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Can fact-checkers discipline the government?

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Abstract

We study the potential of a fact-checker to deter a government from lying. The government wants to increase its acceptance by announcing that the state of the economy is good. The fact-checker must decide whether to check or not the government's announcement and then send a report to the public. We show that there is no separating equilibrium in which the government always reveals the true state of the economy. Moreover, there exist equilibria in which the government always announces that the state of the economy is good. This happens if the fact-checker has low credibility relative to that of the government. Our findings suggest that actions that discredit fact-checking agencies, such as calling them ``fake news", increase the chances of lying equilibria. If we allow mixed strategies, our analysis shows that, under quite intuitive conditions, the fact-checker can partially discipline the government.

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1 Introduction

The role of the media as a democratic accountability mechanism should not be taken for granted. Since the 2016 American Presidential Election, the inefficiency of such a mechanism has become evident: the number of false statements made by presidential candidates and other politicians has continually grown, although the media has denounced such lies (Allcott and Gentzkow, 2017; Bucciol, 2018; Silverman and Singer-Vine, 2016). Since then, the pernicious effects of the information asymmetry between governments and citizens have regained the general public's and the academy's attention. As a response, media broadcasters and independent organizations have begun to offer fact-checking services. Although such services were welcomed by a large share of the journalists and the population, they were not enough to deter politicians from lying (Brandtzaeg et al., 2018; Rich et al., 2020).

We provide a simple explanation for the fact that politicians continue to lie, even in the presence of fact-checking agencies. We do so by studying the interaction between a government and a fact-checker in a signaling game. The model incorporates recent empirical findings regarding the effectiveness of fact-checkers in influencing the individuals' evaluation of the government. By assuming that citizens are sensitive to both the government's and the fact-checker's announcements about the state of the economy, we show that equilibria in which the government always reports the true state of the economy do not exist. Moreover, pooling equilibria in which the government always announces that the state of the economy is good exists under reasonable conditions. This strategy always composes Perfect Bayesian Equilibria (PBE), if citizens are sufficiently sensitive to the government's announcements—relative to fact-checker's.

The possibility of the fact-checker disciplining the government arises when we allow the players to play mixed strategies. Contrasting with the pooling equilibria we mentioned previously, the mixed strategies PBE is such that the government tells the truth when the state of the economy is bad with positive probability and never lies when the economy is going well. The equilibrium behavior of the fact-checker is to check the government's message with positive probability only when the message says the state of the economy is good. This probability, in turn, depends mainly on the importance of the fact-checking process (validation and correction) in the government's welfare. Thus, we can answer the question in the paper's title by stating that fact-checkers can indeed discipline governments, but their power to do so depends critically on the efficiency of their technology for fact-checking and several economic and social parameters of the society.

In addition to explaining some empirical regularities, our paper is one of the first theoretical attempts to find conditions under which the threat of being corrected by a fact-checker induces politicians to tell the truth. By doing so, we contribute to the recent Political Economy literature on fake news and its propagation in society. Other references closely related to our work are Santos and Griebeler (2020), Papanastasiou (2020), Grossman and Helpman (2019), and Sheen (2021). The work of Santos and Griebeler (2020), for example, studies the politician's choice about the level of the brazenness of her lies. The present paper—as well as Santos and Griebeler (2020)—was inspired by Papanastasiou (2020), which studies the spread of a lie on a social media platform where the users act like fact-checkers, deciding if they should incur the cost of inspecting the message to be sure about its validity. Other works studying the spread of fake news in social media platforms are Azzimonti and Fernandes (2018), Oliver (2020), and Hartley and Vu (2020). Finally, although our approach employs a signaling game, we contribute to

the modern literature on cheap-talk models, where there is the possibility of fact-checking (Levkun, 2021) or lie-detection (Sadakane and Tam, 2022). While the former includes a third-party fact-checker—in addition to sender and receiver—, the latter allows the receiver herself to check the message.

2 Environment

The true state of the economy is represented by $\theta \in \{\theta_G, \theta_B\}$, where θ_G and θ_B stand for good and bad states, respectively. The citizens do not observe the state of the economy, but they receive two signals about θ, namely a message from the government and a report from the fact-checker. We assume the citizens' evaluation of the government is affected by both signals, leading to a strategic interaction between the government and the fact-checker. On the one hand, the government aims to increase its acceptance among the public by announcing that the state of the economy is good. On the other hand, the fact-checker may check the government's message. If the message is false, the fact-checker will send a public report correcting the government, which makes the citizens more suspicious about the government's honesty.

The game begins with the government observing θ and sending a message $m \in \{m_G, m_B\}$, where m_G (m_B, respectively) stands for the message "the state of the economy is good" ("bad", respectively). This message represents a public announcement, so the citizens and the fact-checker receive it.

