Information Aggregation in Stratified Societies

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Abstract

We analyze a model of political competition, in which the elite forms endogenously to aggregate information, and then advises the uninformed median voter which candidate to pick. The median voter knows whether or not the endorsed candidate is elite-biased, yet might prefer the biased candidate if the elite's endorsement carries enough information about the candidate's efficiency. The elite size, the extent of information aggregation by the elite, and the income stratification depend on the extent to which the uninformed voters follow the elite's advice. A high cost of redistribution results in lower trust, minimizes the elite's information advantage, and reduces the overall efficiency.

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Introduction

Economic progress requires efficient institutions of information aggregation. The idea that the public can benefit from trusting a small group of better informed people – be it politicians, professional public servants, journalists, or academic scholars — in making political decisions is as old as the idea of a representative democracy. Information transmission, however, might be fragile. For example, it breaks down if elites are suspected, rightly or not, that they exploit their power to promote own interests at the expense of the general public. In these cases, the social cohesion, social welfare, and the strength of the democratic system all decline.

The recent wave of populism has been often attributed to the breakdown of trust between elites and voting masses (Algan et al., 2017; Dustmann et al., 2017; Guriev and Papaiannou, 2021). Inglehart and Norris (2016) consider the 2016 Brexit vote as a rejection of the informed elite's advise. In Eichengreen (2018), the breakdown of trust results from a combination of economic insecurity and the inability of the political system to address the demand for change. Guiso et al. (2018) show that populist policies that disregard long-term economic harm emerge when voters 'lose faith' in the institutions and elites.[1] Yet, what is, structurally, the breakdown of information transmission? Is it related to economic stratification? And how does the elite's ability to aggregate information depends on the extent to which their advise is trusted by the uninformed voters?

In this paper, we offer a simple political model that relates information aggregation by an elite, the inefficiency of redistribution, and the willingness of the uninformed voters to use the elite's advise. The population consists of two groups: the elite minority group, which forms endogenously to aggregate information dispersed amongst the individual members, and the uninformed majority, the rest of the society. There are two politicians running for office who differ across two dimensions: their ability to create resources for the economy and their affinity with the elites. Members of the elites observe, individually, imperfect signals about the ability of the politicians, share them among themselves, and endorse one of the candidates based on the aggregated information. When the uninformed majority makes the choice, it takes into account that the elites are interested not only in the competence of the candidate, but also in the bias of one of the candidates towards them. The latter is important as, depending on the level of inefficiency of redistribution, it affects how resources are distributed in the economy when the politician is in office. The majority's willingness to follow the advice plays a critical role: if there is no trust, elite's endorsement is ignored, and valuable information is lost.

[1] In a classic study, Dornbusch and Edwards (1991) emphasized that populist policy "have almost unavoidably resulted in major macroeconomic crises that have ended up hurting the poorer segments of society."

A special feature of our modeling approach is that all agents are *ex ante* identical. As a result, the elite-commons stratification is an outcome of the elite-formation process, rather than an exogenous parameter.[2] While this assumption should not be taken literally – after all, in the real world the elite does not form anew each period – it allows us to unpack the relationship between information aggregation at the elite-formation stage and trust in the elite's advise at the voting stage. In particular, the advantage of using more information at the later voting stage leads to a more equitable elite formation at the first stage: with a higher chance that the voters follow the elite advice, the value of the advice is higher for those who give it. Therefore, with a higher trust in their advice, the optimal size of the elite, from the elite standpoint, becomes larger, and the stratification between the elite and non-elite members smaller.

In equilibrium, if the cost of redistribution is low, the majority follows the elite's endorsement. As in Crawford and Sobel (1982), the equilibrium in which information is transmitted is welfare-improving. However, when the cost of redistribution is relatively high, the voters do not trust the elites' advice, and valuable information is not transmitted. In other words, the negative relationship between the willingness to follow the elites' endorsement and stratification is driven by the information mechanism: because of the dead-weight losses of taxation, the elite's relative benefit is increasing in the cost of redistribution, which makes the elite's endorsement less informative when stratification is high.

Our approach allows to study a specific channel that relates information aggregation, which we model using the framework of Argenziano, Severinov and Squintani (2016), and trust: the endogenous formation of a group that shares information. All agents are *ex ante* identical, but for those who decided to form "the elite" individual information is aggregated; thus, the resulting group has an informational advantage over the rest of the population. When the majority is unwilling to follow the elite's advice, incentives to form a big "information-sharing club" is low; consequently, little information is aggregated, the median voter has little incentives to follow the informed advice, and common welfare suffers.

There is a substantial theoretical literature that focuses on the impact of third-party (e.g., media or special interest group) endorsements following the classic paper by Grossman and Helpman (1999). In our paper, there is no third party: the pivotal voter knows that the elite's endorsement is biased, yet tries to take advantage of the information that is transmitted by the endorsement. Myerson (2008) models trust as an equilibrium phenomenon, but the context is very different: trust is what keeps the autocrat's lieutenants abiding his command.

[2] We use the dead-weight losses of redistribution as an exogenous parameter, which is consistent with standard assumptions in political economy; see, e.g., Acemoglu and Robinson, 2001.

Chakraborty and Ghosh (2016) consider a model of Downsian competition between two office-seeking parties, in which voters that care about both the policy platform and "character" of candidates make a decision based on a media endorsement.[3] The media has its own policy agenda and, though voters know that the media's endorsement is based solely on information about the candidate's character, candidates in equilibrium pander to the media's policy preferences. Chakraborty and Yılmaz (2017) analyze a model of two-sided expertise that can be used to evaluate endorsements and elections with multiple informed parties with different interests; Chakraborty, Ghosh and Roy (2020) offer a model of elite endorsement and policy advocacy in a spatial model. In our model, the breakdown of information transmission is akin to the non-existence of influential endorsements when the interests are too divergent.

In Martinelli (2006), voters decide whether or not to acquire information before making a choice. In Prato and Wolton (2016), successful communication between candidates and voters during the pre-election campaign requires both an effort from the candidates and attention from voters. (See Prato and Wolton, 2018, on populism as political opportunism by incompetent politicians and Pastor and Veronesi, 2020 for the equilibrium model of populism in which voters elect a populist in response to rising inequality.) In Kartik and van Weelden (2019), uncertainty generates reputationally-motivated policy distortions in office no matter what the policymaker's true preference, so voters might prefer a "known devil to the unknown angel." In our setting, a similar outcome occurs via a different mechanism when the pivotal voter ignores the recommendation of the elite and goes with the unbiased politician, in which case valuable information is lost.[4]

Finally, our paper is related to the literature on club formation (Tiebout, 1956; Roberts, 2015; Acemoglu, Egorov and Sonin, 2012). As Ray (2011) observes, the literature on endogenous formation of clubs that aggregate information is scarce. In our model, elites form endogenously, with the optimal size satisfying the natural club formation requirements: current members want neither to accept new members nor to expel any of the current ones. The novel feature of our club formation process is information aggregation: the benefit of having more members is that the aggregated information is based on more independent signals and is, therefore, more precise.

