmaya gerek duymasından kaynaklanıyor. Teorik bulgularımızı daha sonra 172 ülkeden oluşan bir veri kümesi aracılığıyla empirik olarak test ediyoruz.

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1 Introduction

June 2013 in Turkey was marked with violent clashes between the police and protesters who were trying to prevent the demolition of a small park in the heart of Istanbul, known as Gezi Park. Many aspects of the events, such as the socio-economic diversity of the protesters, involvement of the very popular soccer fan clubs, the government's response to the protests, or the amount of violence used by the riot police, were worth mention (and occupied headlines and columns in the international media; e.g. see Arango and Yeginsu, 2013). But, the way the Turkish mainstream media ignored the events took center stage instead. For example, while CNN International was broadcasting the hundreds of thousands of protesters under brutal teargas and water cannon attacks by the police, CNN's Turkish version, CNN Türk, was broadcasting a documentary about penguins. One channel was showing a beauty pageant, yet another a gourmet program about ethnic food. The state of the mainstream media, the TV channels, the newspapers and their websites, was scandalous throughout the first few days of the protests. What brief coverage they did was mostly focused on the vandalism committed by the protesters, with little or no mention of the excessive use of police force (Turgut, 2013). The most accurate and extensive coverage of the events took place in social media,[1] and a few alternative media outlets whose anti-government stances were well established. People utilized social media to alert fellow citizens about the existence of a few small TV stations and newspapers which reported the events more reliably than the mainstream media, channeling people to these sources for information. A good example is Halk TV, a small TV station that belongs to the main opposition party, CHP. During the Gezi protests, a great many references were made in the social media to its live feeds from the protests, and the small channel first became a Trending Topic in the evening of May 31st, 2013, increasing its ratings from a mere 0.453% to 1.308%, an almost threefold increase within a few days. Similarly, the anti-government daily Sözcü, which was the fourth most popular newspaper in Turkey at the time, saw a 21 percent increase in sales during the week following the start of the protests.

A brief exploration of the Turkish media yields why some outlets appear to be free to produce whatever news they wish, whereas most others choose to ignore what seem to be very significant historical events. Like Halk TV, the newspaper Sözcü is universally acknowledged to be extremely anti-government, and very much pro-CHP. Many of its editors moved to Sözcü after they were fired from their previous outlets, allegedly due to government pres-

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[1]According to data by NYU Social Media and Political Participation laboratory, during the first three days of the protests, 10 million tweets had been sent that included the most popular hashtags such as #occupygezi (Fitzpatrick, 2013).

sure. Similarly, a huge portion of Sözcü's audience switched to the anti-government daily after their previous newspapers changed their stances to accomodate the incumbent prime minister Erdoğan's government. Eventually Sözcü became a haven for the disillusioned Kemalists in an increasingly polarized society. It should be no surprise that Sözcü sold an average of 363.057 copies in the last week of June 2013, soon after the protests erupted, a sixfold increase after its initial debut in June 2007 when it only sold an average 61.183 copies on its first week. (Medyatava, 2007) Not only is the audience of Sözcü utterly opposed to Erdoğan and his Justice and Development Party (AKP), its staunch adherence to old Kemalist principles makes it unlikely to ever appeal to the Islamists and the liberals of the country. The following excerpt from the Freedom House's Special Report on Turkey, published in February 2014, summarizes the situation:

> [D]espite being among the country's highest-circulating dailies, Sözcü only reaches the substantial minority already predisposed to its secularist Kemalist views, which would never vote for the AK Party. It is not a government target. (Freedom House, 2014)

This is in contrast to the more mainstream media outlets in Turkey, who used to bear some resemblance of unbiased journalism until very recently. These outlets have a relatively milder tone, and they are much less extreme, regardless of whether they are pro- or anti-government. Among them are the TV channels NTV, Kanal D, ATV, Haber Türk, Show TV and CNN Türk, as well as a number of very popular newspapers:

> There is also a group of newspapers considered "mainstream," meaning that despite their political legacies they can reach an audience beyond the true believers of one ideological group. These papers include Hürriyet (409,000), Milliyet (168,000), Sabah (319,000), and Akşam (103,000). A key aspect of the government's efforts to control the media has been to focus most of its attention and pressure on these "mainstream" outlets. (Freedom House, 2014)

The AKP government chose to accomodate both extreme pro-government and extreme anti-government media outlets, and focused its efforts almost exclusively on the mainstream outlets that reached a much broader audience. How they managed to do that, of course, is another very important question.

Audience related revenues for media outlets are limited in Turkey, and it is understood that often the owners of media outlets are in this business so that they have a means to show

their loyalty to the government in charge, in the hopes that the favor will be returned. 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 others, are run by the prime minister's office. Given that the prime minister has the final say on many lucrative business contracts, it is hardly surprising to see anti-government protests in Turkey make headlines anywhere but Turkey.

> A remark heard frequently during Freedom House's investigations is that many owners of powerful holding companies regard media properties as a burden rather than a privilege—a levy that must be paid to ensure continued access to government contracts. An increasingly common phenomenon is a game of "pass the can," where holding companies bear the cost of running a pro-government media group for a time and then try to transfer ownership to another beneficiary of government favor as quickly as circumstances allow. (Freedom House, 2014)

It should be no surprise that the citizens of Turkey started depending on the internet, in particular the social media, to receive news about their country. This is indeed what happened increasingly, as one report shows that average daily time spent on the internet increased by 50 percent between 2011 and 2013. Meanwhile the time spent on TV and newspaper decreased by 11 percent (eMarketer, 2013). Furthermore, Turkey is a close contender to the top spot in rankings of countries with the highest penetration rate of popular social media websites, most notably Facebook and Twitter.

The recent proliferation of social media slowly but surely alters the way people receive and share news across the globe. A Eurovision study published in February 2013 claims that 43% of young people surveyed find their news via social media instead of search engines (Hahn, 2013). Another report by the Pew Internet Center published in November 2012 found that 30% of the registered voters in the USA had been encouraged to vote for either the Democrat or the Republican candidate in the 2012 presidential elections by family and friends via posts on social media (Rainie, 2012). Moreover, social media has been central throughout the Arab Spring. Evidence shows that protesters across Middle East and North Africa utilized social media to disseminate information regarding the incumbent as well as organizing rallies and demonstrations (Howard et al., 2011).[2]

It appears that politicians have caught up with this trend. In many countries, including Iran, Bahrain, Oman and Belarus social media users have been jailed or arrested for posts

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[2]One example is a video showing Tunis' ex president Zine El Abidine Ben Ali's wife using a government jet to make expensive shopping trips to Europe.

critical of the government. Turkey's prime minister, as a response to the wide-spread use of Twitter during the June 2013 protests, called it a "menace to society" (Freedom House, 2013a). Soon after, a famous Turkish actor, Memet Ali Alabora, was personally targeted by pro-government media outlets for a tweet he sent before the popular spread of the protests. In Vietnam, a law came into effect in September 2013 that makes it illegal to post and share information gathered from press organizations to social media (Greenhouse, 2013). According to the Freedom on the Net report published by the Freedom House in October 2013, 22 of the 60 governments examined in the study found evidence of hired pro-government commentators to manipulate online discussions.

