Informational Autocrats, Diverse Societies*

A. Arda Gitmez† Pooya Molavi‡

November 6, 2023

This paper presents a theoretical model of an autocrat who controls the media in an attempt to persuade society to support a policy. We base our analysis on a Bayesian persuasion framework in which citizens have heterogeneous preferences. We characterize the autocrat's information manipulation strategy when society is monolithic and when it is divided. In both cases, when the preferences in society become more diverse, the autocrat engages in less information manipulation. Our findings thus suggest that the diversity of attitudes and opinions can act as a bulwark against information manipulation by hostile actors.

*We would like to thank Daron Acemoglu, Raphael Boleslavsky, Georgy Egorov, Emin Karagözoğlu, Nicola Persico, Mehdi Shadmehr, Emilie Sartre, Alex Wolitzky and Leifu Zhang for helpful discussions, and various seminar participants for their comments. Earlier versions of this paper were circulated under the title "Media Capture: A Bayesian Persuasion Approach" and "Polarization and Media Bias."

†Department of Economics, Bilkent University. E-mail: arda.gitmez@bilkent.edu.tr.

‡Northwestern University. E-mail: pmolavi@kellogg.northwestern.edu.

1 Introduction

Over the past two decades, many democracies have devolved into hybrid regimes and outright autocracies (Bermeo, 2016; Levitsky and Ziblatt, 2018; Haggard and Kaufman, 2021). From Hungary's Victor Orbán to Venezuela's Hugo Chávez and Russia's Vladimir Putin, politicians who came to power through democratic means have consolidated their control and undermined democratic institutions. Unlike the dictators of the 20th century, this new breed of autocrat does not resort to overt violence. Instead, they maintain power by building support among the masses and winning elections that appear to be democratic. To cultivate their image as competent leaders, they manipulate information by controlling state media (Rozenas and Stukal, 2019), co-opting or pressuring independent media outlets (McMillan and Zoido, 2004; Szeidl and Szucs, 2021), and covertly censoring unfavorable news (Lorentzen, 2014).They are, as Guriev and Treisman (2019, 2020) put it, *informational autocrats*.

But not all autocracies are alike. Even setting aside those that adhere to the 20th-century playbook and completely control the media (such as North Korea), there is still a wide variation in media freedom across informational autocracies. As Egorov and Sonin (2022) note, "media freedom varies a lot across nondemocratic regimes, from levels comparable to mature democracies, to that of totalitarian regimes." This raises the question of why some societies are capable of preserving a degree of media freedom under autocratic rule while others are totally dominated by information manipulation.

This paper establishes a theoretical link between the diversity of attitudes in a society and its vulnerability to information manipulation. We show that autocrats engage in less information manipulation in more diverse societies. Informational autocrats need to fine-tune their manipulation strategies to citizens' attitudes; greater diversity complicates this task. As societies become more diverse, it becomes harder for autocrats to convince their opponents without alienating their supporters. They respond optimally by manipulating information less and allowing for a more free media landscape.

We present this insight in a Bayesian persuasion model (Kamenica and Gentzkow, 2011) with a population of heterogeneous receivers. The autocrat (sender) commits to a public communication strategy to maximize citizens' support on a salient political issue. Citizens (receivers) are heterogeneous in their costs of supporting the autocrat. They observe the message sent by the autocrat and decide whether to support him. To maximize the expected support, the autocrat must send the message that the policy is "good" as frequently as possible. However, citizens understand that information is manipulated and only act based on the autocrat's communication when they find it informative. As the autocrat manipulates information more, fewer people act based on the

autocrat's messages but those who do support him with a higher probability. The optimal policy balances these two effects in a way that depends on the distribution of citizens' costs.

Our main theoretical contribution is to show that when the distribution of costs is more spread out, the autocrat finds it optimal to engage in less information manipulation. We prove this result both when the distribution of costs is single-peaked and when it is single-dipped. We do so by introducing a novel partial order on distributions and proving two comparative statics results. Our partial order is a variability order that compares the distribution of receiver costs in terms of its *spread*.

The intuition for these results is best illustrated by introducing some heterogeneity to a Bayesian persuasion model where citizens have identical preferences. In the homogeneous model, the optimal strategy involves sending the "bad" message just frequently enough to make citizens indifferent upon receiving the "good" message. However, in a society with costs spread around those in the homogeneous society, this strategy would only secure the support of half the citizens when the "good" message is sent. To gain broader support, the autocrat must appeal to more skeptical citizens, which requires a reduction in information manipulation. Our theoretical results formalize and generalize this intuition.

Related Literature. First and foremost, our model contributes to the growing literature on informational autocrats (Guriev and Treisman, 2019, 2020, 2022; Egorov and Sonin, 2022; Gehlbach et al., 2022).[1] Previous work has studied several channels through which societal fragmentation may benefit autocrats. Heterogeneity tends to exacerbate the collective action problem (Baland and Platteau, 1997; Dayton-Johnson, 2000; Bardhan et al., 2007), reduce the social capital (Alesina and La Ferrara, 2000; Khwaja, 2009), and render the "divide-and-rule" strategies more effective (Acemoglu et al., 2004; Padró i Miquel, 2007). Our analysis shows that the informational channel works in the opposite direction: Autocrats find it harder to manipulate public opinion in more diverse societies.[2]

A closely related literature on *media capture* studies the idea that politicians control media by co-opting private media (Besley and Prat, 2006), controlling state media (Gehlbach and Sonin, 2014), censoring news (Shadmehr and Bernhardt, 2015; Boleslavsky et al., 2021), or controlling media's access to information (Ozerturk, 2022)—Prat (2015) and Enikolopov and Petrova (2015) provide comprehensive reviews.[3] We establish that the vulnerability of a society to media capture depends not only on the attitudes of the median citizen but also on citizens' diversity.