The fact-checker does not observe θ but it holds a prior belief over the possible values for θ. This belief is given by $p := Pr(\theta_G)$ and $1 - p = Pr(\theta_B)$, with $p \in [0, 1]$. After receiving the government's message, m, the fact-checker forms a posterior belief $q(m, p) := Pr(\theta_G|m)$ that the state of the economy is good and $1 - q(m, p) = Pr(\theta_B|m)$ that the state of the economy is bad. Based on this posterior and the government's message, the fact-checker takes two decisions: first, whether to check or not to check the government's message; second, which report about the state of the economy $r \in \{r_G, r_B\}$ must be sent to the citizens, where r_G (r_B, respectively) stands for "the state of the economy is good" ("bad", respectively)[1].

By checking the announcement, the fact-checker incurs an inspection cost of $K \in (0, 1/2)$ but learns the true state of the economy[2]. Lemma 1 shows that if $K = 0$ ($K = 1/2$, respectively), then performing the inspection is always (never, respectively) a best response to the government's message, except in degenerate cases. We also assume that the fact-checker has incentives to report the true state of the economy. These incentives are reflected in the fact-checker's payoff, which equals 1 if $r = \theta$ and 0 if $r \neq \theta$. Therefore, if the fact-checker decides to check the government's message and hence discovers the true state of the economy, it automatically chooses $r = \theta$, ensuring a payoff of $1 - K$. If the fact-checker chooses not to check the government's message, it remains unaware of the true θ and must choose r based on the expected payoffs from each report.

[1]The messages in $\{m_G, m_B\}$ and $\{r_G, r_B\}$ indicate states of the economy $\theta \in \{\theta_G, \theta_B\}$. For this reason, it is natural and convenient to write $\theta = m$ when the state of the economy is θ, and the government's message is *"the state of the economy is θ"*. The same follows for $r = \theta$ ($r = m$, respectively), meaning that the fact-checker's report corresponds to the state of the economy (the government's message, respectively). We use equalities and inequalities of this sort repeatedly throughout the paper.

[2]If K is too large, one could not rule out trivial equilibria in which the fact-checker never checks. In fact, the literature has adopted such a constraint on the inspection cost (Papanastasiou, 2020).

Since the fact-checker's report is automatically defined if it inspects the message, we can define the action space of the fact-checker as $\mathcal{R} := \{r_G, r_B, c\}$, where c represents the pair of actions (Check, $r = \theta$) and r_G and r_B represent the pairs (Not to check, r_G) and (Not to check, r_B), respectively. The following figure illustrates the fact-checker's decision three.

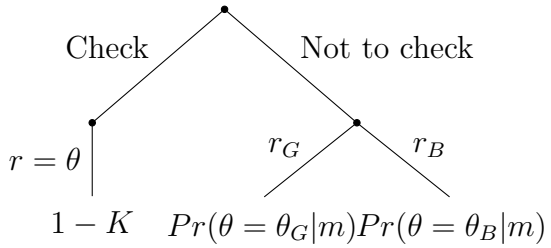


Figure 1: Fact-checker's decision tree

The government's payoff is given by $U(m, r) = I_g(m)\delta + I_f(m, r)\gamma - (1 - I_f(m, r))\eta$[3], where the indicator functions are such that $I_g(m_G) = 1$ and $I_g(m_B) = 0$, and $I_f(m, r) = 1$ if $m = r$ and $I_f(m, r) = 0$ if $m \neq r$. The parameter $\delta > 0$ captures the positive effect that an announcement $m = m_G$ has on citizens' evaluation of the government. In other words, the government is better evaluated by citizens because they have received a signal that the economy's true state is good, which yields a positive payoff for the government. The parameter $\gamma > 0$ ($\eta > 0$, respectively) represents the impact of a validation (correction, respectively) by the fact-checker on the citizens' evaluation of the government. To the citizens' eyes, the observation $m = r$ is a signal that the government has told the truth, which increases the citizens' evaluation of the government and yields the payoff $\gamma > 0$ for the latter. If the message is corrected by the fact-checker ($m \neq r$), the government loses credibility and support, leading to a negative impact of $-\eta$ on its payoff. If one supposes that the incumbent is an office-seeker, the parameters represent impacts on her reelection probability. A well-known result from the literature on Political Economy is that when voters believe that the economic prospects are promising—even when it is not true—they tend to reward the politician in office (parameter δ)[4]. Moreover, we can argue that $m = m_G$ and $r = m$ would increase the reelection probability via γ, while $r \neq m$ would make it lower via η. In this interpretation, citizens can only observe θ after the election, such that even if the government has lied, their disappointment does not affect the government's payoff.

This interpretation is in line with evidence pointing that electoral outcomes indeed are highly correlated with the level of prosperity of the country (Brady et al., 2006). This fact implies that the incumbent's message m_G, at least when taken at its face value, increases the probability of reelection[5]. The evidence regarding the signs of γ and η is mixed, indicating that these parameters depend on the context. Indications

[3]The government's payoff also depends directly on θ. We omit this dependence now, and make it clear in the next section.

[4]There is, for instance, a vast literature on Political Cycles that corroborates the above claim. See, for instance, Alesina et al. (1997).