In this paper, we provide a theoretical analysis of the effects of social media on the government's capture of the media industry, and thus, on government accountability and political competition. We construct and analyze a game theoretical model of political competition, the main actors of which are (i) an incumbent politician whose type (*e.g.* corrupt or clean) is unobservable, (ii) mainstream and alternative media outlets (*e.g.* CNN Türk and Halk TV in the above example), and (iii) two groups of voters, each following one of the two types of media outlets.

Our model extends that of a seminal paper by Besley and Prat (2006), a canonical political agency model (a la Barro, 1973 and Ferejohn, 1986) where information about the government is provided endogenously by the media industry. Besley and Prat analyze a Bayesian game where there is an incumbent who is either bad or good, whose type may be observed by the media, but cannot be observed by the voters directly. A bad incumbent in this setting chooses whether to make transfers to media outlets in return of them suppressing information about their type. At the final stage of the game, voters observe the (possibly biased) media news and after updating their beliefs regarding the politican's type, choose to vote for the incumbent or a challenger of unknown type. The tractability of this model, as well as the consistency of its predictions with empirical data (see Prat and Stromberg, 2011) made it very popular.[3]

We extend Besley and Prat (2006) to introduce the possibility that "informed voters" might use the social media to alert others about sources (*e.g.* the alternative media) that reveal the incumbent's true type. This complicates the analysis since, while a single informed voter cannot do much to inform the society, a great many informed voters revealing the same information has a much larger effect. Thus, the social media interaction among the informed

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[3]Using this model, Besley and Prat (2006) discuss how and when government captures media and what effect this has on political outcomes. Their main results are (i) media pluralism provides effective protection against capture, (ii) independent ownership (*i.e.* the difficulty with which the state is able to transfer resources to the media) reduces capture, and (iii) media capture affects political outcomes.

voters creates a coordination game where payoffs from using the social media depend on how many other informed voters are doing it.

We argue that an important parameter in determining the outcome of the social media interaction is the "level of connectedness" in a country. We take the level of connectedness to be a measure of both technological and economic variables (such as the amount of internet penetration, social media usage rates, prevalence of mobile devices or other telecommunication technologies) as well as sociological ones (such as social capital or political trust). Improvements in access to communication technologies as well as the extent to which information shared through such technologies disseminates to the rest of the society increases the level of connectedness in a country.

Our results show that an increase in connectedness of a country serves to bring in line the amount of information shared by the mainstream and the alternative media. Either, an increase in connectedness frees the mainstream media, thus making all media outlets sharing relevant information with the public. Or it leads the government to capture the alternative media outlets beside the mainstream media, thus preventing dissemination of information in the country. These results predict that, as the world becomes more connected, we should observe an increase in the number of countries with free media; but among those countries that still have captured media, we should observe more media outlets captured.

We test our results empirically and find that our hypotheses are supported by a cross-country data set of 172 countries. Using internet penetration rate as a proxy for connectedness, our study of the data reveals that countries with greater connectedness on average have significantly greater press freedom. However, these countries also have significantly greater cross-country variance, suggesting that increased connectedness may lead governments to further suppress media freedom in high rent countries.

In the theoretical part of our model, the coordination game where the voters who learned the incumbent's true type choose to share this information or not is modeled as a global game.[4] In that part, we assume that the informed voters derive utility from sharing per se, which depends on how many people their messages reach, that is to say, how connected the society is. This assumption is not necessary for our findings, and in the appendix we examine an extension with an alternative payoff structure and show that our results still hold.

The rest of the paper is organized as follows: In section 2 we examine the related literature, in section 3 we present the game and find its equilibria, in section 4 we evaluate our findings empirically, and section 5 concludes the paper. Finally, the appendix presents an

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[4]See Carlsson and van Damme (1993) and Morris and Shin (1998, 2001).

extension of our baseline model.

2   Literature Review

This paper is intended to contribute to the recent literature on the question of media bias and how it relates to politics. There have been various attempts to explain why media bias exists. Baron (2004) examines a model where media bias is rooted in the supply side. In their setting, media outlets have the option to hire journalists for lower wages if they allow them to publish biased news, who might prefer to slant the news if this may help them further their careers. Gentzkow and Shapiro (2005), on the other hand, focus on the demand side. They argue that if customers believe that the quality of a news report is proportional to how well it conforms with their prior expectations, then media outlets will have an incentive to slant the news towards their audience's priors to build a reputation of high quality. In a behavioral model, Mullainathan and Shleifer (2005) assume that customers derive utility from consuming news that confirm their beliefs. Besley and Prat (2006) focus instead on the political side of press freedom, and examine a model where the head of state in a democratic setting can make transfers to media outlets in order to suppress a bad signal they may have about her.

Edmond (2013) examines a noisy signalling model in which the incumbent can take a costly action that manipulates the information provided by the media outlets in order to discourage dissent. Employing a global game framework, he finds that the proliferation of new information technologies has offsetting effects on a bad regime's chances of survival. On the downside, a greater number of media outlets that a regime may manipulate leads to public opinion becoming more precise, and in this case coordination on status quo can be induced relatively easily. However, this also means that the costly action the incumbent may take is now more costly, simply because there are more outlets to capture. Edmond argues that unless there are strong economies of scale in information control (*e.g.* radio propaganda in Nazi Germany) an increase in the number of signals makes the regime easier to overthrow. The main question of that paper is how an incumbent can utilize manipulation to fake strength and therefore discourage attacks by citizens who know that the incumbent is bad. The theoretical findings are then evaluated under different media structures. In this sense, mass media and social media are interpreted as substitutes in Edmond's paper. In contrast, they are complements in our model, and we study how information that the incumbent is bad may leak in an electoral system.

3 The Model

In this section, we introduce a two-period retrospective voting model a la Barro (1973), Ferejohn (1983), and Besley and Prat (2006). Technically, our model is a Bayesian game involving (i) an incumbent politician, I, whose type (good or bad) is unobservable, (ii) mainstream and the alternative media outlets M and A (e.g. CNN Türk and Halk Tv in the above example), and (iii) a set V of voters, 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, an incumbent is exogenously in power whose type space is $\zeta \in \{b, g\}$, where b stands for "bad" and g stands for "good". An incumbent is good with probability γ, and bad with probability $1 - \gamma$. A good incumbent yields a payoff of one to voters, whereas a bad incumbent generates zero payoff. The voters cannot observe their payoffs at the end of the first period, which is the time for election.

For simplicity, we assume that there are two media outlets. We call them M (for mainstream) and A (for alternative).[5] We denote by σ_i the audience share of outlet i. Without loss of generality, we assume that the audience share of the mainstream outlet is strictly larger than the audience share of the alternative outlet. That is to say, $\sigma_M > \sigma_A$. The media outlets are identical in their strategy sets and preferences. They have two types of profit, audience related and policy related. The former includes subscription fees and advertisements etc. whereas the latter may be in the form of direct bribes from the incumbent, or favorable policies for the groups or individuals associated with the outlet.