[1] Also related is the literature on *democratic authoritarianism* (Brancati, 2014) and *competitive authoritarianism* (Levitsky and Way, 2002) in political science. However, those works are less focused on information manipulation and more on the dismantling of democratic institutions.

[2] A related literature analyzes the political consequences of diversity, such as its impact on conflict (Desmet et al., 2017; Arbatlı et al., 2020) and political institutions (Alesina et al., 1999; La Porta et al., 1999; Lindqvist and Östling, 2010; Galor and Klemp, 2018), but not on information manipulation.

[3] Corneo (2006), Petrova (2008, 2012), and Alonso and Padró i Miquel (2022) study media capture by special interest groups.

Another literature focuses on understanding the variation in and limits of information manipulation. As a source of variation, Egorov et al. (2009) study the natural resource endowment, VonDoepp and Young (2013) study the threats that governments face, while McGreevy-Stafford (2020) studies protests. Factors limiting information manipulation include first-hand experiences (Di Tella et al., 2012), existence of alternative media outlets (Durante and Knight, 2012; Gläßel and Paula, 2020; Knight and Tribin, 2022; Enikolopov et al., 2023), market competition (Qin et al., 2018), and citizens' ability to "tune out" (Knight and Tribin, 2019). Our findings contribute to this literature by highlighting the role of diversity of citizens' attitudes and opinions in limiting information manipulation.

Our model of information manipulation follows the Bayesian persuasion approach (Kamenica and Gentzkow, 2011), especially works that incorporate receiver heterogeneity (Wang, 2015; Alonso and Câmara, 2016a; Kolotilin et al., 2017; Bardhi and Guo, 2018; Chan et al., 2019; Arieli and Babichenko, 2019; Kerman et al., 2022; Sun et al., 2022; Alonso and Câmara, 2016b; Laclau and Renou, 2017; Kosterina, 2022; Innocenti, 2022; Gitmez and Sonin, 2023).[4] We contribute to this literature by establishing two new comparative statics results with respect to changes in the extent of receiver heterogeneity, as measured by a novel variability order. Kolotilin (2015), Kolotilin et al. (2022), Sun et al. (2022), and Curello and Sinander (2022) also conduct comparative statics exercises in Bayesian persuasion settings. Whereas Kolotilin (2015) focuses on changes in welfare, we analyze changes in the optimal policy. Sun et al. (2022) derive comparative statics with respect to the sender's preferences. Our result complement theirs by focusing on changes in receivers' characteristics. Kolotilin et al. (2022) consider changes in the distribution of receiver types that correspond to location-scale shifts in receivers' inclination to take an action. In contrast, we consider changes that keep the mode of the distribution constant while increasing its spread. Finally, in parallel work, Curello and Sinander (2022) examine the comparative statics of Bayesian persuasion. Our approach differs from theirs in two key ways. First, while they focus on changes in the sender's value function, we focus on variations in the distribution of receiver types. Second, our approach employs a novel variability order on distributions, enabling us to view changes in the distribution of types as changes in the extent of heterogeneity.

2 The Model

There are two types of agents: an autocrat and a unit measure of citizens, indexed by $r \in [0,1]$. Each citizen chooses an action, denoted by $a_r \in \{0,1\}$. The $a_r = 1$ action represents any costly

[4] Also related is the literature on information design, which studies the optimal information structure in a game with multiple players (Bergemann and Morris, 2019; Taneva, 2019; Mathevet et al., 2020; Inostroza and Pavan, 2022).

action taken by citizen r to support the autocrat on a given political issue—such as voting for the autocrat in an election or attending a rally in support of the autocrat's position.

There is an underlying state of the world, denoted by $\theta \in \{0,1\}$. The state represents whether supporting the autocrat on the political issue in question is in the citizens' best interest. The $\theta = 1$ state is the "good" state where it is optimal for citizens to support the autocrat, whereas $\theta = 0$ is the "bad" state where supporting the autocrat is not optimal. Citizens and the autocrat share a common prior $p \in (0,1)$ that the state is good.

The autocrat wants to maximize his support regardless of the state of the world. Specifically, he has state-independent preferences represented by the payoff function

$$u_s(\{a_r\}_r) = \int_0^1 a_r dr. \tag{1}$$

Citizens want to support the autocrat only when the state is good. Citizen r's payoff when she chooses action a_r and the state is θ is given by

$$u_r(a_r, \theta) = a_r(\theta - c_r), \tag{2}$$

where $c_r \in [0,1]$ is citizen r's cost of supporting the autocrat's policy.[5] Citizens are heterogeneous in their costs of support, with $f(c)$ denoting the density of costs. We assume that f is common knowledge and continuously differentiable and bounded over its support. Although citizens are heterogeneous, they all want to support the autocrat in the good state and not support him when the state is bad.

We use the heterogeneity in the distribution of costs as a shorthand for the diversity of "attitudes and opinions" in society. The paper's main comparative statics results concern how changes in the heterogeneity of f affect the autocrat's optimal persuasion policy. Similar results would obtain in an extended model that features other dimensions of heterogeneity.[6] A change in f can thus represent any change in citizens' attitudes and opinions that impact their inclination to support the autocrat.