[5]The potential of politicians in persuading individuals is discussed in Iyengar and Simon (2000) and illustrated, for instance, in Slutsky and Gavra (2017). However, it is valid to mention that the worth and credibility that citizens attribute to a politician's messages depends heavily on the citizens' political leaning (Jarman, 2005, 2016).

that the parameters γ and η are positive were found in Kuklinski et al. (2000) (study 2), Bennett and Entman (2000), Gilens (2001), Bullock (2007), Howell and West (2009), Cobb et al. (2013), Nyhan and Reifler (2015), and Wintersieck (2017). On the other hand, findings inconclusive or contrary to the hypothesis of positive values have been reported by Kuklinski et al. (2000) (study 1) and Sides and Citrin (2007). The findings in Wintersieck (2017) about the efficacy of the fact-checkers are particularly elucidative. They found that the presence of a fact-checker providing statements of accuracy during a debate can alter the spectators' perceptions about the truthfulness of the candidates' messages as well as the spectators' vote intention. In particular, the confirmations and corrections were found to be effective ($\gamma, \eta > 0$), even when the fact-checker's report goes against the individuals' political leaning. Figure 2 illustrates the extensive form of the game.

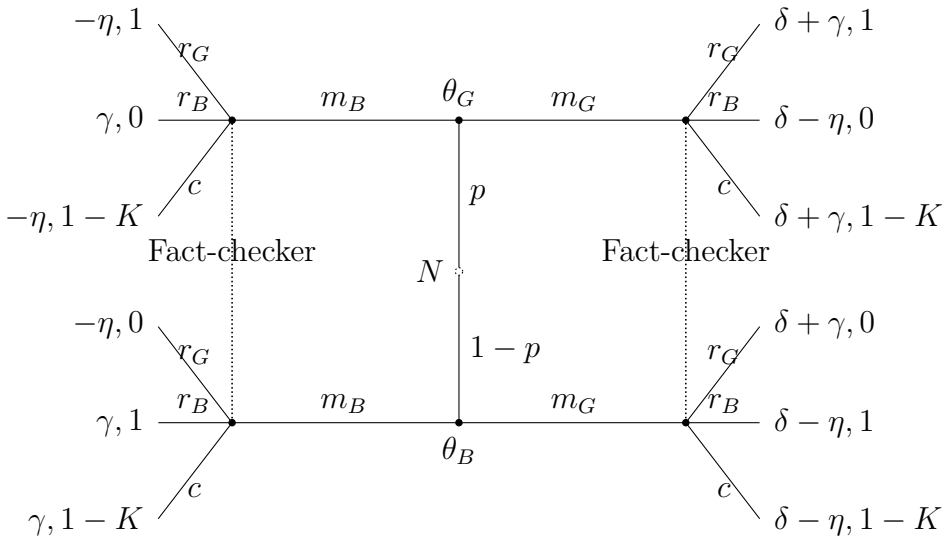


Figure 2: Game's extensive form

3 Equilibrium Analysis

The government's and the fact-checker's spaces of pure strategies are given by the sets of functions $\mathcal{M} := \{m : \{\theta_G, \theta_B\} \to \{m_G, m_B\}\}$ and $\mathcal{R} := \{r : \{m_G, m_B\} \to \{r_G, r_B, c\}\}$, respectively. The following lemma determines the fact-checker's optimal strategy.

Lemma 1. *The fact-checker's optimal strategy is given by*

$$r^*(m,p,K) = \begin{cases} r_G & \text{if} \quad q(m,p) \geqslant 1-K, \\ r_B & \text{if} \quad q(m,p) \leqslant K, \\ c & \text{if} \quad K < \min\{q(m,p), 1-q(m,p)\}. \end{cases} \tag{1}$$

Proof. The result follows directly from the fact-checker's payoff and the assumption that, when the fact-checker is indifferent between c and r_G (r_B, respectively), it chooses r_G (r_B, respectively). Also, it is worth mentioning that the conditions on the posterior $q(m,p)$ are exhaustive and, given that $K \in (0, 1/2)$, mutually exclusive as well. □

Lemma 1 highlights the role of the inspection cost in driving the fact-checker's choice[6]. Intuitively, if K is sufficiently high (close to $1/2$), then it is hardly lower than $\min\{q(m,p), 1-q(m,p)\}$, which implies that the fact-checker does not check the announcement. Similarly, we can understand how uncertainty affects the decision. Whenever the fact-checker is very uncertain about θ (posterior $q(m,p)$ close to $1/2$), K is likely lower than the threshold, such that $r^*(m,p,K) = c$. Finally, as $q(m,p)$ approaches 1, there is a higher (posterior) probability that $\theta = \theta_G$, which induces the fact-checker to choose $r^*(m,p,K) = r_G$. The opposite happens when $q(m,p)$ approaches zero.