The rest of the paper is organized as follows. Section 2 briefly reviews the main features of

[3] As defined in Chakraborty and Ghosh (2016), "character" is similar to "valence" (Groseclose, 2001; Aragones and Palfrey, 2002; Banks and Duggan, 2005). Kartik and McAfee (2007) were the first to introduce voters' uncertainty about valence. Bernhardt, Câmara and Squintani (2011) consider a dynamic citizen-candidates model with candidates that have both ideology and valence characteristics.

[4] For other models of cheap talk in elections, see Harrington (1992), Panova (2017), Schnakenberg (2016), and Kartik, Squintani and Tinn (2015).

anti-elite politics. In Section 3, we introduce our model. In Section 4, we assume that the size of the elite is fixed, while in Section 5 we endogenize it. Section 6 concludes.

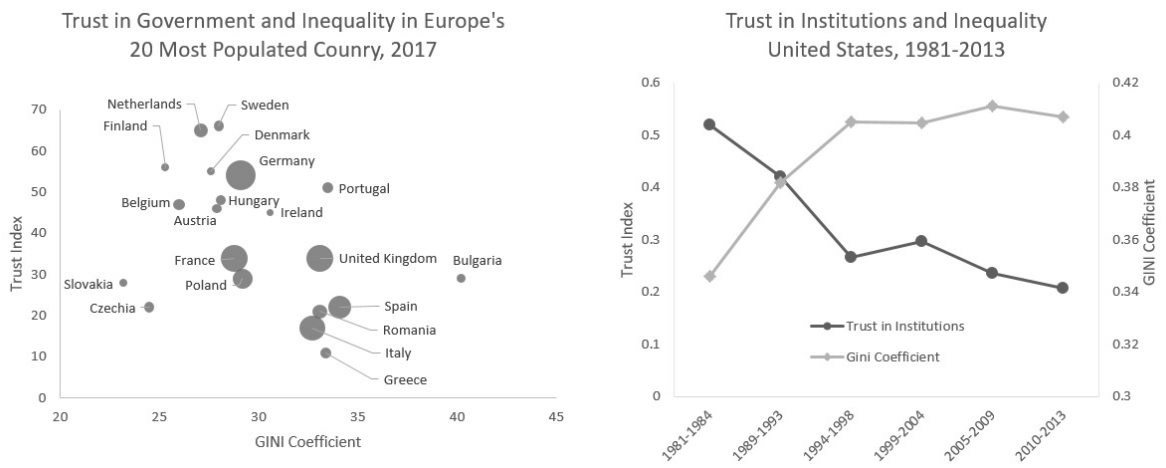
2 Anti-Elite Politics

The notion of the anti-elite politics has perhaps as long pedigree as politics itself. In 1820s, Andrew Jackson rode a horse as the champion of the "common man" against the emerging New England "aristocracy". In 1930s, the populist Louisiana Senator Huey Long threatened the dominance of Franklin Delano Roosevelt. Senator McCarthy did not run for president in 1950s, but his anti-elitism was bipartisan — he attacked professionals in both the Democratic and Republican administration – and highly popular at the peak.

In the 21st century, the anti-elite politics is most commonly associated with notion of populism. In fact, the most inclusive definition of populism adopted in the major recent survey by Guriev and Papaiannou (2021) from Mudde (2004) and Mudde and Kaltwasser (2017) defines it as a "thin-centered ideology" that considers society to be ultimately stratified into two homogeneous, antagonistic groups: "the pure people" and "the corrupt elite."

Rodrik (2017) points out that the modern populists often target the new elites, "unelected technocrats running central banks, independent regulatory agencies and international organizations, mainstream media, national and international NGOs, and corporate lobbyists". Rodrik goes on to argue that the solutions that elite offers on immigration, trade, outsourcing, or automation have been often indeed skewed towards the elites' interests. What our theory adds to this picture is that the distrust of the elites and the low quality of these elites are mutually reinforcing. When the people distrust the elites, the elites have low incentives to aggregate information, which leads to even more distrust as the quality of advice worsens.

In the 21st century Europe, the populism was fueled primarily by the issues of immigration and increased policy control by technocratic bureaucrats. Nowadays, populist parties represent a significant chunk of voters: the Freedom Party in Austria, the National Rally (formerly the National Front) in France, the League and the Five Star Movement in Italy, the Dutch Party for Freedom and the Forum for Democracy in the Netherlands, the True Finns Party in Finland, the People's Party in Denmark, the UK Independence Party and the Brexit Party in Great Britain. In our theory, there is no political positioning. However, the main force is exactly what drives the anti-elite populism: in an ideal world with full commitment, a competent pro-elite politician would commit to a position that would guarantee information transmission, and, therefore, the election of a more competent candidate. Our model demonstrates how this inability to



(a) Cross-country data

(b) United States data

Figure 1: Relationship between Trust and Inequality

commit translates into mistrust, which, in turn, leads to low level of information aggregation.

Keefer, Scartascini and Vlaicu (2019) analyze survey data from 6,000 respondents in seven Latin American countries to demonstrate the critical link between populism, trust, and the quality of government: voters who express low trust are significantly more likely to prefer populist policies, which in turn are determined by low quality of government.

Another important relationship that arises endogenously in our model is the one between stratification and willingness of the voters to use the elite's advice. Figure 1 illustrates the negative correlation between the level of political trust, a common sociological variable, and wealth inequality, one possible proxy for stratification, in two ways. Trust, as measured by opinion polls, is an imperfect proxy for the willingness to follow political endorsement; still, this is the best measure available to researchers. Panel (1a) uses data from the 20 most populated countries in Europe in 2017; similar picture may be obtained if one uses trust in media instead of the trust in governments, both of which are imperfect but reasonable proxies for trust in elites. The simple OLS regression detects negative relation between inequality as measured by the GINI coefficient and any of these two measures of political trust ($p = 0.03$ for trust in media and $p = 0.08$ for trust in governments).[5] Panel (1b) presents the evolution of political trust in institutions in the US from 1981 to 2013.[6] In general, the decrease in trust is accompanied by a

[5]Trust data are taken from the Eurobarometer 88 database. The trust index is the percentage of people who "tend to trust"the national government in each country in 2017. GINI coefficient data and population data are taken from the Eurostat database for 2017. See Dustmann et al. (2017) for more illustrations.