Citizens do not learn the state of the world until after they have decided on whether to support the autocrat. Since citizens do not observe the state, they can only act based on their beliefs. The autocrat can influence those beliefs (and the resulting actions) by sending informative messages. To simplify the analysis, we assume that the autocrat can commit to a public communication strategy $\sigma : \{0,1\} \to \Delta(M)$, where $\sigma(\theta)[m]$ is the probability that public message $m \in M$ is generated when the state is θ.[7] The communication strategy represents the policies followed by the media controlled by the autocrat and used by him to influence the views of citizens.

[5] Setting citizens' payoffs from the $a_r = 0$ action to zero is a normalization.

[6] An earlier draft of the paper allowed for citizens to have both heterogeneous priors and heterogeneous costs. Our analysis there followed the same steps as in the common prior model by replacing the density of costs with a unidimensional distribution that summarizes the two dimensions of heterogeneity. See Gitmez and Molavi (2023) for the details.

[7] If the autocrat could observe each citizen's type, he would use a personalized strategy. The optimal policy would then be independent of

The commitment assumption can be defended on several grounds. First and foremost, in our setup, persuasion satisfies the credibility assumption of Lin and Liu (2022). Specifically, the persuasion game investigated in this paper can be seen as one instance in a series of recurring persuasion games played between the autocrat and citizens. In each round, a new political issue emerges, prompting citizens to decide whether to support the autocrat's stance on the issue. The likelihood that the autocrat's and citizens' interests align on any given issue is given by p, independently of other issues. Due to the recurring interactions between citizens and the autocrat, citizens are able to identify the frequency at which various messages are sent by the autocrat. Given that the autocrat's payoff in our model is additively separable, Lin and Liu (2022)'s main result implies that the autocrat's optimal long-term strategy is to adhere to the optimal commitment solution, even in the absence of commitment power.

Second, the autocrat's policy can viewed as an "editorial policy," which describes the general attitude of media sources, with the details of the coverage to be decided by reporters and editors (Gehlbach and Sonin, 2014). Finally, the outcome under commitment can be seen as a benchmark that describes the best-case scenario for the autocrat. Under this interpretation, our results characterize an "ideal media landscape" for a politician in a heterogeneous society.

Timing. The timing of the communication game is as follows:

1. The cost of each citizen is drawn from $f(c)$, and citizen r observes c_r.
2. The autocrat commits to a strategy σ, which is observed by all citizens.
3. The state is realized, and the autocrat sends the message drawn according to σ.
4. Citizens update their priors, and citizen r chooses action a_r.
5. Payoffs are realized.

The solution concept we adopt is the Perfect Bayesian Equilibrium.

3 Information Manipulation in Monolithic Societies

3.1 Single-Peaked Distributions

The solution to the autocrat's persuasion problem takes a particularly simple form when the distribution of costs satisfies the following condition:

the distribution of types. However, under the assumption that a citizen's cost of support is private information, the autocrat has to use an incentive-compatible persuasion mechanism. Kolotilin et al. (2017, Appendix B, Corollary 2) show that any such mechanism is implementable by a public communication strategy.

Definition 1. The density $f(\mu)$ is *single-peaked* if there exists some $\tilde{\mu} \in [0,1]$ such that $f'(\mu) > 0$ for all $\mu < \tilde{\mu}$ and $f'(\mu) < 0$ for all $\mu > \tilde{\mu}$.

Single-peakedness requires a large share of citizens to have moderate costs, with fewer and fewer people having extreme costs. We thus consider single-peaked densities to be representative of *monolithic* societies.

The significance of Definition 1 rests on the following observation: When the density is single-peaked, the autocrat's value function is first convex and then concave. Therefore, Corollary 2 of Kamenica and Gentzkow (2011) implies the following characterization of the optimal strategy:

Proposition 1. *If the density is single-peaked, the optimal strategy uses only two messages and one of the messages fully reveals the bad state.*

We maintain the assumption of single-peakedness throughout this section. We do so in part for tractability. However, single-peaked distributions also constitute a natural and widely used class of distribution functions. In Section 4, we show that the optimal strategy in the case where the density is instead single-dipped is the mirror image of the optimal strategy in the single-peaked case.

3.2 A Measure of Information Manipulation

In light of Proposition 1, we can assume without loss that the autocrat uses only two messages. We label the messages $m \in M = \{0,1\}$, with $m = 1$ the "good" message, which is suggestive of $\theta = 1$, and $m = 0$ the "bad" message, which is suggestive of $\theta = 0$. The autocrat's strategy can be represented by a pair of numbers:

$$\sigma = (\sigma^0, \sigma^1) \in [0,1]^2,$$

where $\sigma^\theta \equiv \sigma(\theta)[m = 1]$ is the probability of sending the good message in state $\theta \in \{0,1\}$. Throughout, we assume without loss of generality that $\sigma^1 \geq \sigma^0$.

The autocrat *manipulates information* if he sends the good message when the state is bad or sends the bad message when the state is good. By Proposition 1, when the density is single-peaked, the bad message fully reveals the bad state; this entails sending the good message whenever the state is good, i.e., $\sigma^1 = 1$. Therefore, in the single-peaked case, the extent of information manipulation is conveniently summarized by the probability σ^0 of sending the good message when the state is bad. We use the following notion of information manipulation in this case:

Definition 2. Consider single-peaked densities f_1 and f_2 with the corresponding optimal strategies $\sigma_1 = (\sigma_1^0, \sigma_1^1)$ and $\sigma_2 = (\sigma_2^0, \sigma_2^1)$ for the autocrat. The autocrat *manipulates information less* given f_1 than given f_2 if $\sigma_1^0 \leq \sigma_2^0$.