From now on, we ease the notation by replacing $r^*(m,p,K)$ with $r^*(m)$ whenever no confusion is likely to arise. Notice that the latter emphasizes the interaction between the government and the fact-checker. In view of Lemma 1, the government's maximization problem can be stated as[7]

$$\max_{m \in \{m_G, m_B\}} U(m, r^*(m), \theta). \tag{2}$$

Definition 1. *Let $\Gamma = \{m, r, q, p\}$ denote a general profile of strategies and beliefs where $m \in \mathcal{M}, r \in \mathcal{R}$ and $q, p \in [0,1]$. Then Γ is a Perfect Bayesian Equilibrium (PBE) if*

1. *$q = q(m,p)$ whenever $m = m(\theta)$ for some $\theta \in \{\theta_G, \theta_B\}$.*
2. *$r = r^*(m)$ as defined in Lemma 1.*
3. *$m(\theta) \in \arg\max_{\{m_G, m_B\}} \mathbb{E}[U(m, r^*(m), \theta)]$ for $\theta \in \{\theta_G, \theta_B\}$.*

The next proposition tells us that the equilibria in which the government "always tells the truth" or "never tells the truth" are extremely unlikely to occur. Also, this fact does not depend on the fact-checker's prior beliefs nor on its inspection cost, but on the reward and punishment parameters. For the proof, it will be convenient to identify each of the government's strategy $m \in \mathcal{M}$ with the coordinate pair $(m(\theta_G), m(\theta_B))$.

Proposition 1. *Consider the game represented in Figure 2 and let $r^*(m,p,K)$ be defined as in Lemma 1. The strategies (m_G, m_B) and (m_B, m_G) compose Perfect Bayesian Equilibria if and only if $\delta = 0$.*

Proof. We will prove that $\delta = 0$ is necessary and sufficient for (m_G, m_B) to compose an equilibrium. The proof for (m_B, m_G) is analogous.

Assume the government plays (m_G, m_B) and the fact-checker plays $r^*(m,p,K)$. Since all messages are in the equilibrium path, the fact-checker's posterior belief are $q(m_G, p) = 1$ and $q(m_B, p) = 0$. When $\theta = \theta_B$ the government sends $m = m_B$, the fact-checker chooses $r^*(m_B, p, K) = r_B$, and the government's payoff is given by $\mathbb{E}[U(m_B, r_B, \theta_B)] = \gamma$. Since $q(m_G, p) = 1$, the fact-checker's response to a deviation is $r^*(m_G, p, K) = r_G$ for all $p \in [0,1]$ and $K \in (0, 1/2)$. Therefore, by deviating the government obtains the payoff of $\delta + \gamma$. Therefore $m_B \in \arg\max_{\{m_G, m_B\}} \mathbb{E}[U(m, r^*(m,p,K), \theta_B)]$ if and only if $\delta = 0$. It is easy to see that when $\theta = \theta_G$ and $\delta = 0$, the government is indifferent between maintaining the equilibrium strategy or deviating to m_B. □

[6]This result is similar to the one found by Levkun (2021), namely fact-checking is optimal whenever the inspection cost is sufficiently low (below a given threshold). However, contrary to that study, the threshold is not only a function of the fact-checkers preferences. Instead, we found that it also depends on the fact-checker's beliefs.

[7]Notice that the government's objective function depends indirectly on $p \in [0,1]$ and $K \in (0, 1/2)$ via the function r^*. Moreover, it depends directly on θ whenever the fact-checker chooses to check the message. For instance, if $\theta = \theta_G$, the combination of $r = c$ and $m = m_G$ gives the government the payoff of $\delta + \gamma$, while the payoff is $\delta - \eta$ if $\theta = \theta_B$ (see Figure 2).

The impossibility of fully informative equilibria comes from the absence of fact-checking in these contexts. For the strategy (m_G, m_B), the lack of effective fact-checking in equilibrium makes the government deviate when $\theta = \theta_B$. Moreover, Proposition 1 suggests that a possible reason why politicians do not always tell the truth—and do not always lie—is that voters are sensitive to positive signals about the economy. As one can see below, such a sensitiveness has an essential role in guaranteeing the existence of the pooling equilibria (m_G, m_G).

Proposition 2. *Consider the game described by Figure 2 and let $r^*(m, p, K)$ be defined as in Lemma 1.*

1. *If $p \geqslant 1 - K$, then $\{(m_G, m_G), r^*(m, p, K), p, q(m_B, p)\}$ is a PBE for all $q(m_B, p) \in [0, 1]$. In this case, the government reports that the economy is good regardless of the true state and the fact-checker corroborates it;*

2. *If $p \leqslant K$ and $\delta \geqslant \gamma + \eta$, then $\{(m_G, m_G), r^*(m, p, K), p, q(m_B, p)\}$ is a PBE for all $q(m_B, p) \in [0, 1]$. In this case, the government reports that the economy is good regardless of the true state despite the fact-checker denying it;*