Media outlets observe no signal if the incumbent is good. However, a bad incumbent is revealed with probability $q \in (0, 1)$ to both media outlets, and with probability $1 - q$ its type remains hidden. If an outlet receives no signal, then we say that they have no informative news and their payoff is normalized to zero. If they observe the bad signal, on the other hand, they can either publish it for the audience related profit of σ_i for $i \in \{M, A\}$; or they can suppress the bad signal in exchange for a transfer t_i from the incumbent, which yields a profit of t_i to outlet i.

The transfers are offered by the incumbent in exchange for the suppression of bad news about them, after the incumbent observes whether the verifiable signal is received by the media outlets. The offers to both outlets are made simultaneously, and are unobserved by

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[5]One may extend on this assumption and think of M and A as two distinct groups of jointly owned several media outlets. In fact, one can further extend to think of M and A as any partition of the set of media outlets into two.

the voters. Reelection yields a profit of $r > 0$ to both types of incumbents. Thus the payoff of the incumbent is $r - \sum_{i \in I} t_i$ if the incumbent is reelected, and $- \sum_{i \in I} t_i$ if they are not, where I is the set of media outlets who accept the offer.[6]

Next, the voters observe the signals reported by the media outlets they follow. Voters who observed $s = b$ also observe whether the other media outlet published or suppressed the signal. If one of the media outlets accept the offer whereas the other does not, the followers of the informative outlet (informed voters, or IV) play what we call a social media game to pass on the signal to the audience of the other outlet. How likely the uninformed voters are to be convinced depends on both the ratio of IV who choose to share the information on social media, and how connected the society is. If both outlets accept the offer, or if both reject, the game moves on to the next stage automatically. At the final stage of the game, voters vote for the incumbent or a challenger of unknown type.

We will examine the details of the model in the following subsections. Part 3.1 examines the Social Media Game, the global game played by the informed voters. Part 3.2 focuses on the Media Game, and Part 3.3 finds the equilibria of the game.

3.1 Social Media Game

The social media game is a global game played by the informed voters (IV) who have obtained the information that the incumbent is bad. Upon receiving this verifiable signal, IV can use the social media to propagate this information. If they succeed, the uninformed voters switch to the informative outlet and thus receive the verifiable signal about the incumbent's type. If they fail, the uninformed voters stay uninformed and the status quo remains.

Whether uninformed voters receive the bad signal from the IV depends on two factors. First, the ratio of the IV who share the bad signal via social media, denoted by $\nu \in [0, 1]$ increases this likelihood. The second factor we call connectedness, denoted by $\theta \in \mathbb{R}$. We use the term to refer to both observable and unobservable measures of connectedness among members in a society. Observable measures include internet penetration and social media usage rates, as well as prevalence of mobile phones and other communication technologies. Unobservable measures refer to sociological concepts such as social capital or political trust, for example, to what extent an individual is open to what others have to say, or how likely one's opinions, especially those with political content, are to reach others. The extent of social capital in a society may be roughly estimated by individuals in that society, however,

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[6]The assumption that good and bad type incumbents receive the same rent is not restrictive in our setting, because a good incumbent never offers positive transfers to either media outlet in any equilibrium.

since each individual's interactions are limited to a subset of the society, and social capital is not precisely quantifiable, each individual has an imperfect information about it. Another way to think of social capital is that it may be the inverse of misinformation present within communication channels. For example, a citizen in a society where there is strong trust among individuals may be easier to convince by other citizens relative to a similar individual in a society abundant in conspiracy theories or propaganda.

We assume that the voters' prior expectations of θ, the connectedness parameter, are normally distributed with mean μ and precision α (variance $1/\alpha$). Once it is realized, the actual value of connectedness, θ, is observed by the incumbent and the media outlets. However, a voter i only receives a signal 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. An intuitive way to think about θ is that the observable measures of connectedness such as internet penetration rate are common knowledge. These observables would then correspond to μ the prior expectation of θ. After interacting with others in their networks, people use the Bayes' rule to update their beliefs regarding social capital in the overall society, which correspond to the error terms. The posterior expectation ρ_i of an IV i who received signal x_i is given by (DeGroot 1970):

$$\rho_i = \frac{\alpha\mu + \beta x_i}{\alpha + \beta}$$

Furthermore, the precision of the posterior expectation is equal to $\alpha + \beta$.

Given the level of social connectedness, θ; and the ratio of IV who share the news about the bad signal, $\nu \in [0, 1]$, the probability that the uninformed voters learn the incumbent's true type is given by the function $p(\theta, \nu)$. It is continuous and non-decreasing in both θ and ν with $p(\theta, 0) = 0$ for any θ. This means that if no one shares the bad signal about the incumbent, the audience of M cannot learn the true type of the incumbent regardless of how well the society is connected. If the signal is shared by a sufficient ratio of informed voters, on the other hand, the incumbent is overturned with probability $p(\theta, \nu)$, and with probability γ, the challenger who replaces the incumbent is good and yields a payoff of one to voters. Therefore, all informed voters receive the expected utility $p(\theta, \nu)\gamma$, regardless of whether they choose to share or not.

There is a cost associated with sharing the news of the bad signal about the incumbent, given by the expression $c(1-\nu)+\delta$. The first part is in the form of punishment, such as fines or imprisonment. It is decreasing in the ratio of IV who share the news, and is multiplied by

a non-negative constant c which is a measure of the severity of the punishment depending on laws and regulations related to social media use. The latter part is a strictly positive and arbitrarily small fixed cost associated with time and effort spent on sharing the news. For example, δ may be the opportunity cost of the time consumed while composing a political blog, a Facebook post or a tweet.

There is also a benefit that informed voters derive from sharing information via social media, which is given by the linear function:

$$b(\theta) = \theta$$

This benefit may be in the form of material gain when the media in question is in the form of a political blog, where more clicks correspond to larger advertisement revenue for the owner. It may also be in the form of immaterial gain in the form of interactions for social media (*e.g.* "likes" and "comments" for Facebook or "favorites" and "retweets" for Twitter) . We assume that when connectedness increases, an informed voter is able to reach a greater audience, and therefore derives a larger utility.

Within the social media game, the payoff of an IV who shares the information, as a function of θ and ν is then:

$$\theta + p(\theta, \nu)\gamma - c(1 - \nu) - \delta$$

On the other hand, the expected payoff of an IV who refrains from sharing is:

$$p(\theta, \nu)\gamma$$

Then, the utility gain of sharing for an IV is[7]:

$$\theta - c(1 - \nu) - \delta$$

There are three intervals in which we can examine the best responses of the informed voters:

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[7]Implicit in this setup is the assumption that the informed voters who share the signal on social media incur the costs of sharing regardless of the outcome of the elections. This is for purposes of simplicity and the model can easily be extended to accomodate costs that are dependent on the whether the bad incumbent stays in power or not.

- When $\theta \in (-\infty, \delta)$, refraining is a strictly dominant action for every informed voter, since the benefit of sharing is always lower than its cost, regardless of the actions of other IV.