3.3 A Measure of Heterogeneity

To study how diversity affects information manipulation, we need to introduce a measure of heterogeneity. Our measure is a novel partial order on probability distributions.

Definition 3. Consider two single-peaked distributions with densities f_1 and f_2 supported on a common compact set. f_1 is *more spread out* than f_2 if

$$f_2(x) = \alpha\left(f_1(x)\right) \qquad \text{for all } x, \tag{3}$$

for some strictly increasing and convex function $\alpha : \mathbb{R}^+ \to \mathbb{R}^+$.[8]

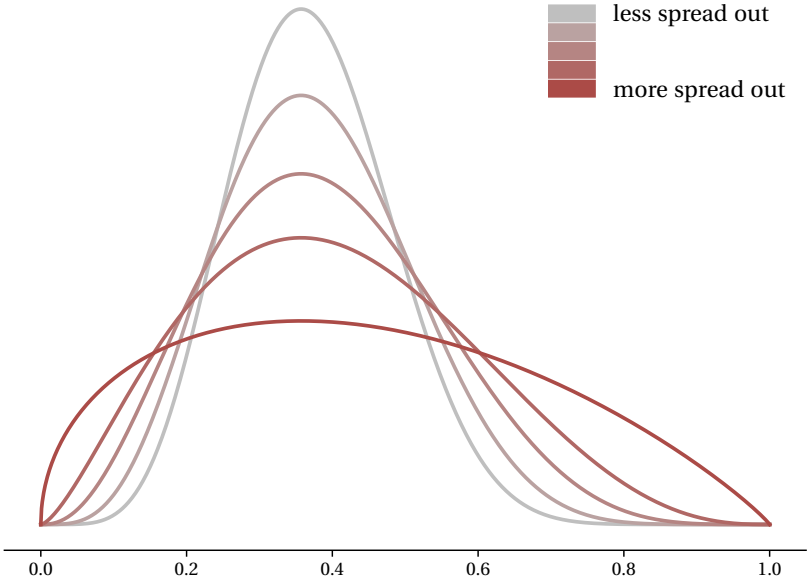

Figure 1. The spread order on single-peaked densities.

This partial order has an intuitive interpretation. Because α is increasing, f_2 is single-peaked whenever f_1 is single-peaked. Since α is convex and f_1 and f_2 both have to integrate to one, transforming f_1 by α magnifies the parts of f_1 with larger values and shrinks the parts with smaller values. Moving from f_1 to f_2 thus moves mass from parts of the distribution that initially have smaller mass to parts with larger initial mass. In other words, f_2 looks like f_1, but with higher peaks and deeper troughs. But since f_1 is single-peaked, most of its mass is concentrated around its peak. Therefore, f_2 has even more mass in the center and even less mass in the periphery relative to f_1; that is, f_2 is less spread out than f_1. Figure 1 illustrates the probability density functions for a set of single-peaked Beta distributions that are ranked in the spread order.

Members of many parametric families of distributions can be ordered in the spread order. Two examples follow:

[8] That a single-peaked distribution f_1 is more spread out than another single-peaked distribution f_2 does *not* mean that f_1 is a mean-preserving spread of f_2. If anything, f_1 can be viewed as a *mode-preserving spread* of f_2.

Example 1. Consider two single-peaked Beta distributions

$$f_1 = \text{Beta}(\alpha_1, \beta_1),$$
$$f_2 = \text{Beta}(\alpha_2, \beta_2),$$

where $\frac{\alpha_1-1}{\alpha_1+\beta_1-2} = \frac{\alpha_2-1}{\alpha_2+\beta_2-2}$. If $\alpha_1 \geq \alpha_2$, then f_2 is more spread out than f_1, while if $\alpha_1 \leq \alpha_2$, then f_1 is more spread out than f_2. In particular, any two single-peaked Beta distributions with the same mode are ranked according to the spread partial order.

Example 2. Consider the following truncated normal distributions on $[0, 1]$:

$$f_1 = \text{TruncatedNormal}(\mu, \sigma_1^2),$$
$$f_2 = \text{TruncatedNormal}(\mu, \sigma_2^2).$$

If $\sigma_2^2 \geq \sigma_1^2$, then f_2 is more spread out than f_1.

Johnson and Myatt (2006)'s *rotation order* is a related partial order, which also ranks distributions in terms of their heterogeneity. The main difference between the two is that Johnson and Myatt (2006) consider rotations of a cumulative distribution function around a given point, whereas in our partial order the rotation point itself depends on the distribution function. The endogeneity of the rotation point to the distribution function is crucial for our comparative statics results. It ensures that the rotation point is always in the appropriate range for an increase in heterogeneity to have an unambiguous effect on the extent of information manipulation.

3.4 Heterogeneity and Information Manipulation in Monolithic Societies

We are now ready to examine how heterogeneity affects information manipulation. Our main result establishes that information manipulation is less severe in societies with more spread out costs of support.

Theorem 1. *Let f_1 and f_2 be two single-peaked densities. If f_1 is more spread out than f_2, then the autocrat manipulates information less given f_1 than f_2.*

The intuition for this result is best understood by examining the effectiveness of targeted messaging. The autocrat's optimal strategy targets a marginal citizen who, upon receiving the positive message, is just indifferent between supporting the autocrat and not. Citizens with lower costs follow the recommendation conveyed by the message, while those with higher costs never support the autocrat. The optimal strategy balances the autocrat's goal of maximizing the mass of supporters with that of maximizing the support frequency. In a less spread out society, the costs are tightly concentrated around the modal citizen's cost. Therefore, targeting a citizen whose cost

is slightly above the mode ensures the support of almost every citizen. But in a diverse society with more spread out costs, this same approach yields too few supporters. To counter this, the autocrat needs to increase the informativeness of the media, appealing to those with costs further from the mode.