3. *If $K < \min\{p, 1 - p\}$ and $\delta \geqslant \gamma + \eta$, then $\{(m_G, m_G), r^*(m, p, K), p, q(m_B, p)\}$ is a PBE for all $q(m_B, p) \in [0, 1]$. In this case, the government reports that the economy is good regardless of the true state despite the fact-checker checking it.*

Proof. 1. In pooling equilibria the sender's message does not change the receiver's beliefs, therefore we have $Pr(\theta_G|m) = p$. Since $p \geqslant 1 - K$, we have $q(m_G, p) \geqslant 1 - K$ and, by Lemma 1, it follows that $r^*(m_G, p, K) = r_G$. Therefore, under the equilibrium strategy (m_G, m_G), the government's payoff is $\delta + \gamma$, for all $\theta \in \{\theta_G, \theta_B\}$. Since $\delta + \gamma$ is greater or equal to any other payoff, m_G dominates m_B for both states of the economy.

2. If $p \leqslant K$, we have that $q(m_G, p) \leqslant K$ and, by Lemma 1, it follows that $r^*(m_G, p, K) = m_B$. Therefore, the government's payoff is $\delta - \eta$ for both states of the economy. Given that the highest payoff the government can get by deviating is γ, we have that $\delta \geqslant \gamma + \eta$ is again sufficient to guarantee the stability of the equilibrium.

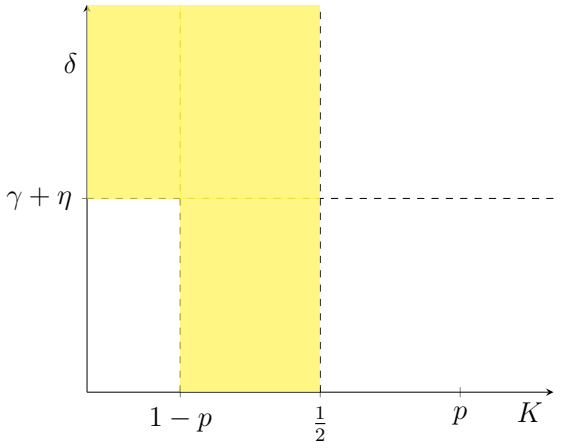
3. We have seen that $K < \min\{q(m_G, p), 1 - q(m_G, p)\}$ implies $r^*(m_G, p, K) = c$. Therefore, for $\theta = \theta_G$ the government's payoff is $\delta + \gamma$ and the government does not deviate. When $\theta = \theta_B$, the government's payoff on the equilibrium path is $\delta - \eta$. Also, when $\theta = \theta_B$ the maximum payoff the government can earn out of the equilibrium path is γ. Therefore, if $\delta \geqslant \gamma + \eta$, the government does not deviate[8].

□

In the first item, the fact-checker has an auspicious view of the state of the economy, which is represented by a relatively high value for the prior probability p. In this scenario, there are no further conditions on the parameters for the pooling equilibrium to hold, which contrasts with the second and third items. Roughly speaking, the government's incentive to pooling is correlated with p. As an intuitive extrapolation, we can assume

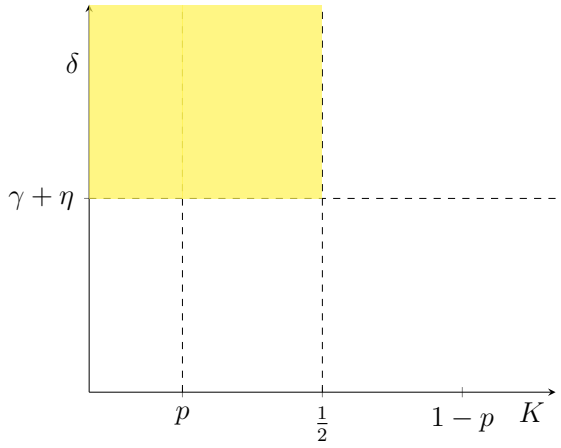
[8]Observe that we could have stated the above proposition with a single parameter, $\omega = \gamma + \eta$, representing the government's loss from being fact-checked and proven wrong. In other words, there is no mathematical need for two different parameters, given that only their sum matters. Nevertheless, we keep both as they have an important intuitive interpretation for our model.

Figure 3: Pooling equilibria when $p > \frac{1}{2}$



Source: Created by the authors

Figure 4: Pooling equilibria when $p \leqslant \frac{1}{2}$



Source: Created by the authors

that the fact-checker's belief about the state of the economy being good, p, is the result of good economic outcomes in previous periods. In this case, we would conclude that the government's incentive for pooling is the highest exactly after it has presented a good performance. Notice also that we have $q(m_G, p) = p$ in all items. This is a recurrent result of pooling equilibria, where the government's message carries no information. The fact-checker's report, on the other hand, carries perfect information ($r = \theta$) in item (iii), when the fact-checker always checks the message. Therefore, if individuals believe that the fact-checker's cost of inspecting the message is low (or that the fact-checker holds moderate beliefs about θ), then it would make sense for these individuals to take the fact-checker's report at face value. However, if individuals are suspicious about the fact-checker's efficiency to inspect messages or if individuals believe that the fact-checker is highly prone towards $\theta = \theta_G$ or $\theta = \theta_B$ (these cases are treated in items 2 and 3), then the fact-checker's report will not be taken seriously, as individuals will conclude it has resulted from the low efficiency or high bias of the fact-checker.