- When $\theta \in [\delta, (\delta + c)]$, neither strategy is strictly dominant. Hence the equilibrium depends on players' beliefs about both the actual value of connectedness, and what the other players will do. The benefit of sharing is then characterized by $\delta \leq b(\theta) \leq c + \delta$ (strictly if $\theta \in (\delta, (\delta + c))$). [8]

- When $\theta \in ((\delta + c), \infty)$, sharing is a strictly dominant action for every informed voter, since the benefit of sharing is always greater than its cost, regardless of the actions of other IV.

A pure strategy for an IV is a function specifying an action for each possible posterior, that is to say, $s_i(\rho_i) \in \{0, 1\}$ for all ρ_i. Note that, for any informed voter the expected utility gain of sharing increases as their posterior expectation of connectedness goes up, holding ν constant. Then, as ρ increases we would expect that the likelihood that any informed voter shares the news on social media should not decrease. Hence, it is natural to think of a strategy profile where each informed voter chooses to share when their posterior expectation of connectedness is higher than a cutoff ρ^*, and refrain when it is lower.

When every informed voter uses such a cutoff strategy, since their preferences are identical, their cutoff points must be equal as well. We will show below 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 cutoff point. For her to use ρ^* as the cutoff rule, she must be indifferent between sharing and refraining. This holds true only when the expected benefit of sharing equals the expected cost of sharing, i.e. $\rho_i = c(1 - \nu) + \delta$. For a voter whose posterior on θ is ρ^*, the expected benefit of sharing is equal to $b(\rho^*) = \rho^*$. To see whether this equals to $c(1 - \nu) + \delta$, we must first calculate the expected proportion of IV who share the information conditional on the posterior expectation ρ^*. Note that the proportion of IV who choose to share is equal to the probability that any single 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^*.

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

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[8]If there was perfect information on θ, there would be two self-fulfilling equilibria at $\nu = 0$ and at $\nu = 1$.

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

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

$$\frac{1}{\frac{1}{\alpha+\beta} + \frac{1}{\beta}} = \frac{\beta(\alpha + \beta)}{\alpha + 2\beta}$$

Hence we follow Morris and Shin (2001) and write:

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

Therefore, 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 $\eta = \dfrac{\alpha^2(\alpha + \beta)}{\beta(\alpha + 2\beta)}$ we can rewrite the cdf above as:

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

The probability that any informed voter j has a posterior greater than ρ^* is equal to the proportion of informed voters who have posteriors above the threshold. Then, the equilibrium cutoff ρ^* must satisfy the equality:

$$b(\rho^*) = c\left(1 - \left(1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)\right)\right) + \delta$$

Therefore we have:

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

Both sides of the above equation are increasing in ρ^*. For there to be a unique cutoff point where the IV choose to share if and only if their posterior is greater than that cutoff point, the two sides of the above equation must cross exactly once. As standard in the literature, to ensure that the two sides cross only once, we assume that the slope of the right hand side is always lower than 1, the slope of $b(\theta)$. The upper bound of the slope of the cdf is given by $\sqrt{\eta/2\pi}$, hence we set the upper bound of the slope of the right hand side equal to $c\sqrt{\eta/2\pi}$.

Proposition 1 *When $\eta < \dfrac{2\pi}{c^2}$, there is a unique symmetric equilibrium. In this equilibrium, every IV shares the information if and only if their posterior $\rho > \rho^*$, where ρ^* is the unique solution to:*

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

Proof. Denote by $u(\rho, \hat{\rho})$ the expected utility of an informed voter with the posterior expectation ρ who shares, when all other informed voters use the cutoff $\hat{\rho}$. Conditional on ρ 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:

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

If $\theta \leq \delta$, sharing is weakly dominated, regardless of the actions of the other IV. Let $\rho_1 = \delta$. Then, any IV with $\rho \leq \rho_1$ will refrain[9]. This gives us the first round of elimination of dominated strategies for low values of ρ. Since all informed voters know this, they realize that when others have posteriors lower than ρ_1 they will never share. 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 also the best response threshold strategy to ρ_1. Furthermore, since $u(.,.)$ is increasing in the first argument and decreasing in the second, we know that $\rho_2 \geq \rho_1$. Due to $\rho_2 \geq \rho_1$ and the fact that payoffs are symmetric, 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 $\rho < \rho_2$,

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[9]The equality part follows from our assumption that voters use undominated strategies.

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:

$$\rho_1 \leq \rho_2 \leq ... \leq \rho_k \leq ...$$

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

A symmetric argument from the other side, that is to say, for high values of ρ, establishes a similar sequence:

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

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 premise $\eta \leq \dfrac{2\pi}{c^2}$ ensures that there is a unique value of ρ such that $u(\rho, \rho) = 0$, and therefore $\rho_m = \rho^m$, which concludes our proof. ∎

We know that an informed voter with signal x_i has the posterior:

$$\rho_i = \frac{\alpha\mu + \beta x_i}{\alpha + \beta}$$

We also know that she will share if and only if $\rho_i > \rho^*$ which satisfies the equality in Proposition 2. Then an informed voter shares if and only if $x_i > \rho^* + \dfrac{\alpha}{\beta}(\rho^* - \mu)$. Since x_i are distributed with mean θ and precision β, from the incumbent's perspective the proportion of informed voters who share is given by:

$$1 - \Phi\left(\sqrt{\eta}\left(\rho^* + \frac{\alpha}{\beta}(\rho^* - \mu) - \theta\right)\right)$$

Let us denote by $\nu(\theta)$ the proportion of IV who share when connectedness level is given by θ. The incumbent and the media outlets observe the level of connectedness perfectly and hence believe that the probability of overturn is only a function of the underlying state of the world. Hence, we suppress $\nu(\theta)$ and denote by $p(\theta)$ the probability of overturn when connectedness is θ and fraction $\nu(\theta)$ of informed voters share the signal.

3.2 Media Game

When the mainstream media outlet publishes the bad signal, it receives:

$$U_M(publish) = \sigma_M$$

So M's product is consumed by its own audience, and its payoff is the size of the audience regardless of what A does. When M suppresses the signal in exchange for a transfer by the incumbent, it receives:

$$U_M(suppress) = t_M$$

The payoff of A depends not only on its own action, but also on whether M chooses to publish or not. When both publish, A only reaches its own audience. When M suppresses, however, with probability $p(\theta)$ the audience of M is convinced by the informed voters via social media that A contains important news. In this case the audience of M switch to A and therefore the expected payoff of the alternative outlet increases[10]:

$$EU_A(publish) = \begin{cases} \sigma_A, & \text{if M publishes} \\ \sigma_A + p(\theta)\sigma_M, & \text{if M suppresses} \end{cases}$$

When A suppresses, its payoff is the transfer proposed by the incumbent:

$$U_A(suppress) = t_A$$

The incumbent receives payoff r from reelection, and when $I \subset \{M, A\}$ accept the transfers, incumbent's total payoff is $r - \sum_{i \in I} t_i$ if he is reelected, and $- \sum_{i \in I} t_i$ if he is not.