Theorem 1 describes the impact of heterogeneity on information manipulation while maintaining the assumption that the society is monolithic, and so, the density is single-peaked. In the next section, we study persuasion in divided societies, in which there are more people in the extremes than in the middle of the cost distribution.

4 Divided Societies

Throughout this section, we study the properties of the optimal persuasion strategy when the density of costs is the polar opposite of single-peaked.

Definition 4. The density $f(\mu)$ is *single-dipped* if there exists some $\tilde{\mu} \in [0,1]$ such that $f'(\mu) < 0$ for all $\mu < \tilde{\mu}$ and $f'(\mu) > 0$ for all $\mu > \tilde{\mu}$.

In a society with a single-dipped density, there are fewer moderates than those with extreme preferences. Therefore, we consider single-dipped densities to be representative of *divided* societies.[9]

When the density is single-dipped, the autocrat's value function is first concave and then convex. The following proposition characterizes the optimal persuasion strategy in this case:

Proposition 2. *If the density is single-dipped, the optimal strategy uses only two messages and one of the messages fully reveals the good state.*

A comparison of Propositions 1 and 2 reveals that the optimal persuasion strategies are qualitatively different in monolithic and divided societies. In a divided society, there are many strong supporters (i.e., those with costs close to zero) and many strong skeptics (i.e., those with costs close to one). The autocrat's challenge is to convince the skeptics without alienating his supporters. The optimal strategy is to use a media source that frequently sends the bad message, so that the rare but credible occurrence of the good message is sufficient to convince even the most skeptical citizens.[10] [11] The strong supporters then have no reason to follow the media because they support the autocrat even when the bad message is realized.

[9] Following Fiorina and Abrams (2008, Figure 1), one may also call such a society *polarized*. We refrain from adopting this terminology because polarization is typically visualized as having a small number of groups, with high homogeneity within groups and high heterogeneity across groups (Esteban and Ray, 1994).

[10] Baum and Groeling (2009), Ladd and Lenz (2009), and Chiang and Knight (2011) document evidence of the persuasive power of communication when messages are sent by actors least expected to send them.

[11] One may interpret the optimal persuasion strategy as the existence of a limited number of independent media that are often critical of the autocrat. The generally critical coverage by such media lends them credibility, allowing the autocrat to benefit from their positive coverage in times of crisis. Such strategies are indeed employed by informational autocrats from time to time. For instance, following the anti-government protests and riots in Zhanaozen in December 2011, Kazakhstan's President Nursultan Nazarbayev suffered from a lack of

When the density is single-dipped, the autocrat's optimal strategy entails sending the bad message whenever the state is bad. The extent of information manipulation is then summarized by the probability σ^1 of sending the good message when the state is good.

Definition 5. Consider single-dipped densities f_1 and f_2 with the corresponding optimal strategies $\sigma_1 = (\sigma_1^0, \sigma_1^1)$ and $\sigma_2 = (\sigma_2^0, \sigma_2^1)$ for the autocrat. The autocrat *manipulates information less* given f_1 than given f_2 if $\sigma_1^1 \geq \sigma_2^1$.

We now examine the impact of increased heterogeneity on information manipulation. The following partial order is the appropriate extension of the partial order defined in Section 3.3 for single-peaked densities to the set of single-dipped densities:

Definition 6. Consider two single-dipped distributions with densities f_1 and f_2 supported on a common compact set. f_2 is *more spread out* than f_1 if

$$f_2(x) = \alpha\left(f_1(x)\right) \qquad \text{for all } x, \tag{4}$$

for some strictly increasing and convex function $\alpha : \mathbb{R}^+ \to \mathbb{R}^+$.

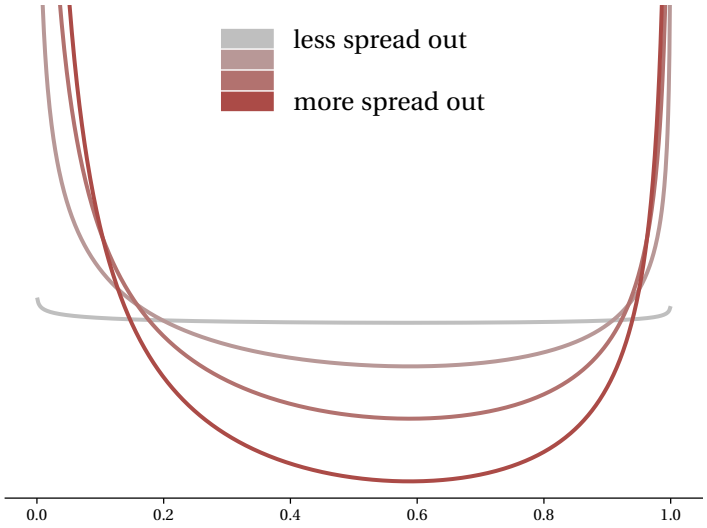

Figure 2. The spread order on single-dipped densities.