Figures 3 and 4 present the possible cases associated with the above proposition. Recall that, given that $K < 1/2$, if $p \leqslant 1/2$ then $K < 1 - p$, and if $p > 1/2$ then $K < p$. One can see that, while $\delta \geqslant \gamma + \eta$ is a sufficient and necessary condition for the pooling equilibrium when $p \leqslant 1/2$, it is only sufficient when $p > 1/2$. In fact, as we have seen, if the inspection cost is sufficiently high, the government has incentive to lie.

3.1 Mixed Strategy Equilibrium

Let us start by defining mixed strategies for both players.

Definition 2. *A mixed strategy for the government is a function* $\mathbf{m} : \{\theta_G, \theta_B\} \to [0, 1]$, *where* $\mathbf{m}(\theta)$ *represents the probability that the government sends* $m = m_G$ *after observing* θ. *Accordingly,* $1 - \mathbf{m}(\theta)$ *is the probability that the government plays* m_B *after observing* θ.

Let p_G, p_B, and p_c denote the probability with which the fact-checker chooses r_G, r_B, and c, respectively. After observing the government's message, the fact-checker chooses

a point in the following set:

$$\Delta_{FC} = \{(p_G, p_B, p_c) \in \mathbb{R}^3_+ : p_G + p_B + p_c = 1\}. \tag{3}$$

Definition 3. *A mixed strategy for the fact-checker is a function* $\mathbf{r} : \{m_G, m_B\} \to \Delta_{FC}$. *We denote* $\mathbf{r}(m_G) = (p^1_G, p^1_B, p^1_c)$ *and* $\mathbf{r}(m_B) = (p^2_G, p^2_B, p^2_c)$. *An strategy* $\mathbf{r}$ *can be represented by the pair* $(\mathbf{r}(m_G), \mathbf{r}(m_B)) = ((p^1_G, p^1_B, p^1_c), (p^2_G, p^2_B, p^2_c))$.

In Lemma 1 we have adopted a convention to handle the cases where the fact-checker was indifferent between two alternatives: if the fact-checker's payoff from playing c equals that from reporting r_G, the fact-checker would choose r_G (the analogous also holding if the indifference were between c and r_B). This convention was necessary because, at that point, we were studying equilibria in pure strategies. The following is the counter-part of Lemma 1, in which the fact-checker is allowed to play mixed strategies.

Lemma 2. *Let* $p \in [0,1]$, $K \in (0, 1/2)$, *and* $m \in \{m_G, m_B\}$. *The fact-checker's optimal strategy is given by*

$$\mathbf{r}^\star(m) = \begin{cases} r_G & \text{if} \quad q(m,p) > 1-K, \\ \{(1-p, 0, p) : p \in [0,1]\} & \text{if} \quad q(m,p) = 1-K, \\ r_B & \text{if} \quad q(m,p) < K, \\ \{(0, 1-p, p) : p \in [0,1]\} & \text{if} \quad q(m,p) = K, \\ c & \text{if} \quad K < \min\{q(m,p), 1-q(m,p)\}. \end{cases} \tag{4}$$

The above lemma shows that the fact-checker accepts to randomize between alternatives that give the same payoff. If the payoffs are different, then Lemma 1 holds, and the fact-checker does not randomize.

Proposition 3. *Assume that* $\gamma + \eta \geqslant \delta$ *and let* $p^1_c = \delta/(\gamma+\eta)$, $\mathbf{m}(\theta_B) = pK/((1-p)(1-K))$, *and* $q(m_G, p) = p/(p + \mathbf{m}(\theta_B)(1-p))$. *Then the following profile is a PBE*

$$\Gamma = \{(1, \mathbf{m}(\theta_B)), ((1-p^1_c, 0, p^1_c), (0,1,0)), q(m_G, p), 0\}. \tag{5}$$

Proof. Notice that the government only plays m_B when $\theta = \theta_B$ and, therefore, the equilibrium belief $q(m_B, p)$ must be equal to zero. The expression for $q(m_G, p)$ was derived by the Bayes' rule and, therefore, the beliefs in Γ satisfy the requirement of Definition 1. Also, notice that, given that $q(m_B, p) = 0$, Lemma 2 implies that the fact-checker's response to m_B must be r_B, which is represented by the vector $(0,1,0)$. The specification $\mathbf{m}(\theta_B) = pK/((1-p)(1-K))$ and the Bayes' rule implies that $q(m_G, p) = 1-K$, such that the fact-checker is willing to randomize between r_G and c after receiving m_G (see Lemma 2). The government does not deviate when $\theta = \theta_G$ because it earns the maximum payoff, $\delta+\gamma$, for $r = r_G$ and $r = c$. If $\theta = \theta_B$, then the government is willing to randomize if and only if $p^1_c = \delta/(\gamma+\eta)$. □

The above proposition shows that, when we allow both players to play mixed strategies, the fact-checker can partially discipline the government. It is no longer the case that the politician in office always claims that the state of the economy is good. Instead, now she tells the truth with positive probability $1 - \mathbf{m}(\theta_B)$ whenever the state is bad. Notice that, contrasting with the pooling equilibria (where $q(m_G, p) = p$), the government's message in the equilibrium of Proposition 3 is not immaterial, since we may have $q(m_G, p) \neq p$.