[6]Trust data are taken from the World Values Survey, which is conducted every five years and asks respondents the following questions: "I am going to name a number of organizations. For each one, could you tell me how much confidence you have in them?" There are four possible answers: (a) A great deal, (b) Quite a lot, (c) Not very much, and (d) None at all. We plot the average fraction of respondents who answered either (a) or (b) when asked about

steady increase in inequality (Piketty and Saez, 2003). Not surprisingly, the growing inequality contributes to the rise of populism (Pastor and Veronesi, 2020).

3 Setup

Consider a democratic society that consists of a large finite number of citizens, N. The citizens engage in two sequential interactions: First, they form two social groups, Elites and Commons. Second, they participate in a political game in which their interests depend on the group to which they belong. As a part of the political game, information about the competence of politicians can be communicated from Elites to Commons. Whether this information affects the voting decisions of Commons defines the level of *trust* in the society.

Elite formation. We assume that the Elites' group size, k, is determined endogenously so as to maximize the utility of its members. In equilibrium, Elite members do not want to change the group size by accepting or removing members. All citizens who are not part of Elites form the group of Commons. We denote the share of Elites in the citizenry by $\lambda = \frac{k}{N}$, and focus on the case that $\lambda < \frac{1}{2}$.

The political game. The citizens have to elect a politician to office. Once elected, the politician decides how to divide the available resources between the two groups. Being a majority, Commons can unilaterally decide the identity of the elected politician. However, Elites have an advantage over Commons: the information possessed by Elite members aggregates. Thus, Elites are informed better than Commons about the competence of the candidates. Since all citizens within Elites get the same level of resources, and all citizens within the Commons get the same level of resources, there is no collective action problem within groups.

Politicians. The two politicians who run for office differ across two dimensions: their preferences over how to distribute resources and their ability to create resources for the economy. We assume that one of the politicians, U, is unbiased and ascribes equal importance to the marginal per capita consumption she allocates to each of the two groups. The other politician, B, is biased towards the Elites. Her level of bias is determined by a parameter $\alpha \in \mathbb{R}^+$ that is known to both Elites and Commons. The value of α proxies the strength of ties the biased politician shares with Elites relative to Commons, where larger values capture higher leniency toward Elites.

parliament, the government and political parties.

We denote by $a^j \in \{0, \alpha\}$ the level of bias of politician $j \in \{U, B\}$ and by $x^E \geq 0$ and $x^C \geq 0$ the per capita consumption of Elites and Commons, respectively. The objective function of politician $j \in \{B, U\}$ is given by:

$$v\left(x^C, x^E\right) = \left(x^C + a^j\right)^{1-\lambda} \left(x^E\right)^{\lambda}. \tag{1}$$

The functional form of Equation (1) reflects a compromise between the politicians' egalitarian and utilitarian motives. The objective function of the unbiased politician is sometimes referred to as the Nash collective utility function (see, e.g., Moulin, 2004, and Kaneko and Nakamura, 1979, for a discussion of some desirable properties of this function). The objective function of the biased politician is different in that the importance of a marginal unit of Commons' per capita consumption is discounted, and this discount is stronger as α increases.

A politician's competence to create resources depends on a state of the world θ that is uniformly distributed over $[0, 1]$ and is unknown at the outset. We denote the competence of politician $j \in \{B, U\}$ by θ^j and assume that

$$\theta^B = 1 + \theta,$$
$$\theta^U = 2 - \theta.$$

Thus, the *ex ante* expected qualities of the two politicians are identical: $\mathbb{E}[\theta^B] = \mathbb{E}[\theta^U] = \frac{3}{2}$. The biased politician is more competent than the unbiased one if and only if $\theta > \frac{1}{2}$, which happens with a probability one-half.

The politician in office distributes the available resources θ^j among the two groups such that

$$\lambda x^E + (1 - \lambda)\, x^C \cdot \psi = \theta^j, \tag{2}$$

where the parameter ψ captures the cost of redistribution, that is the cost of converting a unit of Elites' consumption x^E into a unit of Commons' consumption x^C.[7] To simplify our analysis, we assume further that $\alpha \cdot \psi < \frac{1}{2}$.[8]

Information structure. At the outset, before the state of the world is realized, the group of Elites is formed in a way that maximizes the expected payoff of its members (as described

[7] Acemoglu and Robinson (2001, 2006) simply assume that redistributive taxation results in welfare losses; that is, that $\psi \geq 1$. The microfoundation for this effect is the classic "no distortion at the top" result in contract theory (see, for example, Bolton and Dewatripont, 2005).

[8] This assumption guarantees, for example, that the threshold defined in Lemma 1 is interior.

above). Then, the state θ is drawn from a uniform distribution over $[0,1]$. The state is not observed by the citizens.

We use the framework developed in Argenziano, Severinov and Squintani (2016) to model information aggregation. After the state is realized, each member of Elites conducts a (conditionally) independent experiment that results in a success or a failure. We assume that the probability of success is equal to the true θ. Thus, a successful experiment serves as a signal that θ is high, implying that the biased candidate is the more competent one. Conversely, a failed experiment serves as a signal that θ is low, implying that the unbiased candidate is the more competent one.

Elite members share the outcomes of their experiments. Thus, all the members of Elites observe the outcomes of all the experiments. This assumption captures the general intuition that assessing the quality of politicians is a complicated task that requires time investment, expertise, and interaction with those who possess some private information. In our model, these interactions take the form of sharing information among club members. [9]

In our basic setup we assume that commoners cannot conduct experiments. This assumption simplifies the analysis. However, in Section 5 we show that this assumption is not crucial in the following sense: even if commoners could conduct own experiments, but not share their outcomes, they would choose not to do so when the size of Elites is determined endogenously.[10] Indeed, our analysis shows that when the size of Elites is optimal, the information conveyed from Elites to Commons suffices to make each commoner disregard the outcome of her own experiment, eliminating the need to conduct an experiment in the first place. Thus, we view our restriction on information collection of Commons as a rather mild assumption.

Endorsements and voting. While Commons constitute the majority of the population and can effectively decide who is elected, Elites are better informed. It is therefore in the interest of both groups that information held by Elites is shared with Commons to ensure that the more competent politician is elected.