Figure 2 illustrates the spread order on a set of single-dipped Beta distributions. As the distribution becomes more spread out, mass is moved from the center of the distribution to its tails.

credibility of the state broadcasting outlets. When all else failed to calm the public, the government invited six well-known bloggers, most labeling themselves as "independent," to make a two-day visit to Zhanaozen. The bloggers carried a sense of credibility that the government sources lacked, and they were "quite effective at reassuring readers that the city was outwardly calm, that rumors of morgues or hospitals full of corpses were unfounded and that shops were well-stocked and inhabitants able to buy food and drink" (Lewis, 2016, p.267, also see Guriev and Treisman, 2022, p.79). In a similar episode, Vladimir Putin utilized the liberal Russian radio station Echo of Moscow to cover a credible account of a large pro-government demonstration in the capital in early 2012, thereby discouraging participation in opposition rallies elsewhere (Sobolev, 2023).

Our next result establishes that, here, as in the single-peaked case, heterogeneity reduces information manipulation.

Theorem 2. *Let f_1 and f_2 be two single-dipped densities. If f_1 is more spread out than f_2, then the autocrat manipulates information less given f_1 than f_2.*

Theorem 2 shows that the main message of Theorem 1 continues to hold in divided societies: Heterogeneity of attitudes and opinions reduces the extent of information manipulation.

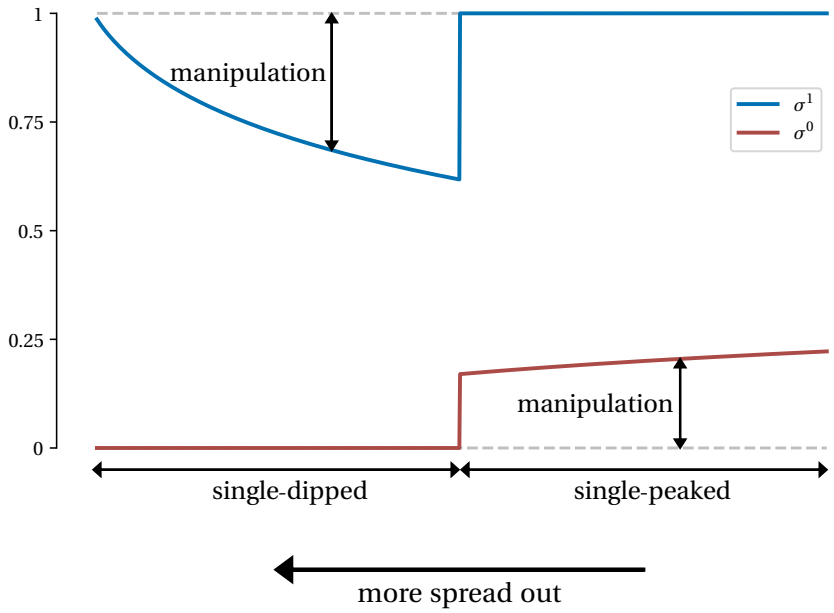

Figure 3. Autocrat's information manipulation as a function of heterogeneity in society.

The effect of heterogeneity on information manipulation can be succinctly summarized in a single figure by considering a parametric family of distributions that span both single-peaked and single-dipped cases. Figure 3 illustrates the effect of heterogeneity on information manipulation for the case where the density is a (symmetric) Beta$(1+\alpha, 1+\alpha)$ distribution, and the prior is $p = 0.4$. The figure plots how the autocrat's optimal strategy changes as α ranges from -1 to $+1$. In the right half of the figure, $\alpha > 0$, the distribution is single-peaked, and so, by Proposition 1, the optimal policy has the form $(\sigma_\alpha^0, \sigma_\alpha^1) = (\sigma_\alpha^0, 1)$. As citizens' types become more spread out, by Theorem 1, σ_α^0 decreases and the autocrat manipulates information less. On the left half of the figure, $\alpha < 0$, the distribution is single-dipped, the optimal policy has the form $(\sigma_\alpha^0, \sigma_\alpha^1) = (0, \sigma_\alpha^1)$ (by Proposition 2), and σ_α^1 increases and information manipulation decreases with heterogeneity (by Theorem 2).[12]

[12] Transitioning from a single-peaked to a single-dipped density changes the nature of the autocrat's optimal policy. This makes it hard to compare the extent of information manipulation between the single-peaked and single-dipped cases.

5 Conclusion

The growing literature on the rise of informational autocrats (Guriev and Treisman, 2022) discusses the modern autocrats' tendency to manipulate information. A natural question that follows from this research is about the conditions that make a society more susceptible to information manipulation. In this paper, we show that the heterogeneity of opinions puts a limit on an informational autocrat's ability to manipulate information.

To provide empirical support for this prediction, one needs to find variables that capture the heterogeneity of attitudes and opinions in a society. One readily available, albeit imperfect measure of heterogeneity is the Gini coefficient.[13] Petrova (2008) provides evidence that suggests a link between income inequality and media freedom in autocracies. Figure 2 of Petrova (2008) shows that, within autocracies (classified as countries with Democracy score $\leq$ 1 in Polity IV dataset), there is a positive association between the Gini coefficient and Freedom House's media freedom index in 1994–2003. Reassuringly, the corresponding association is negative for countries classified as democracies in that period (Figure 1 of Petrova, 2008), suggesting that the lack of functioning democratic institutions is an essential part of this story.

Throughout our analysis, we considered the distribution of opinions and attitudes to be exogenous, and we remained agnostic about the forces that may increase its heterogeneity. Two channels that may lead to increased heterogeneity are independent media and online media. In a recent working paper, Enikolopov, Rochlitz, Schoors and Zakharov (2023) demonstrate that access to independent online TV in Russia before the 2016 elections had asymmetric effects on individuals who relied on news from social media. Specifically, it bolstered the support among supporters of the regime while leading to a decline in support among those who opposed it. In light of the discussion here, one can argue that online media not only affect the attitudes of citizens but also have an impact on the effectiveness of traditional state-controlled media. In particular, online media do not have to convince every citizen—as long as they influence the opinions of *some* citizens, they could make it harder for the autocrat to engage in information manipulation.