3.3 Equilibria

We assume that when a media outlet is indifferent between accepting or rejecting an offer, it will always choose to accept. This assumption is purely to ensure the existence of equilibria.

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[10]We could easily introduce a punishment imposed by the V_M to M, when the UV learn through social media that the incumbent is bad but M chose to suppress this information in exchange for a transfer. Our main results hold in that case as well.

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Making any offer to an outlet that is strictly greater than its opportunity cost is a strictly dominated strategy for the incumbent. These ideas are captured in the following lemma:

Proposition 2 *Given the level of connectedness, the incumbent must adopt one of the following four strategies:*

    1. Offer $t_M = \sigma_M$ and $t_A = \sigma_A + p(\theta)\sigma_M$ (capture both)

    2. Offer $t_M = \sigma_M$ and $t_A = 0$ (capture M only)

    3. Offer $t_M = 0$ and $t_A = \sigma_A$ (capture A only)

    4. Offer $t_M = 0$ and $t_A = 0$ (no capture)

Proof. The first strategy leads to the capture of all media outlets where transfers equal to the expected profits of publishing are made to both M and A. In other words, if M deviates its product will be consumed by its audience with size σ_M and it will receive a payoff of σ_M as a result. The incumbent must transfer the equal amount in equilibrium in order to capture M. If A deviates, its product will be consumed by its audience with size σ_A, and furthermore with the probability of $p(\theta)$ it will also be consumed by the audience of M with size σ_M. A's expected payoff from publishing is therefore $\sigma_A + p(\theta)\sigma_M$, and the incumbent must transfer an equal amount to A to capture it as well.

The second strategy leads to M's capture, but since $t_A = 0$, A will reject the offer and publish the bad signal. In fact the incumbent could offer any amount strictly lower than $\sigma_A + p(\theta)\sigma_M$, and the outcome would be the same. But for simplicity of notation we assume that they offer zero whenever they wish not to capture an outlet.

In the third and fourth strategies M rejects the offers because they are strictly below the expected payoff of publishing. Since M publishes the signal, the V_M will not switch to A, thus making the expected payoff of publishing σ_A for the alternative outlet. Hence the incumbent has no incentive to transfer any amount greater than σ_A.

Finally, the incumbent has no incentive to offer an amount greater than σ_M to M and greater than $\sigma_A + p(\theta)\sigma_M$ to A in any case. ∎

In equilibrium, when both media outlets are captured the bad incumbent will be reelected for certain. When only M is captured, the incumbent will be reelected with probability $1 - p(\theta)$. And whenever M is not captured, the bad incumbent will certainly be turned over.

Lemma 3 *The expected payoff of the incumbent is then:*

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$$EU_{Inc}(t_M = \sigma_M, t_A = \sigma_A + p(\theta)\sigma_M) = r - \sigma_M - (\sigma_A + p(\theta)\sigma_M)$$

$$EU_{Inc}(t_M = \sigma_M, t_A = 0) = r(1 - p(\theta)) - \sigma_M$$

$$EU_{Inc}(t_M = 0, t_A = \sigma_A) = -\sigma_A$$

$$EU_{Inc}(t_M = 0, t_A = 0) = 0$$

Proof. 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 will be 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 will be overturned with certainty. If the incumbent decides to offer a positive transfer to the alternative outlet nevertheless, and the alternative outlet accepts the transfer, the incumbent will lose the transfer and receive nothing in return.

If the incumbent chooses to capture both outlets by offering $t_M = \sigma_M$ and $t_A = \sigma_A + p(\theta)\sigma_M$, then the media will be captured completely, and the incumbent will be reelected for sure and receive $r - \sigma_M - (\sigma_A + p(\theta)\sigma_M)$. Finally, if only the mainstream outlet is captured, the incumbent will be reelected with probability $(1 - p(\theta))$, and therefore their expected utility is equal to $r(1 - p(\theta)) - \sigma_M$. ∎

Clearly, the strategy $t_M = 0, t_A = \sigma_A$ is dominated by $t_M = 0, t_A = 0$.

Before moving forward to the equilibria of this game let us denote by $r_1(\theta)$ the critical value of r at which the incumbent is indifferent between offering $t_M = \sigma_M, t_A = 0$ and offering $t_M = 0, t_A = 0$. In other words, $r_1(\theta)$ is the level of political rent that leaves the risk neutral incumbent indifferent between choosing to capture M alone, and capturing neither outlet, given the value θ. Formally:

$$r_1(\theta) = \frac{\sigma_M}{1 - p(\theta)}$$

It can easily be seen that $r_1(\theta)$ is increasing in θ.

Further denote by $r_2(\theta)$ the critical value of r at which the incumbent is indifferent between offering $t_M = \sigma_M, t_A = \sigma_A + p(\theta)\sigma_M$ and offering $t_M = \sigma_M, t_A = 0$, when $p(\theta) > 0$. That is to say when $r = r_2(\theta)$, the incumbent will be indifferent between capturing both outlets and capturing M alone. Formally:

$$r_2(\theta) = \frac{\sigma_A + p(\theta)\sigma_M}{p(\theta)} = \frac{\sigma_A}{p(\theta)} + \sigma_M$$

Clearly, $r_2(\theta)$ is decreasing in θ. Then:

$$r_1(\theta) \leq r_2(\theta) \iff \frac{\sigma_M}{1 - p(\theta)} \leq \frac{\sigma_A}{p(\theta)} + \sigma_M$$

Since $\sigma_A = 1 - \sigma_M$, we have for all $p(\theta) \in (0, 1)$:

$$r_1(\theta) \leq r_2(\theta) \iff \sigma_M \leq \frac{1 - p(\theta)}{1 - p(\theta) + p(\theta)^2}$$

We are finally ready to characterize the equilibrium of this game.

Proposition 4 *Given θ, the following constitutes an equilibrium:*

a) Beliefs of voters:

the audience of M believe $P(\theta = g) = \begin{cases} 0 & if & s_M = b \\ \hat{\gamma}_M & if & s_M = \emptyset \end{cases}$

the audience of A believe $P(\theta = g) = \begin{cases} 0 & if & s_A = b \\ \hat{\gamma}_A & if & s_A = \emptyset \end{cases}$

where $\hat{\gamma}_M \geq \gamma$ and $\hat{\gamma}_A \geq \gamma$.

b) Strategies of Informed Voters:

Informed voters share if $\rho > \rho^*$, and refrain otherwise, where ρ^* is the solution to:

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

c) Strategies of Voters:

Audience of M vote for incumbent if $s_M = \emptyset$ and $s_A = \emptyset$. If $s_M = b$ they vote for the challenger. If $s_M = \emptyset$ and $s_A = b$, and if they are convinced to switch to outlet A, they observe $s_A = b$ and therefore vote for the challenger. Otherwise they vote for the incumbent.

Audience of A vote for the incumbent if $s_A = \emptyset$ and vote for the challenger otherwise.

d) Strategies of the Incumbent:

Incumbent offers:

If $r < \sigma_M$, then $t_M = 0$ and $t_A = 0$.