[9] Our assumption that elites have access to superior information is in line with a large body of literature on the sociology of elites. For example, Khan (2012) argues that knowledge capital is one of the five significant types of resources typically controlled by the elites (the other four types of resources are political, economic, social and cultural). To accumulate knowledge capital, which translates into informational advantage in our model, elites facilitate a network of social connections between group members to transfer information. These connections are created via social institutions such as elite schools and social clubs, which are used both to strengthen the ties between group members and to exclude outsiders. (See also Zimmerman, 2019, and Michelman, Price and Zimmerman, 2021.)

[10] More precisely, each commoner would be indifferent between conducting or not an experiment, since in any case the gathered information would not affect his actions. For any positive cost of experimentation, commoners would strictly prefer not to acquire information.

We assume that Elites cannot credibly share their information with Commons (in other words, they cannot reveal the number of successful experiments) and that they cannot commit *ex ante* to a strategy of information disclosure. Thus, information transmission between the two groups takes the form of "cheap talk" (Crawford and Sobel, 1982). Having observed the number of successful experiments, Elites can send costless and unverifiable messages to Commons, who update their beliefs about θ and elect their desired politician.

We denote by M the set of possible messages that Elites can send, and assume without loss of generality that $M = \{m_B, m_U\}$.[11] We interpret the message m_B as an *endorsement for the biased politician* and the message m_U as an *endorsement for the unbiased politician*. The strategy of Elites in the endorsement stage is denoted $\sigma_E : L \to M$, where $\sigma_E(l)$ is the endorsement when Elites observe $l \in L \equiv \{0, \ldots, \lambda N\}$ successful experiments.

Each commoner hears the endorsement, updates his posterior belief regarding the state of the world θ and the politicians' competence, and votes for a politician. A strategy for a commoner, denoted $\sigma_C : M \to \Delta\{B, U\}$, is a mapping between messages and distributions over votes (that is, for each message $m \in M$, the outcome $\sigma_C(m)$ is a lottery over the politician for which Commons vote). Since Commons constitute the majority, the politician for whom they vote is elected into office.

Our solution concept is the Perfect Bayesian Equilibrium, and we assume that each citizen votes as if her vote is decisive, which is a weakly undominated strategy, at the voting stage.

Timing. For the analysis that follows, it is useful to divide the timeline into two stages – the *formation stage* and the *political subgame* – as follows:

FORMATION STAGE:

1. The Elites' group of size k (which corresponds to the share $\lambda = k/N$) is formed; the size is optimal for the members of Elites.

POLITICAL SUBGAME:

2. Nature determines the state of the world $\theta \in \Theta$
3. Members of Elites conduct experiments and share results of these experiments with each other.
4. Elites endorse a politician: either $B = (\theta^B, \alpha)$ or $U = (\theta^U, 0)$.

[11] Formally, for any equilibrium in the game, there exists another equilibrium in which Elites send at most two messages with positive probabilities such that the distribution over outcomes in both equilibria is the same for almost all states $\theta \in \Theta$.

5. Commons choose the candidate, based on Elites' endorsement.

6. The elected politician steps into office and distributes resources.

4 The Determinants of Trust

We divide our analysis into two parts. We start by characterizing the equilibrium in the political subgame for an exogenously given size of Elites' share $\lambda = k/N$. Then, in Section 5, we determine the optimal choice of λ, taking into account how this choice affects behavior and payoffs in the political subgame.

We solve the political subgame backwards. First, we derive the actions of the elected politician. Then, we find a pair of endorsement and voting strategies (σ_E,σ_C) for Elites and Commons, respectively, that constitute an equilibrium in the subgame. We show that Elites use a cutoff strategy for endorsement, and we describe the conditions under which Commons are willing to accept the endorsement.

Politician's Actions. The actions of the politician in office depend on her type (θ^j, a^j). Specifically, the politician maximizes the objective given by Equation (1) subject to the constraint that appears in Equation (2). Solving the maximization problem yields that a politician of type (θ^j, a^j) chooses the allocation of consumption (x^E, x^C) as follows.

$$x^E\left(\theta^j, a^j\right) = \theta^j + (1-\lambda)\cdot a^j\psi, \tag{3}$$

$$x^C\left(\theta^j, a^j\right) = \frac{\theta^j}{\psi} - \lambda\cdot a^j. \tag{4}$$

Inspection of the Equations (3) and (4) suggests two useful observations. First, when redistribution is costless ($\psi = 1$), the unbiased politician distributes resources equally among all members of the society, whereas the biased politician allocates a higher share to Elites. When redistribution is costly ($\psi > 1$), then even the unbiased politician allocates a higher share of resources to Elites.[12]

Second, when the unbiased politician assumes office (i.e., $a^j = 0$), the share of Elites in the population (λ) does not affect allocations. By contrast, if the biased politician is elected, a larger share of Elites (λ) decreases the per capita consumption of both Elites and Commons.

[12] These results are consistent with the well-documented fact that policy decisions of elected officials are responsive to the public preference, but in a way that is strongly tilted toward the more affluent and well-connected citizens, i.e., the elites. See, e.g., Gilens (2012) and Bartles (2017).

Commons Trust and Elites Endorsement. Given a pair of strategies (σ_E, σ_C), denote by $\sigma_C(m_i)[B]$ the probability that a commoner votes for the biased politician when Elites send message $m_i \in \{m_B, m_U\}$. Since messages are cheap talk, there is no loss of generality in assuming that message m_B leads to a higher probability for electing B than message m_U does; that is, $\sigma_C(m_B)[B] \geq \sigma_C(m_U)[B]$.[13] An equilibrium (σ_C, σ_E) in the political sub-game is said to be *responsive* if Elites' endorsements m_B and m_U induce different distributions over commoners' actions. Otherwise, we call the equilibrium *unresponsive*.

Recall that l denotes the number of successful experiments that were conducted by the k members of Elites. Given θ, the number of successes l is ex ante distributed according to the binomial distribution:

$$f(l|k,\theta) = \frac{k!}{l!(k-l)!}\theta^l(1-\theta)^{k-l}, \quad \text{for } 0 \leq l \leq k.$$

The posterior distribution of θ, given l successes in k trials, is a Beta distribution with parameters $l+1$ and $k-l+1$. Its density is given by

$$\phi(\theta|l,k) = \frac{(k+1)!}{l!(k-l)!}\theta^l(1-\theta)^{k-l}, \text{ if } 0 \leq \theta \leq 1. \tag{5}$$

The conditional expectation of θ, after observing l successes in k trials, is

$$\mathbb{E}[\theta|l,k] = \frac{l+1}{k+2}. \tag{6}$$

The conditional expectation of the state, θ, that is given by Equation (6), allows us to characterize the strategy of Elites in a responsive equilibrium (if such an equilibrium exists).