A straightforward comparative statics exercise shows us that the higher the probability of the true state of the economy being good p, the higher the chance of the government sending the message m_G after observing θ_B. Similarly, the probability of misreporting the state of the economy when $\theta = \theta_B$ is increasing in the inspection cost K[9]. While in the former $\theta = \theta_B$ is less likely, in the latter the fact-checking process is costlier. Both effects make the government more prone to lying.

The behavior of the fact-checker in equilibrium is also substantially different from the case where we consider only pure strategies. Regarding the fact-checker's equilibrium strategy, notice that there is no need to check when the message is m_B, as the government has no incentives to report that the state of the economy is bad when it is actually good. On the other hand, when the message is m_G, the fact-checker checks with probability p_c^1 and validate without checking with probability $1-p_c^1$. Comparative statics shows that the higher the government's benefit from reporting that the economy is going well, the higher the probability of checking the message m_G. We can also conclude that p_c^1 is decreasing in $\gamma+\eta$, which implies that the higher the government's cost of being corrected, the lower is the chance of checking the message m_G[10].

Compared to the PBE obtained in the case with pure strategies, the results derived from the mixed strategies are more intuitive. While Proposition 2 suggests that fact-checkers cannot make governments speak the truth in any reasonable scenario, the possibility of partially disciplining government's speeches arises when one considers mixed strategies. More importantly, such a possibility is more likely when the state of the economy is probably bad and the cost of inspecting the government's message is lower. As a whole, our model suggests that the fact-checker's power to affect the government's behavior, i.e. the fact-checker's ability to discipline, is a function of several important economic and social parameters. These results highlight the importance of analyzing the social context to evaluate the fact-checker's potential to discipline the government.

4 Concluding Remarks

Most of the empirical literature indicates that accuracy statements provided by fact-checkers influence individuals' evaluation of politicians. Despite the threat imposed by fact-checkers, governments (incumbent politicians) frequently appeal to false messages to gain popular acceptance. We incorporate these facts in a signaling game where the government has incentives to lie but is threatened by a fact-checker. Our results indicate that, under reasonable conditions, fact-checking agencies do not have the potential to induce the government to always tell the truth. Naturally, this result is especially harmful when the state of the economy is bad.

The game admits several (pure strategy) equilibria where the government always tells that the state of the economy is good. In particular, the government may adopt the strategy of always announcing "the state of the economy is good" even if the government knows that the fact-checker will check the message and correct it when necessary. On the bright side, we have shown that the fact-checker can prevent these undesirable pooling equilibria. This possibility, however, depends on the credibility that individuals attribute to fact-checkers. Therefore, our work suggests that attacks to fact-checking agencies—such as calling them "fake news"—decrease the punishment for lying behavior and raise

[9]To prove the above claims, it suffices to observe that $\frac{\partial \mathbf{m}(\theta_B)}{\partial p} > 0$ and $\frac{\partial \mathbf{m}(\theta_B)}{\partial K} > 0$.

[10]Notice that $\frac{\partial p_c^1}{\partial \delta} > 0$, $\frac{\partial p_c^1}{\partial \gamma} < 0$ and $\frac{\partial p_c^1}{\partial \eta} < 0$.

the chances of pooling equilibria. When we allow for mixed strategies, however, the possibility of the fact-checker disciplining the government's statements arises. In this case, the fact-checker's power to affect the government's behavior depends on several economic and social parameters of the society.

Possible extensions of our model include considering a fact-checker that does not observe θ perfectly. This would be in line with the concerns presented in Uscinski and Butler (2013) and Uscinski (2015). We abstain from extending the model in this direction because it would shift the focus from the essential elements of the interaction between the government and the fact-checker. Moreover, our model assumes that the fact-checker has no incentives to benefit nor to denigrate the government. This assumption could be relaxed, and such extension would be in line with the discussion in Ostermeier (2011). It is valid to mention however, that Wintersieck (2017) observed that the parameters γ and η are positive even if the fact-checker has a clear political bias. Therefore, we expect an extension in this direction would present results qualitatively similar to ours.

References

Alesina, A., Roubini, N., and Cohen, G. D. (1997) *Political cycles and the macroeconomy*. MIT press.

Allcott, H. and Gentzkow, M. (2017) "Social media and fake news in the 2016 election". *Journal of Economic Perspectives* **31**, 211–36.