If $r_2(\theta) \geq r_1(\theta)$ and

if $r \geq r_2(\theta)$, then $t_M = \sigma_M$ and $t_A = \sigma_A + p(\theta)\sigma_M$,

if $r_2(\theta) > r \geq r_1(\theta)$, then $t_M = \sigma_M$ and $t_A = 0$,

if $r_1(\theta) > r$, then $t_M = 0$ and $t_A = 0$.

If $r_1(\theta) > r_2(\theta)$ and

if $r \geq r_1(\theta)$, then $t_M = \sigma_M$ and $t_A = \sigma_A + p(\theta)\sigma_M$,

if $r_1(\theta) > r$, then $t_M = 0$ and $t_A = 0$.

e) Strategies of the Media Outlets:

For outlet M:

Accept if $t_M \geq \sigma_M$,

Reject otherwise.

For outlet A:

Accept if $t_A \geq \sigma_A + p(\theta)\sigma_M$, or if $t_A \geq \sigma_A$ and $t_M < \sigma_M$,

Reject otherwise.

Proof. a) The proof that a voter will believe that the incumbent is good with probability zero upon receiving the bad signal is trivial, since bad signals are verifiable.

To prove the latter, note that upon receiving no bad signal, every voter will deduce that incumbent is good with a probability at least as high as γ. As likelihood of capture decreases or the probability of information about the incumbent spreading via social media increases, the expectations regarding the incumbent's type improve when the signal is empty.

b) This part follows from Proposition 1.

c) We assume that all types of 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 fixed at γ. Therefore a voter who observes $s = b$ strictly prefers the challenger, and votes against the incumbent.

If a voter observes $s_i = \emptyset$ for $i \in \{M, A\}$, she believes that the incumbent is good with probability $\hat{\gamma}_i \geq \gamma$. If $\hat{\gamma}_i$ is strictly greater than γ, then the expected utility of voting for the incumbent is also $\hat{\gamma}_i > \gamma$, and the voter prefers to vote for the incumbent.

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We need to show that the voter who observes $s_i = \emptyset$ will vote for the incumbent when $\hat{\gamma}_i = \gamma$. Assume for a contradiction that she votes against the incumbent. Then the bad incumbent has no incentive to pay a transfer to media outlet i, since the readers of i vote against the incumbent even when the signal $s_i = \emptyset$. Therefore the incumbent offers $t_i = 0$ and the outlet i rejects and publishes the bad signal. If bad incumbent never captures outlet i, then $\hat{\gamma}_i = 1.$ $\Rightarrow\Leftarrow$

Therefore when $\hat{\gamma}_i = \gamma$ it must be that the audience of outlet i vote for the incumbent.

d) Recall as in proposition 2 the incumbent must choose from one of the four strategies described. Note that the strategy $t_M = 0$, $t_A = \sigma_A$ 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 alone are enough to overturn the incumbent.

The incumbent will find it optimal not to capture either outlet when $r < \sigma_M$, since in any capture equilibrium it must capture M, and if M is too expensive to capture then the incumbent is better off not capturing any outlet. Let us now examine the case when $r_2(\theta) \geq r_1(\theta)$.

If $r \geq r_2(\theta)$, then the incumbent will want to capture both outlets since:

$$EU_{Inc}(\sigma_M, \sigma_A + p(\theta)\sigma_M) = r - (\sigma_A + p(\theta)\sigma_M) - \sigma_M \geq r(1 - p(\theta)) - \sigma_M = EU_{Inc}(\sigma_M, 0)$$

If $r_2(\theta) > r \geq r_1(\theta)$, then the incumbent will choose to capture M only, and take the risk that it will be overturned if the informed voters successfully convince the others about the type of the incumbent, because:

$$EU_{Inc}(\sigma_M, 0) = r(1 - p(\theta)) - \sigma_M > r - (\sigma_A + p(\theta)\sigma_M) - \sigma_M = EU_{Inc}(\sigma_M, (\sigma_A + p(\theta)\sigma_M))$$

If $r_1(\theta) > r$, then the incumbent will choose not to capture either outlet because he must pay σ_M to capture, but with the probability $p(\theta)$ he will still lose his seat. Therefore his expected utility from capturing M is:

$$r(1 - p(\theta)) - \sigma_M < 0.$$

In the case when $r_1(\theta) > r_2(\theta)$:

If $r \geq r_1(\theta)$, then the incumbent will want to capture both outlets since:

$$EU_{Inc}(\sigma_M, \sigma_A + p(\theta)\sigma_M) = r - (\sigma_A + p(\theta)\sigma_M) - \sigma_M \geq 0 = EU_{Inc}(0,0)$$

And finally, if $r_1(\theta) > r$, the incumbent will offer zero to both outlets for the same reasons as above.

e) The expected payoff of M when it publishes the bad signal is σ_M, so it is weakly preferred to accept any transfer equal to or greater than that. Any offer that is lower than that amount will be rejected and the signal published.

The expected payoff of A when it publishes but it is not the only one to do so is σ_A, so it will accept any offer equal to or greater than that. When A is the only outlet to publish the bad signal, on the other hand, its expected payoff is $(\sigma_A + p(\theta)\sigma_M)$, since with probability $p(\theta)$ the informed voters will convince others to switch to A. Therefore, A will accept a transfer if and only if it is greater than or equal to $(\sigma_A + p(\theta)\sigma_M)$ when M is captured. Lower offers will be rejected. ∎

4   Results

First, taking σ_M and r as given, let us examine the effects of θ on capture. The payoff of the incumbent from capturing both and capturing M only decrease as θ goes up. The former happens because A's opportunity cost of suppressing increases. The latter happens because the probability of overturn increases when A publishes. Therefore, the set of political rent levels in which the incumbent finds it optimal to capture the media shrinks. However, since $r_2(\theta) = \dfrac{\sigma_A}{p(\theta)} + \sigma_M$ goes down as θ goes up, the set of r in which capturing both outlets is preferred grows relative to capturing the mainstream outlet only. In other words, when $r_2(\theta) > r_1(\theta)$ for the marginal incumbent who is indifferent between capturing both and capturing M only, capturing both becomes strictly preferred as θ increases. This is because as $p(\theta)$ approaches one, the decrease in the probability of staying in power for the incumbent when he captures M only dominates the increase in the cost of capturing A when both outlets are captured. Therefore as θ goes up, we conjecture that media capture will move towards either extreme, but decrease in general. That is to say, we expect the press in highly connected countries to be generally either very independent or completely captured.[11]   In contrast, press in countries that are less connected should be on average less independent

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[11]Perhaps very convincing for this finding is the fact that the Freedom House, in the report following the Gezi Park protests, moved Turkey from the Partly Free category to Not Free.

and have smaller cross-country variance. Naturally, greater press freedom leads to bad incumbents being identified and overturned more often. Therefore, voter welfare increases as press freedom goes up.

To see how our findings compare against empirical data, we have examined various datasets. In the tables below "Penetration" is the 2012 worldwide internet penetration percentages data published by International Telecommunication Union. We divided our sample of 172 countries of which we had balanced data by the median level of internet penetration to examine how press freedom and voter welfare compare in more connected countries relative to less connected countries.