Lemma 1 *Suppose that (σ_C, σ_E) is a responsive equilibrium. Then, Elites' strategy σ_E attains the following threshold structure:*

$$\sigma_E(l) = \begin{cases} m_B & \text{if } l \geq \hat{l}, \\ m_U & \text{if } l < \hat{l}, \end{cases}$$

where $\hat{l} \equiv \frac{k}{2} - \left(\frac{k}{2}+1\right)\alpha\psi(1-\lambda)$.

[13] For any equilibrium in which $\sigma_C(m_B)[B] < \sigma_C(m_U)[B]$, one can simply "re-label" the messages to obtain an equilibrium that satisfies $\sigma_C(m_B)[B] \geq \sigma_C(m_U)[B]$ in which, for each state $\theta \in \Theta$, the distribution over outcomes is identical to that of the original equilibrium.

Proof. Suppose that (σ_C, σ_E) is a responsive equilibrium. Elites endorse the biased politician if

$$\begin{aligned}&\sigma_c(m_B)[B] \cdot x_E\left(\mathbb{E}\left[\theta^B|l\right], \alpha\right) + (1-\sigma_c(m_B)[B]) \cdot x_E\left(\mathbb{E}\left[\theta^U|l\right], 0\right)\\ \geq &\sigma_c(m_U)[B] \cdot x_E\left(\mathbb{E}\left[\theta^B|l\right], \alpha\right) + (1-\sigma_c(m_U)[B]) \cdot x_E\left(\mathbb{E}\left[\theta^U|l\right], 0\right).\end{aligned}$$

Plugging in the expressions for $x_E\left(\theta^B, \alpha\right)$ and $x_E\left(\theta^U, 0\right)$ from (3) and substituting $\theta^B = 1+\theta$ and $\theta^U = 2-\theta$ we obtain

$$(\sigma_c(m_B)[B] - \sigma_c(m_U)[B]) \cdot (2\mathbb{E}(\theta|l,k) - 1 + (1-\lambda)\cdot\alpha\psi) \geq 0$$

In a responsive equilibrium, $\sigma_c(m_B)[B] > \sigma_c(m_U)[B]$, and, thus, the above inequality is satisfied for all $\mathbb{E}(\theta|l,k) \geq \frac{1}{2} - \frac{(1-\lambda)\cdot\alpha\psi}{2}$, which is satisfied whenever

$$l > \hat{l} = \frac{k}{2} - \left(\frac{k}{2}+1\right)\alpha\psi(1-\lambda).$$

■

Thus, in a responsive equilibrium (if one exists), Elites endorse the biased candidate B if and only if the number of successful experiments they observe is at least $\hat{l}$ (defined in the lemma); otherwise, they endorse the unbiased candidate U. The threshold $\hat{l}$ is less than $k/2$ as Elites are more inclined to endorse the biased politician.

Notice that the threshold $\hat{l}$ decreases with a greater redistribution cost (ψ) or a larger politician bias (α). That is, when the redistribution cost and/or the politician bias are greater, Elites need a smaller number of successes to endorse m_B. Intuitively, this is because *ceteris paribus*, the benefit for Elites of electing the biased politician is increasing in these quantities. On the other hand, an increase in Elite's share (λ) leads to a higher threshold $\hat{l}$. This is because a greater share of Elites decreases the per capita consumption of each member, thus weakening Elites' incentive to endorse the biased politician.

A responsive equilibrium does not necessarily need to exist.[14] In the remainder of this section we look for necessary and sufficient conditions for the equilibrium existence and study its properties.

[14] As it is standard in signaling games, an unresponsive equilibrium always exists. For example, Elites always endorsing the biased politician, and commoners always voting for the unbiased one is one such equilibrium.

4.1 Existence of a responsive equilibrium

To study the existence of a responsive equilibrium we begin by characterizing what Commons learn from endorsements, when Elites employ the cutoff strategy defined in Lemma 1. We then check whether it is in the interest of Commons to follow the endorsement.

In a responsive equilibrium, Elites' endorsements convey information regarding the competence of politicians. The expected values of θ, conditional on the specific endorsement, is as follows.

$$\mathbb{E}(\theta|m_B) = \sum_{l=\hat{l}}^{k} \Pr\left(l|\hat{l} \le l \le k\right) \cdot \mathbb{E}(\theta|l,k) = \frac{3-\alpha\psi(1-\lambda)}{4} - \frac{1}{2(k+2)} \tag{7}$$

$$\mathbb{E}(\theta|m_U) = \sum_{l=0}^{\hat{l}-1} \Pr\left(l|0 \le l \le \hat{l}-1\right) \cdot \mathbb{E}(\theta|l,k) = \frac{1-\alpha\psi(1-\lambda)}{4}. \tag{8}$$

Recall that the competence of the biased candidate, θ^B, is increasing in θ, whereas the competence of the unbiased candidate, θ^U, is decreasing θ. Thus, when the cost of redistribution (ψ) increases, the endorsement m_B provides a *weaker* indication of the competence of the biased politician B, whereas the endorsement m_U provides a *stronger* indication of the competence of the unbiased politician U. We show later that as N grows, the optimal number of Elite members, k^*, increases, whereas their share in the citizenry $\lambda^* = k^*/N$ converges to zero. Thus, as N goes to infinity, $\mathbb{E}(\theta|m_b)$ converges to $(3-\alpha\psi)/4$ and the competence of the biased and unbiased politicians, upon being endorsed by Elites, converges to $(7-\alpha\psi)/4$ and $(7+\alpha\psi)/4$, respectively.

Given what Commons learn from Elites' endorsements, are they willing to follow them?

Endorsements for the unbiased politician. Suppose that Elites, who follow the cutoff strategy defined in Lemma (1), endorse the unbiased politician (m_U). It is easy to verify that Commons always accept such an endorsement. This is because $\mathbb{E}\left[\theta^U|m^U\right] \ge \mathbb{E}\left[\theta^B|m^U\right]$, and, therefore, upon hearing m_U Commons deduce that the quality of the unbiased politician is greater. Since, in addition, the unbiased politician distributes resources more equally, it is always a best response for Commons to accept an endorsement for the unbiased politician.