In this paper, we focused on information manipulation as the only tool available to an autocrat. In reality, many autocrats have other tools at their disposal, such as repression and indoctrination (Gitmez and Sonin, 2023; Gehlbach, Luo, Shirikov and Vorobyev, 2022), even if they do not always use them. The question of how the mix of tools used by autocrats is affected by the distribution of opinions is a fruitful avenue for future research.

[13] Although only a measure of income heterogeneity, the Gini coefficient has been shown to be related to social conflict (Rodrik, 1999) and lack of social cohesion (Easterly, Ritzen and Woolcock, 2006).

6 Proofs

Proof of Proposition 1. We begin by noting that the density is single-peaked if and only if $f'(\mu)$ satisfies the *strict single-crossing-from-above property* adapted from (Milgrom and Shannon, 1994, p.160):

$$\text{If } f'(\mu) \geq 0 \text{ for some } \mu \in [0,1], \text{ then } f'(\tilde{\mu}) > 0 \text{ for all } \tilde{\mu} < \mu.$$

In our proofs, we rely on the equivalence of this condition with single-peakedness of f.

Following Kamenica and Gentzkow (2011), we construct the autocrat's *value function.* The value function $v(\mu)$ denotes the autocrat's payoff when he induces posterior $\mu = \Pr(\theta = 1|m)$. Consider a citizen r with posterior μ. By Equation (2), citizen r supports the autocrat if and only if her posterior that the state is good is at least as large as her cost of action; that is, $a_r = 1$ if and only if $c_r \leq \mu$. By Equation (1), the payoff to the autocrat is the share of the population who supports him:

$$v(\mu) = \int_0^{\mu} f(c)dc. \tag{5}$$

Note that $v(\mu)$ is twice differentiable in μ due to the differentiability of f, and $v''(\mu) = f'(\mu)$. If $f'(\mu)$ satisfies the strict single-crossing-from-above condition, by definition, so does $v''(\mu)$. Therefore, whenever $v(\mu)$ is convex at μ, it is strictly convex at any $\tilde{\mu} < \mu$. This means that $v(\mu)$ is first strictly convex and then strictly concave. Therefore, the set where the concave closure of $v(\mu)$—call it $V(\mu)$—coincides with $v(\mu)$ has the following form:

$$\{\mu \in [0,1] : V(\mu) = v(\mu)\} = \{0\} \cup [\hat{\mu}, 1],$$

for some $\hat{\mu} \in [0,1]$.

When $p_s < \hat{\mu}$, by Corollary 2 of Kamenica and Gentzkow (2011), the optimal policy generates two posteriors: $\mu \in \{0, \hat{\mu}\}$. This is achieved by two messages, with one perfectly revealing the bad state.

When $p_s \geq \hat{\mu}$, the optimal policy is not revealing any information. This can also be achieved by two messages, $m \in \{0,1\}$, and an information structure where $\Pr(m = 1|\theta = 0) = \Pr(m = 1|\theta = 1)$. Message $m = 0$ will occur with probability zero, and the posterior beliefs following $m = 0$ will be free in a Perfect Bayesian Equilibrium. Then, one can set $\Pr_r(\theta = 0|m = 0) = 1$ for all r and make $m = 0$ the message that perfectly reveals the bad state. □

Proof of Theorem 1. Take two single-peaked densities $f_1(\mu)$ and $f_2(\mu)$ that satisfy equation (3). The cumulative distribution function of f_2 is:

$$F_2(\mu) \equiv \int_0^{\mu} f_2(x)dx = \int_0^{\mu} \alpha\left(f_1(x)\right) dx.$$

For $k \in \{1,2\}$, let

$$y_k(\mu) \equiv f_k(\mu)\mu - F_k(\mu).$$

Boundedness of f_k and the fact that $F_k(0) = 0$ imply that $\lim_{\mu\to 0} y_k(\mu) = 0$ for $k \in \{1,2\}$. On the other hand, the continuity of f_k implies that y_k is continuous. Finally, y_k is first strictly increasing and then strictly decreasing since f' satisfies the strict single-crossing-from-above condition. Therefore, the set $\mathcal{U}_{y_k} \equiv \{\mu \in [0,1] : y_k(\mu) \geq 0\}$ has the following form:

$$\mathcal{U}_{y_k} = [0, \hat{\mu}_k].$$

Furthermore, whenever $\hat{\mu}_k < 1$, it satisfies:

$$y_k(\hat{\mu}_k) = 0. \tag{6}$$

The proof goes through showing that $\hat{\mu}_2 \leq \hat{\mu}_1$. If $\hat{\mu}_1 = 1$, this inequality is satisfied. If $\hat{\mu}_1 < 1$, $y_1(\hat{\mu}_1) = 0$, which implies $\frac{F_1(\hat{\mu}_1)}{\hat{\mu}_1} = f_1(\hat{\mu}_1)$. Then,

$$\frac{F_2(\hat{\mu}_1)}{\hat{\mu}_1} = \frac{\int_0^{\hat{\mu}_1} \alpha\left(f_1(x)\right) dx}{\hat{\mu}_1} \geq \alpha\left(\frac{\int_0^{\hat{\mu}_1} f_1(x)dx}{\hat{\mu}_1}\right) = \alpha\left(\frac{F_1(\hat{\mu}_1)}{\hat{\mu}_1}\right) = \alpha\left(f_1(\hat{\mu}_1)\right) = f_2(\hat{\mu}_1),$$