Penetration	N(totalpress)	mean(totalpress)	sd(totalpress)
<39.325	86	60.1512	17.77541
>39.325	86	39.0581	23.19653

Figure 1: Descriptive statics of press freedom scores of countries with penetration levels above or below the median value.

The index of press freedom we utilize for our analysis is the Freedom House's *Freedom of the Press 2013* (Freedom House, 2013b) report whose ratings cover events that took place between January 1, 2012, and December 31, 2012. This index was first conducted in 1980. Each year every country is given a score from 0 (best) to 100 (worst) according to 23 methodology questions and 109 indicators. Countries that have scores between 0 and 30 are regarded to have Free press; 31 to 60, Partly Free press; and 61 to 100, Not Free press.

Figure 1 shows that if we divide the set of countries into two groups of equal size by the median level of internet penetration, the countries above this level have an average press freedom score of 39.1, a score significantly better than the countries with less than median penetration, which have an average of 60.2. This is in line with our hypothesis that higher connectedness is correlated with greater press freedom. Furthermore, highly connected countries also have a wider spread with a standard deviation of 23.2, compared with 17.8. This corroborates our theoretical finding that as connectedness goes up press freedom is likely to go to either extreme.

Figure 2 below is a histogram showing the frequency of countries in each category according to the ratings in the *Freedom of the Press 2013* report, for high penetration countries shown in light grey against low penetration countries shown in dark grey. There are only five countries out of our sample of 172 that are on the lower than median internet penetration rate and rated as a country with a Free press. A great majority of the low penetration countries (81 of out 86) either have a Partly Free or a Not Free press. This contrasts with the press in high penetration countries, which are mostly Free. In line with our hypothesis, there are fewer countries with Partly Free press among high penetration countries relative to low penetration countries.
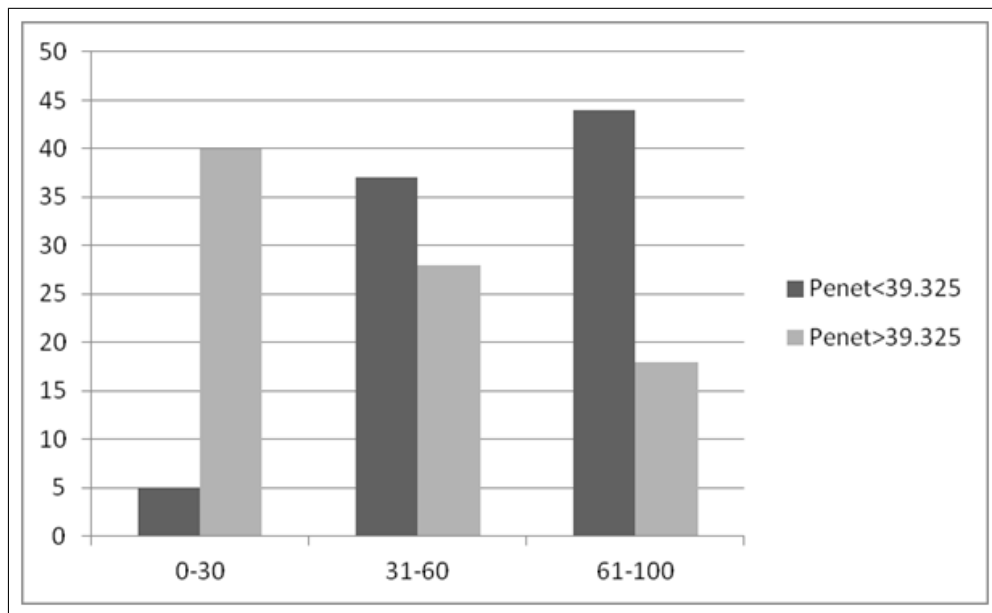

Figure 2: Number of countries by their press freedom rankings: 0-30 (Free); 31-60 (Partly Free); 61-100 (Not Free)

The relationship between press freedom and corruption is well documented, (see for instance Brunetti and Weder, 2003). As a proxy for voter welfare we use a corruption measure, namely the Corruption Perceptions Index 2012 (Transparency International, 2012), which aggregates data from a select number of different sources from credible institutions, including the World Bank, Global Insight and the World Economic Forum. In this index, 0 corresponds to highest possible level of perceived corruption, whereas 100 corresponds to least possible level of perceived corruption.

Penetration	N(cpi2012score)	mean(cpi2012score)	sd(cpi2012score)
<39.325	86	30.7442	10.47258
>39.325	86	55.907	18.55144

Figure 3: Descriptive statics of corruption scores of countries with penetration levels above or below the median value.

Figure 3 reveals that in line with our findings in Figures 1 and 2, countries with greater connectedness are significantly more corruption free in comparison to the countries with low connectedness. The former group has an average score of 55.9, almost twice as large as the average of the latter, 30.7. Even more striking is the difference in the standard deviation of the two groups. High penetration countries have a standard deviation of 18.6, much larger than the standard deviation of the low penetration countries, which is only 10.5. This supports the hypothesis that connectedness can serve as a good deterrent against corruption, but in countries with high political rent, efforts to subvert connectedness despite high levels of internet penetration may be at least partially successful.

5 Conclusion

Our main contribution to the literature is the study of social media and its relation to press freedom in a democratic setting. Our model reiterates that press freedom is a significant tool for political accountability; and suggests that social media, due to its independent nature, may serve as an invaluable complement to traditional media in this sense.

Information technologies keep on spreading across the globe. This, unfortunately, does not necessarily mean that we should see press freedom and political accountability improve everywhere. Governments whose survival depend on the control of information to further their interests find means to counteract the spread of information, and can sometimes even reverse this trend. In other words, while internet penetration rate increases in most countries with a problematic press, connectedness may not show an equivalent rise.This is sometimes done by direct censor of social media, which is the case in China, Iran, Syria and Pakistan among others. A more common practice is enacting laws that introduce fines or prison

sentences to citizens who share political content online, often in the pretense of privacy of personal information. A relatively new method that is spreading quickly is to hire pro-government commentators to manipulate online discussions in an effort to counterbalance the increasing time spent online by citizens. All of these serve to decrease connectedness among voters despite the overall trend of increasing penetration.

Our results indicate that connectedness is a decent predictor of both press freedom and corruption. Although far from conclusive, our empirical research supports this hypothesis. It is not very surprising to see that the introduction of new information technologies hurts those who depend on lack of information. What is surprising, however, is our novel finding that in high political rent countries where there is only partial capture in the absence of social media, proliferation of information technologies may lead to increased suppression of press freedom. That is because alternative media, complemented by social media, may offer substantial opposition to the incumbent. Again, empirical evidence does not reject this hypothesis, an in fact seems to corroborate it.

Our findings highlight the importance of social media and internet freedom as a means to overcome concealment of information, especially of political nature. To this end, it is crucial to promote freedom of speech online. Also important is information about internet freedom across countries. While Freedom House's *Freedom on the Net* report is commendable, it includes only 60 countries, a number which fades in comparison to the number of countries in Freedom House's *Freedom of the Press* report, 197.