Endorsements for the biased politician. Suppose that Elites, who follow the cutoff strategy defined in Lemma (1), endorse the biased politician (m_B). It is a best-response for commons to accept this endorsement if, conditional on the information they learn from the fact that m_b is sent, their payoff from electing the biased politician exceeds the payoff from electing the unbi-

ased one. Formally, Commons follow an endorsement of the biased politician (m_B) if and only if

$$\mathbb{E}[x^C(\theta^B, \alpha) \mid m_B] \geq \mathbb{E}[x^C(\theta^U, 0) \mid m_B].$$

By Equations (4) and (7), the above condition is satisfied if and only if the cost of redistribution (ψ), does not exceed an upper bound $\overline{\psi}(\lambda, \alpha)$:

$$\psi \leq \overline{\psi}(\lambda, \alpha) = \frac{\lambda N}{\alpha(\lambda + 1)(\lambda N + 2)} \tag{9}$$

Thus, when the redistribution cost (ψ) exceeds the threshold $\bar{\psi}(\lambda, \alpha)$, a responsive equilibrium does not exist: in any equilibrium, Commons do not trust Elites and disregard their advice. By contrast, when the redistribution cost is less than $\bar{\psi}(\lambda, \alpha)$, a responsive equilibrium exists. In this equilibrium, Commons follow Elites' endorsement despite the fact that sometimes Elites recommend a biased politician of lower quality than the unbiased one. The following proposition summarizes the above discussion.

Proposition 1 *For any size of Elites λ and any bias of the Elites' candidate α, there exists a redistribution cost threshold $\bar{\psi}(\lambda, \alpha)$ such that if $\psi > \bar{\psi}(\lambda, \alpha)$, then Commons disregard Elites' endorsements and always elect the unbiased politician. If $\psi \leq \bar{\psi}(\lambda, \alpha)$, there exists a responsive equilibrium: Elites recommend the biased politician if and only if they observe more than $\hat{l}$ successful experiments. Commons always accept Elites' endorsements.*

Proposition 1 demonstrates the crucial role that the redistribution cost (and therefore the level of inequality) plays in determining the extent of equilibrium information transmission. When the redistribution cost is low, Commons tolerate the informational distortions that accompany Elites' endorsements and accept the recommendations. When the redistribution cost is high, trust breaks down and Commons disregard endorsements despite their informational content. The positive correlation between the cost of redistribution and the extent of stratification, together with the negative correlation between the equilibrium level of willingness to follow the Elite's advice and the redistribution cost, are consistent with the evidence described in Section 2.

Proposition 1 also allows us to analyze how the politician's bias α and the share of the Elites club in the population λ affect the level of trust that transpires in the political game. For the parameter α, the effect is straightforward: when the biased politician is more 'Elites-oriented' (that is, when α is larger) the threshold $\bar{\psi}(\lambda, \alpha)$ decreases, making Commons less receptive to

endorsements. Intuitively, this is because a greater value of α decreases Commons' per capita consumption when they follow an endorsement for biased politician.

The impact of the Elites share λ is more subtle. A larger λ implies lower per capita consumption for both Commons and Elites when the biased politician is elected. While the former erodes trust, the latter enhances it. Holding the population size N fixed, a larger λ also increases the number of experiments conducted by Elites, hence making their endorsement more informative and Commons more willing to accept it. The next proposition summarizes the above discussion.

Proposition 2 *The redistribution cost threshold $\bar{\psi}(\lambda, \alpha)$ defined in (9) is decreasing in α. It is increasing in the elite's share, λ, when $\lambda < \sqrt{2/N}$, and decreasing otherwise.*

4.2 Properties of a responsive equilibrium

Suppose that the redistribution cost ψ does not exceed the threshold $\overline{\psi}$ so that a responsive equilibrium exists. How does the competence of the elected politician depend on the cost of redistribution?

Inspection of Equations (7) and (8) reveals that, conditional on both the endorsements m_B and m_U, the expected value of θ is decreasing in ψ. This implies that, on the one hand, an endorsement for the biased politician m_B conveys *less* information about her competence. And, on the other hand, an endorsement for the unbiased politician m_U conveys *more* information about her competence. Thus, the overall effect of ψ on the competence of the elected candidate depends on the ex ante probability that each of the endorsements is sent in equilibrium. These probabilities are given by

$$\Pr(m_B) = \sum_{l=\hat{l}}^{k} \Pr(l|k) = \frac{(\alpha\psi(1-\lambda)+1)(k+2)}{2(k+1)},$$
$$\Pr(m_U) = \sum_{l=0}^{\hat{l}-1} \Pr(l|k) = \frac{k-(k+2)\alpha\psi(1-\lambda)}{2(k+1)}.$$

The ex-ante competence of an endorsed politician is then given by

$$\begin{aligned}\mathbb{E}\left[\theta^j | j \text{ is endorsed}\right] &= \Pr(m_B)\cdot\mathbb{E}\left[\theta^B|m_B\right] + \Pr(m_U)\cdot\mathbb{E}\left[\theta^U|m_U\right] \\ &= \frac{7-\alpha^2\psi^2(1-\lambda)^2}{4} - \frac{(\alpha\psi(1-\lambda)+1)^2}{4(k+1)} \end{aligned} \tag{10}$$

Inspection of Equation (10) immediately reveals that, although a larger redistribution cost

(ψ) improves the informativeness of endorsing the unbiased politician, the the overall effect of the cost of redistribution on the ex-ante competence of the endorsed politician is negative.

Proposition 3 *Lower redistribution costs lead to more information transmission. Formally, let ψ_1 and ψ_2 be two levels of redistribution costs satisfying $\psi_1 < \psi_2 < \overline{\psi}$. Then, the expected competence of the politician elected under ψ_1 is higher than that of the elected under ψ_2.*

We conclude this section by briefly discussing how Elites could affect their payoff in the political subgame *if*, prior to observing the state, they could choose the bias level of "their" politician, α. On the one hand, an equilibrium with trust is always better for Elites than an equilibrium without trust. On the other hand, conditional on the equilibrium being responsive, Elites' expected payoff is increasing in α. Therefore, Elites have an incentive to increase the bias level so long as it does not break trust.

Put differently, if Elites have access to a pool of candidates with different levels of α, they choose to promote the political career of the candidate with the highest bias among those whose level of bias satisfies

$$\alpha \leq \bar{\alpha} \equiv \frac{\lambda N}{\psi\left(\lambda+1\right)\left(\lambda N+2\right)}$$

where $\bar{\alpha}$ is the level of bias which makes equation (9) bind in equality. Thus, when Elites can choose the bias level of their candidate they always preempt the breakdown of trust. Notice that as N tends to infinity, $\bar{\alpha}$ converges to $\frac{1}{\psi(1+\lambda)}$. Of course, this is only possible when the chosen candidate's bias is commonly known. (In Kartik and van Weelden, 2019, politicians strategically use cheap talk to signal their bias; in Acemoglu, Egorov and Sonin, 2013, they have to adopt populist policies to signal their unbiasedness.)