Azzimonti, M. and Fernandes, M. (2018) "Social media networks, fake news, and polarization". Tech. Rep. No. w24462, National Bureau of Economic Research.

Bennett, W. L. and Entman, R. M. (2000) *Mediated politics: Communication in the future of democracy*. Cambridge University Press.

Brady, H. E., Johnston, R. G., and Johnston, R. (2006) *Capturing campaign effects*. University of Michigan Press.

Brandtzaeg, P. B., Følstad, A., and Chaparro Domínguez, M. Á. (2018) "How journalists and social media users perceive online fact-checking and verification services". *Journalism practice* **12**, 1109–1129.

Bucciol, A. (2018) "False claims in politics: Evidence from the US". *Research in Economics* **72**, 196–210.

Bullock, J. G. (2007) *Experiments on partisanship and public opinion: Party cues, false beliefs, and Bayesian updating*. Ph.D. thesis, Stanford University Stanford, CA.

Cobb, M. D., Nyhan, B., and Reifler, J. (2013) "Beliefs don't always persevere: How political figures are punished when positive information about them is discredited". *Political Psychology* **34**, 307–326.

Gilens, M. (2001) "Political ignorance and collective policy preferences". *American Political Science Review* , 379–396.

Grossman, G. M. and Helpman, E. (2019) "Electoral Competition with Fake News". Tech. Rep. No. w26409, National Bureau of Economic Research.

Hartley, K. and Vu, M. K. (2020) "Fighting fake news in the COVID-19 era: policy insights from an equilibrium model". *Policy Sciences* **53**, 735–758.

Howell, W. G. and West, M. R. (2009) "Educating the public: how information affects Americans' support for school spending and charter schools". *Education Next* **9**, 40–48.

Iyengar, S. and Simon, A. F. (2000) "New perspectives and evidence on political communication and campaign effects". *Annual review of psychology* **51**, 149–169.

Jarman, J. W. (2005) "Political affiliation and presidential debates: A real-time analysis of the effect of the arguments used in the presidential debates". *American Behavioral Scientist* **49**, 229–242.

Jarman, J. W. (2016) "Influence of political affiliation and criticism on the effectiveness of political fact-checking". *Communication Research Reports* **33**, 9–15.

Kuklinski, J. H., Quirk, P. J., Jerit, J., Schwieder, D., and Rich, R. F. (2000) "Misinformation and the currency of democratic citizenship". *The Journal of Politics* **62**, 790–816.

Levkun, A. (2021) "Communication with Strategic Fact-checking". *Working Paper* URL `https://alevkun.github.io/assets/pdf/fact_checking.pdf`.

Nyhan, B. and Reifler, J. (2015) "The effect of fact-checking on elites: A field experiment on US state legislators". *American Journal of Political Science* **59**, 628–640.

Oliver, A. S. (2020) *Essays on the Economics of Communication and Disclosure*. Ph.D. thesis, Rice University.

Ostermeier, E. (2011) "Selection bias? PolitiFact rates Republican statements as false at three times the rate of Democrats". *Smart Politics* **10**.

Papanastasiou, Y. (2020) "Fake news propagation and detection: A sequential model". *Management Science* .

Rich, T. S., Milden, I., and Wagner, M. T. (2020) "Research note: Does the public support fact-checking social media? It depends who and how you ask". *The Harvard Kennedy School Misinformation Review* .

Sadakane, H. and Tam, Y. C. (2022) "Cheap-talk and Lie-detection". *Working Paper* URL `https://drive.google.com/file/d/1hc_Mg66w3vt1Wg5awlwMW_e0QsVgHUq_/view`.

Santos, S. S. and Griebeler, M. C. (2020) "Political Polarization and Blatant Lies on Social Media". URL `https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3579542`. *Working paper*.

Sheen, G. C.-H. (2021) "Media with reputational concerns: yes men or watchdogs?" *Political Science Research and Methods* **9**, 345–364.

Sides, J. and Citrin, J. (2007) "How large the huddled masses? The causes and consequences of public misperceptions about immigrant populations". In "Annual meeting of the Midwest Political Science Association, Chicago, IL", .

Silverman, C. and Singer-Vine, J. (2016) "Most Americans who see fake news believe it, new survey says". *BuzzFeed News* Last accessed on Jan. 01, 2019.

Slutsky, P. and Gavra, D. (2017) "The phenomenon of Trump's popularity in Russia: Media analysis perspective". *American Behavioral Scientist* **61**, 334–344.

Uscinski, J. E. (2015) "The epistemology of fact checking (is still naïve): Rejoinder to Amazeen". *Critical Review* **27**, 243–252.

Uscinski, J. E. and Butler, R. W. (2013) "The epistemology of fact checking". *Critical Review* **25**, 162–180.

Wintersieck, A. L. (2017) "Debating the truth: The impact of fact-checking during electoral debates". *American politics research* **45**, 304–331.