where the inequality follows from the integral form of Jensen's inequality (e.g., Dragomir et al. 2016). Therefore, $F_2(\hat{\mu}_1) \geq f_2(\hat{\mu}_1)\hat{\mu}_1$, and $y_2(\hat{\mu}_1) \leq 0$. Since $\mathcal{U}_{y_2} = [0, \hat{\mu}_2]$, $y_2(\mu)$ crosses zero from above at $\hat{\mu}_2$, and $y_2'(\hat{\mu}_2) \leq 0$. Since $y_2'(\mu)$ satisfies the strict single-crossing-from-above condition, $y_2(\tilde{\mu}) < 0$ for any $\tilde{\mu} > \hat{\mu}_1$. We conclude that $\hat{\mu}_2 \leq \hat{\mu}_1$.

To complete the proof, consider three cases:

1. If $p_s \geq \hat{\mu}_1$, the optimal policy does not reveal any information in either case, and $\sigma_1^0 = \sigma_2^0 = 1$.
2. If $\hat{\mu}_1 > p_s \geq \hat{\mu}_2$, the optimal policy under $f_2(\mu)$ does not reveal any information, and $\sigma_1^0 < 1 = \sigma_2^0$.
3. If $p_s < \hat{\mu}_2$, the optimal policies σ_1^0 and σ_2^0 satisfy:

$$\frac{p_s}{p_s + (1-p_s)\sigma_1^0} = \hat{\mu}_1, \qquad \frac{p_s}{p_s + (1-p_s)\sigma_2^0} = \hat{\mu}_2.$$

Then, $\hat{\mu}_1 \geq \hat{\mu}_2$ implies $\sigma_1^0 \leq \sigma_2^0$.

□

Proof of Proposition 2. Note that the single-dippedness of the density is equivalent to the following *strict single-crossing-from-below property* for $f'(\mu)$:

$$\text{If } f'(\mu) \geq 0 \text{ for some } \mu \in [0,1], \text{ then } f'(\tilde{\mu}) > 0 \text{ for all } \tilde{\mu} > \mu.$$

Following the same argument as in the proof of Proposition 1, $v''(\mu) = f'(\mu)$. If $f'(\mu)$ satisfies the strict single-crossing-from-below condition, by definition, so does $v''(\mu)$. Therefore, whenever $v(\mu)$ is convex at μ, it is strictly convex at any $\hat{\mu} \geq \mu$. This means that $v(\mu)$ is first strictly concave and then strictly convex. Therefore, the set where the concave closure of $v(\mu)$ coincides with $v(\mu)$ has the following form:

$$\{\mu \in [0,1] : V(\mu) = v(\mu)\} = [0, \hat{\mu}] \cup \{1\}.$$

When $p_s < \hat{\mu}$, the optimal policy is not revealing any information. This can be achieved by two messages, $m \in \{0,1\}$, and an information structure where $\Pr(m = 1|\theta = 0) = \Pr(m = 1|\theta = 1) = 0$. Message $m = 1$ will occur with probability zero, and the posterior beliefs following $m = 1$ will be free in a Perfect Bayesian Equilibrium. One can set $\Pr_r(\theta = 1|m = 1) = 1$ for all r to make $m = 1$ the message that perfectly reveals the good state.

When $p_s \geq \hat{\mu}$, by Corollary 2 of Kamenica and Gentzkow (2011), the optimal policy generates two posteriors: $\mu \in \{\hat{\mu}, 1\}$. This is achieved by two messages, $m \in \{0,1\}$, where message $m = 1$ perfectly reveals the good state. □

Proof of Theorem 2. Take two single-peaked densities $f_1(\mu)$ and $f_2(\mu)$ that satisfy equation (4). For $k \in \{1,2\}$, let

$$z_k(\mu) \equiv f_k(\mu)(1-\mu) - (1 - F_k(\mu)).$$

By an argument similar to the one in the proof of Theorem 1, the set $\mathcal{L}_{z_k} \equiv \{\mu \in [0,1] : z_k(\mu) \leq 0\}$ has the following form:

$$\mathcal{L}_{z_k} = [\hat{\mu}_k, 1].$$

The proof goes through showing that $\hat{\mu}_2 \leq \hat{\mu}_1$. By the definition of $\hat{\mu}_1$, $z_1(\hat{\mu}_1) \leq 0$, which implies: $\frac{1-F_1(\mu))}{1-\hat{\mu}_1} \geq f_1(\hat{\mu}_1)$. Then,

$$\frac{1 - F_2(\hat{\mu}_1)}{1-\hat{\mu}_1} = \frac{\int_{\hat{\mu}_1}^1 \alpha\left(f_1(x)\right) dx}{1-\hat{\mu}_1} \geq \alpha\left(\frac{\int_{\hat{\mu}_1}^1 f_1(x)dx}{1-\hat{\mu}_1}\right) = \alpha\left(\frac{1 - F_1(\hat{\mu}_1)}{1-\hat{\mu}_1}\right) \geq \alpha\left(f_1(\hat{\mu}_1)\right) = f_2(\hat{\mu}_1).$$

Therefore, $z_2(\hat{\mu}_1) \leq 0$. This means that $\hat{\mu}_1 \in \mathcal{L}_{z_2} = [\hat{\mu}_2, 1]$, and therefore, $\hat{\mu}_2 \leq \hat{\mu}_1$. Repeating the same argument as in the proof of Theorem 1, we conclude that $\sigma_2^1 \geq \sigma_1^1$. □

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