5 The Optimal Size of Elites

Previously, we analyzed the impact of stratification on the uninformed voter's willingness to follow the elite's advice. The reverse question – How does Commons' willingness to listen affects the process of elite formation and information aggregation? – is no less critical. In this section, we analyze the optimal size of Elites; as the size of Elites is the number of conditionally independent signals about the state of the world, this is a study of how optimal information aggregation depends on the extent to which Commons follow Elites' endorsements.

In a responsive equilibrium, Elites' expected utility is given by

$$u_T^E(\lambda) \equiv \mathbb{E}\left[x^E\right] = \Pr(m_B)\cdot x^E\left(\mathbb{E}\left[\theta^B|m_B\right],\alpha\right) + \Pr(m_U)\cdot x^E\left(\mathbb{E}\left[\theta^U|m_U\right],0\right)$$
$$= \frac{3}{2} + \frac{\alpha^2\psi^2(1-\lambda)^2 + 2\alpha\psi(1-\lambda)}{4} + \frac{\alpha^2\psi^2(1-\lambda)^2 + \lambda N}{4(\lambda N+1)}. \tag{11}$$

Suppose, for the time being, that λ can take any value in $\left[0,\frac{1}{2}\right]$. Our next lemma characterizes $\hat{\lambda}$ that maximizes $u_T^E(\lambda)$.

Lemma 2 *For a sufficiently large N, the expected payoff of Elites $u_T^E(\lambda)$ given by Equation (11) is single-peaked in λ and has a unique maximum $\lambda^* = \lambda^*(N) \in \left(0,\frac{1}{2}\right)$. Furthermore, $\lambda^*(N)$ is asymptotically bounded below by $\underline{\gamma}N^{-\frac{1}{2}}$ and above by $\overline{\gamma}N^{-\frac{1}{2}}$ for some positive constants $\underline{\gamma} < \overline{\gamma}$.*

Proof. We calculate and examine the first, second, and third derivatives of u_T^E, and draw the following implications. First, for large enough N, the function u^E is increasing at 0 and decreasing at $\frac{1}{2}$, i.e. $\frac{d}{d\lambda}u^E(0) > 0$ and $\frac{d}{d\lambda}u^E\left(\frac{1}{2}\right) < 0$. Next, for a sufficiently large N, the function u^E is concave in the neighbourhood of zero: $\frac{d^2}{(d\lambda)^2}u^E(0) < 0$. Finally, for a sufficiently large N, the third derivative is always positive in the interval $\lambda \in \left[0,\frac{1}{2}\right]$. This last observation implies that the the second derivative can be zero at most once, which means that the function u^E can switch from concavity to convexity once, but cannot switch back to concavity.

Now, suppose that N is sufficiently large so the above three properties hold. Since the function u^E is continuous, increasing at 0 and decreasing at $\frac{1}{2}$, then it must have at least one (local) maximum at some value $\lambda' \in \left[0,\frac{1}{2}\right]$. To show that this local maximum is unique, it suffices to show that the function cannot have a local minimum. If if it did, then there should be a point, at which the continuous function u^E switches from concavity to convexity, which is impossible as argued above.

Denote the unique maximum $\lambda^* = \lambda^*(N)$. Evaluating $u_T^{E\prime}(\cdot)$ at $\lambda^* N^{-\frac{1}{2}}$, we get an expression whose sign is determined by the term $1 - \alpha\psi\left(1 + 2(\lambda^*)^2\right)$. Thus, for a small $\varepsilon > 0$ and a sufficiently large N, $\left(\sqrt{\frac{1}{2\alpha\psi} - \frac{1}{2}} - \varepsilon\right)N^{-\frac{1}{2}} < \lambda^*(N) < \left(\sqrt{\frac{1}{2\alpha\psi} - \frac{1}{2}} + \varepsilon\right)N^{-\frac{1}{2}}$. ■

Since all agents are *ex ante* symmetric, Lemma 2 guarantees, generically, the existence of an equilibrium size $\lambda^* \in \left\{0,\frac{1}{N},\frac{2}{N},\ldots,\frac{1}{2}\right\}$ of Elites. Since $u_T^E(\lambda)$ is single-peaked over a domain when λ is continuous, it has at most two maxima when λ is discrete; in a generic case, it has a unique maximum. Now, suppose that λ^* is this maximum, and the club of $k^* = N\lambda^*$ members has been formed. Clearly, this club satisfies our equilibrium criteria regardless of the decision-making rule within the club. Every member would prefer neither to accept any more members nor to expel anyone.

Of course, Lemma 2 does not guarantee the uniqueness of a stable club. One reason for non-uniqueness is familiar for students of club formation: the instability of a subcoalition makes a large coalition stable (e.g., Acemoglu, Egorov and Sonin, 2012). In our case, suppose that decisions about club membership are accomplished by majority voting, $k^* < \frac{N}{4}$, and suppose that a club of size $2k^*$ is formed. First, observe that this club will not admit any more members as the utility function of each member is single-peaked. Therefore, increasing membership brings down the utility for each member. Second, there will be at least k^* members who would not agree to the removal of a single Elites member. Indeed, if at least one member from the $2k^*$-sized Elites is removed, there is a coalition of k^* members who have the majority to remove the remaining $k^* - 1$ members. Thus, there is a blocking coalition of k^* members that make the $2k^*$-sized Elites stable.[15]

An Elites group that consists of k^* members is a natural outcome of the elite-formation process: this is the club that forms if formation starts, naturally, from the club consisting of one member. The following Proposition 4 states the existence result formally.

Proposition 4 *For a sufficiently large N, Elites is a stable club of size k^* at the elite formation stage. Moreover, this club size satisfies the condition for the existence of a responsive equilibrium given by Equation (9).*

Proof. The first part of the proposition follows from Lemma 2. To prove that a responsive equilibrium exists when the Elites' share is λ^*, rewrite condition (9) as follows:

$$\frac{-N\alpha\lambda^2\psi + N\lambda - 2\alpha\lambda\psi - N\alpha\lambda\psi - 2\alpha\psi}{\alpha(\lambda+1)(N\lambda+2)} \geq 0.$$

The numerator is a quadratic function with two real roots, $\underline{\lambda}$ and $\overline{\lambda}$. A responsive equilibrium exists whenever $\lambda^* \in \left[\underline{\lambda}, \overline{\lambda}\right]$. This follows from the asymptotic boundedness of λ^* established in Lemma 2. ■

Proposition (4) implies that as N tends to infinity, the number of members in Elites grows asymptotically as $\sqrt{N}$. Thus, as the size of the population grows, the optimal number of members in the Elites club grows unboundedly (k increases), but their proportion in the population goes to zero (i.e. $\lambda \to 0$).