Further research may focus on endogenizing media capture, in the sense that instead of assuming that mass media is made up of two distinct groups, the incumbent may choose what fraction of the market share to capture. Also interesting would be a study of extensions where the incumbent can take a costly action to interfere with connectedness by hiring pro-government commentators that spread misinformation online, or by introducing new laws and regulations that effectively increase the cost of sharing, c. As for the empirical part, an important research question is how social capital fares with respect to the other critical variables, particularly press freedom, corruption, and penetration.

Finally, we would like to reiterate that our theoretical findings are robust to a variety of specifications, some of which can be seen in the appendix.

6 Appendix

One potential criticism towards the baseline model is our assumption that informed voters may derive positive benefits from sharing news on social media. In this appendix, we remove this assumption, and examine a situation where informed voters receive higher utility from the successful overturn of a bad incumbent, relative to those who refrained from sharing. This may be the case when citizens who spread the bad signal about the incumbent are thought to be the proponents of the overturn, and treated as such by a grateful challenger. We show that with a few technical assumptions, our results hold in this case as well.

As before, the probability that the uninformed voters learn the incumbent's true type is given by the function $p(\theta, \nu)$, which is differentiable and non-decreasing in both θ and ν. In this extension, we assume that social media acts merely as a catalyst for social interaction, and it is redundant in a perfectly connected society. In other words, for sufficiently high values of θ we have that $p(\theta, 0) = 1$. Conversely, in a society where people are extremely disconnected due to lack of information technologies and want of social capital, we assume that any attempt to spread information via social media will be in vain. Hence, for sufficiently low values of θ we have that $p(\theta, 1) = 0$.[12]

When a portion of the voters is informed that the incumbent is bad, their expected payoff when the incumbent retains power is zero, whereas overturning the incumbent and electing a challenger of unknown type has an expected payoff of γ. Moreover, informed voters receive higher utility from overturning the incumbent when they actively participated in spreading information about them. That is to say, in the case that the bad incumbent is overturned and succeeded by a challenger of unknown type, a voter who shared the news receives the expected payoff $\gamma + \kappa$ (where $\kappa > 0$ is the political advantage obtained by voters who were active in social media), whereas a voter who refrained receives the expected payoff γ. Therefore, if an informed voter believes that the incumbent will be overturned with probability $p(\theta, \nu)$, his expected payoff from sharing as a function of θ and ν is:

$$p(\theta, \nu)(\gamma + \kappa) - c(1 - \nu) - \delta$$

On the other hand, the expected payoff of an IV who refrains from sharing is:

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[12]The former scenario of a perfectly connected society is only plausible in real life when the society in question is sufficiently small so that news can spread without any effort on the part of the informed voters. The other extreme is somewhat more realistic, as according to 2012 statistics many countries in Sub-Saharan Africa and Southeast Asia have internet penetrations lower than 5%.

$$p(\theta, \nu)\gamma$$

Then, the utility of sharing minus the utility of refraining for given values of θ and ν:

$$p(\theta, \nu)\kappa - c(1 - \nu) - \delta$$

Note that if $\kappa < \delta$, then for any value of θ sharing is strictly dominated by refraining. When this is the case the presence of social media becomes irrelevant and the model is reduced to a setting very similar to that of Besley and Prat (2006). Therefore we only examine the case where $\kappa > \delta$. In fact to ensure the two-sided limit dominance property standard in the global game literature, we further restrict our attention to the case when $\kappa > c + \delta$. That is to say, we focus on the setting that when the incumbent is overturned for sure, the utility of sharing is strictly greater than its cost, even when none of the other informed voters share the signal. [13]

By the assumptions above and by the continuity of $p(\theta, \nu)$ in θ, there exists a critical level of connectedness $\bar{\theta}$, such that the following equality holds:

$$p(\bar{\theta}, 0)\kappa = c + \delta$$

Similarly, denote by $\tilde{\theta}$ the critical level of connectedness that satisfies the following:

$$p(\tilde{\theta}, 1)\kappa = \delta$$

Since $p(\theta, \nu)$ is non-decreasing in both arguments, it must be that $\tilde{\theta} \leq \bar{\theta}$, strictly when $c > 0$. Hence, there are three intervals in which we can examine the best responses of the informed voters:

- When $\theta < \tilde{\theta}$, refraining is a strictly dominant action for every informed voter, since the benefit of sharing is always lower than its cost, regardless of the actions of other IV.

- When $\tilde{\theta} \leq \theta \leq \bar{\theta}$, neither strategy is strictly dominant. Hence the equilibrium depends

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[13]$\delta < \gamma\kappa < c + \delta$ leads to one-sided limit dominance, which is outside the scope of this paper. For an application of one-sided limit dominance, see De Mesquita (2010).

on players' beliefs about both the actual value of connectedness, and what the other players will do.

- When $\bar{\theta} < \theta$, sharing is a strictly dominant action for every informed voter, since the benefit of sharing is always greater than its cost, regardless of the actions of other IV.

By iterating the arguments in the baseline model, we get that the equilibrium cutoff ρ^* must satisfy the equality:

$$p\left(\rho^*, \left(1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)\right)\right)\kappa = c\left(1 - \left(1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)\right)\right) + \delta$$

Therefore we have:

$$p\left(\rho^*, \left(1 - \Phi\left(\sqrt{\eta}(\rho^* - \mu)\right)\right)\right)\kappa = c\Phi\left(\sqrt{\eta}(\rho^* - \mu)\right) + \delta$$

This equation means that an increase in the cutoff rule has three effects on the marginal informed voter whose posterior expectation is exactly equal to the cutoff point. On the right hand side we see that as the threshold increases, the ratio of informed voters who share the bad news about the incumbent goes down, which means that the cost of sharing increases. The other two effects can be seen on the left hand side. First of these is the direct effect which states that as connectedness goes up, the uninformed voters will have a greater probability of switching to the informative outlet and receiving the signal that the incumbent is bad. The second effect on the left hand side is the indirect effect, which says that as the threshold the informed voters use to decide increases, a lower ratio of informed voters choose to share, and the probability of the uninformed voters switching goes down. In other words, an increase in ρ^* in the above equation leads to an increase in the right hand side, but the effect on the left hand side is ambiguous.

To get the single crossing property standard in the global game literature, we assume that $p_1 - p_2\sqrt{\eta}\phi(\rho^*) > \dfrac{c\sqrt{\eta}}{\kappa}\phi(\rho^*)$ for all $\rho^* \in \mathbb{R}$, where p_1 refers to the derivative of $p(\theta, \nu)$ with respect to the first argument, and p_2 refers to the derivative of $p(\theta, \nu)$ with respect to the second argument, and ϕ is the probability mass function of the standard normal distribution. We can rewrite the above inequality as follows:

$$p_1 > \phi(\rho^*)\sqrt{\eta}\left[p_2 + \frac{c}{\kappa}\right]$$

Propositions 1 and 4 can easily be replicated in this setting

It should be clear that our results in the baseline model do not depend on the particular payoff structure, and can be accomodated in a wide range of specifications, so long as the two-sided limit dominance property standard in the global game literature is satisfied.

7 References

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