Once we have established that an optimal equilibrium size of Elites exists, a natural question is: what is the effect of the redistribution cost on the optimal size? Proposition 5 provides

[15] This argument is admittedly heuristic, as we have not specified any game that leads to Elites formation. Still, given the equilibrium of the continuation game, the payoffs that citizens have *ex ante* satisfy the conditions for a non-cooperative club formation game in (Acemoglu, Egorov and Sonin, 2012). Thus, our argument can be made formal at the cost of introducing additional game-theoretic machinery.

comparative statics results. Once again, the result follows from the analysis of the derivative of $u_T^E(\lambda)$, which is cubic in λ and single-peaked on $\left[0, \frac{1}{2}\right]$.

Proposition 5 *The optimal size of the Elites club k^* is decreasing in the bias α of the pro-elite candidate and in the cost of redistribution ψ.*

The comparative statics results of Proposition 5 is intuitive. The critical element is the breakdown of trust: with higher bias, the range of parameters for which Commons follow the Elites' endorsement narrows. Increasing α decreases the value of information as well. Similarly, a higher cost of redistribution ψ results in a lower level of trust, which in turn decreases the value of information that a potential member of Elites contributes. As a result, the optimal size of Elites and the quality of information that Elites aggregate are lower.

Optimal Elites Size and Commoners Experimentation. In the analysis above, we assumed that commoners cannot conduct experiments. We will now show that when the size of Elites is determined optimally, commoners *do not want* to conduct experiments even if they can. This is because whenever the result of a commoner's experiment disagrees with Elites endorsement, it is the commoner's best interest to disregard her own signal. This result hinges, of course, on the assumption that commoners cannot share the results of their experiments with each other.

Proposition 6 *When Elites' share is optimal, λ^*, commoners have no incentive to conduct experiments.*

Proof. Suppose first that a commoner conducts one experiment that fails. By Equation (5), the density function of his posterior belief about θ is given by $\hat{f}(\theta|\text{one failure observed}) = 2(1-\theta)$. From this commoner perspective, the probability to observe l successes when k more experiments are conducted is given by:

$$\begin{aligned}\Pr(l \mid k, \text{one failure observed}) &= \int_0^1 2(1-\theta)\frac{k!}{l!(k-l)!}\theta^l(1-\theta)^{k-l}\,d\theta \\ &= \frac{2(k+1-l)}{(k+1)(k+2)}.\end{aligned}$$

By Lemma 1, Elites endorse the biased politician if they observe at least $\hat{l}$ successes. From the commoner's perspective, the probability that exactly l successes are observed by Elites, conditional on the fact that they observe at least $\hat{l}$ successful experiments, and that he observed

one failed experiment, is then given by

$$\frac{\Pr\left(l \mid k,\text{one failure observed}\right)}{\sum_{j=\hat{l}}^{k}\Pr\left(j \mid k,\text{one failure observed}\right)}=\frac{\frac{2(k+1-l)}{(k+1)(k+2)}}{\sum_{j=\hat{l}}^{k}\frac{2(k+1-j)}{(k+1)(k+2)}}=\frac{2k+2-2l}{\left(k-\hat{l}+1\right)\left(k-\hat{l}+2\right)}.$$

Denote the conditional expectation of θ as a function of k by $H_F(k)$. We then have that:

$$H_F(k)=\sum_{l=\hat{l}}^{k}\frac{2k+2-2l}{\left(k-\hat{l}+1\right)\left(k-\hat{l}+2\right)}\cdot\mathbb{E}\left[\theta|l,k+1\right]=\frac{k+2\hat{l}+3}{3\left(k+3\right)}. \tag{12}$$

The commoner votes for the biased politician whenever $2H_F(k)-1-\alpha\lambda\psi\geq 0$. Using Equation (12), and the expression for $\hat{l}$, as defined in Lemma 1, and the fact that $k=N\lambda$ we rewrite the above inequality as follows:

$$\frac{1}{3\left(N\lambda+3\right)}\left(-N\alpha\lambda^2\psi+\left(-5\alpha\psi+\left(\frac{1}{2}-\alpha\psi\right)2N\right)\lambda-\left(4\alpha\psi+3\right)\right)\geq 0.$$

Lemma 2 implies that for sufficiently large N, the sign of the left-hand side of the above inequality is determined by the sign of $\left(\frac{1}{2}-\alpha\psi\right)$. As $\frac{1}{2}>\alpha\psi$, the commoner votes for the biased politician even though his experiment failed. A similar argument establishes the result in the case of a commoner conducting a successful experiment while Elites endorse the unbiased politician. ■

Proposition 6 establishes that when Elites' club size is λ^*, then even if a commoner were to conduct an experiment on her own, she would choose to disregard its outcome and follow Elites' endorsement. Intuitively, the fact that Elites share the outcomes of their experiments makes the informativeness of their endorsement sufficiently strong so as to dominate the informativeness of the experiment of any single commoner.

Finally, notice that club size k^* is optimal for Elites even if commoners can experiment. This is because, for sufficiently large N, Elites are always worse off when commoners acquire information and decide the outcome of the elections rather than follow the Elites' recommendation.[16] Thus, when N is sufficiently large, a club of size λ^* (which is optimal when commoners cannot, or do not want to, acquire information) is better for Elites compared to any smaller club size that potentially induces commoners to conduct experiments.

[16] To see this, notice that by Equation (11), when N is sufficiently large and the club size is λ^*, the expected utility of an Elite member converges to $7/4+(\alpha\psi)/2+(\alpha^2\psi^2)/4$. When commoners vote based on their own signal, the quality of the elected politician is bounded above by $7/4$, the probability of electing the biased politician is bounded above by $1/2$, and the expected utility of an Elite member is therefore bounded above by $7/4+(\alpha\psi)/2$, according to Equation (3).

6 Conclusion

Recently, there has been a noticeable decline in voters willingness to follow the elites' advice, both as measured by opinion polls and by surges of support for anti-elite, populist politicians and parties. We provide a political model in which the endogenously formed elite has an information advantage over the rest of society, and the median voter elects a politician after considering the elite's endorsement. When the cost of redistribution are low, the interests of the elite and median voter in electing a competent leader are aligned, the formed elite is relatively large, and valuable information is aggregated and successfully transmitted in equilibrium. In contrast, when the society is stratified, there is a complete breakdown of trust, which results in no information transmission and efficiency losses.

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