Breaking News: A Model of Media Competition, Fact-Checking and Political Accountability*

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Abstract

We study the impact of media competition on the incentives of media outlets to fact-check information before publishing, as well as on consumer demand for fact-based news. On the supply side, increased competition can lead media outlets to forego fact-checking, so as to circumvent the risk of losing the opportunity to break news first. Consequently, excessive media competition can compromise the quality of reporting. Conversely, on the demand side, increasing competition encourages readers' selectiveness, thus giving media outlets an incentive to fact-check. We use our model to assess the impact of the internet on news quality, demonstrating, for instance, that a faster news cycle can foster increased fact-checking.

Keywords: media competition, fact-checking, political accountability, news cycle.

Supplementary material for this article is available in the appendix in the online edition.

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1 Introduction

The news media play a fundamental role in providing political information to citizens and holding politicians accountable to public opinion (Strömberg, 2015; Hayes and Lawless, 2015). Yet, even in countries with free media, the degree of accuracy of media reports often appears insufficient, contributing to the observed declining trust in media.[1] What is more, this occurs although most citizens value accuracy as one of the key characteristics of a media outlet (Young, 2016). This raises the question of why having free and competitive media markets is not sufficient to ensure the dissemination of accurate news, crucial for enabling voters to make well-informed political decisions.

To fulfill their role, the news media act as a filter between the information they receive from their sources and the information they transmit to the public. At the heart of this process lies fact-checking, which means verifying claims before reporting them. By its nature, fact-checking takes time and delays publication. This poses a significant trade-off in a business like media, where breaking news is a cornerstone. As the former *New York Times* editor Bill Keller put it: "The major feature of the media landscape today is the acceleration of everything. Probably the most troublesome tension is the one between the need to file immediately because a thousand other people are filing immediately, and the time it takes to do real reporting." As the quote suggests, the conflict between speed and accuracy is quintessential to journalism, and we may suspect that it has been exacerbated by the changes in the media landscape occurred in recent years – primarily the key role played by the internet and the abundance of online media outlets.

In this paper, we develop a theoretical model to study how media competition affects the accuracy of the information published and political accountability. In the baseline model, we consider a media outlet contemplating whether to fact-check an unverified rumor or report it immediately. The media outlet's audience is composed of two types

[1] See for example: https://pewrsr.ch/3DF4dn1.

of readers: naïve readers, who are willing to consume any type of breaking news, and sophisticated readers, who instead have a preference for facts. Fact-checking requires putting the publication of the story on hold until the successful verification of the facts. Therefore, fact-checking is risky, especially when multiple media outlets are competing: only the fastest ones to verify the rumor will be able to break the news, whereas the rest will lose the scoop. As a result, intense media competition can undermine fact-checking, by giving outlets with an unverified rumor the incentive to immediately report it, in order to at least capture the naïve share of readers and avoid being preempted by some other outlet.

This reasoning revolves entirely around the incentives of the supply-side to publish accurate news, taking the demand for accuracy as given. In reality, however, the demand for accuracy is endogenous to the news environment. We extend our model to capture this focusing on the choice of sophisticated readers between demanding speed or accuracy. Specifically, we show that the presence of a sufficient number of fact-checking outlets encourages sophisticated readers to ignore rumors and wait for fact-based news. Unlike what happened for the supply-side, this points to a positive effect of media competition, based on making readers picky and not letting them settle for news of inferior quality.

Whether the supply or demand forces dominate depends on the circumstances: there are cases where only supply is a concern, implying that 'too much competition is bad'; in other cases the opposite is true and only the demand for facts is a concern, hence 'too little competition is bad'. Finally, there are cases where both concerns are valid, such that in order for fact-checking to be sustainable there must be enough competitors, but there cannot be too many.

The results of our model may be used to gain a better understanding of the effects of the internet on news provision, identifying some key forces at play. The first one is the number of competitors. In this respect, the internet is likely to have increased the competitive pressure, both directly – by allowing a number of new actors to supply news

– and indirectly – by increasing the number of news outlets that can be consulted by each reader, for example via news aggregators and social media. As we discussed earlier, our model shows that although the risk of preemption is important, more competition may also make consumers more selective, making the effect on fact-checking ambiguous.

The second key force is the ability of news outlets to fact-check quickly, which, according to our model, unambiguously improves news quality. In this case, however, it is the net effect of the internet to be ambiguous: on one hand there is nowadays a wide array of resources that enable journalists to verify information (e.g. geo-location, the possibility to search through vast archives of texts and images), but on the other hand the scope and sophistication of forgery have increased, and so has the amount of noise to be filtered out.

Third, the internet has crucially affected the way news are consumed: news are part of a wider online environment, such as a social network. In this context, news are just one out of the many types of content competing for the attention of consumers who are avid for entertainment rather than accurate reporting. As put by communication scholar Pablo Boczkowsky, more and more people are only "touched, rubbed by the news".[2] As our model suggests, this may be a decisive factor making the effect of the internet detrimental to the accuracy of news.

Finally, our model can also be used to address the concerns about the (internet-driven) 'acceleration of everything' described in the above-mentioned quote of Bill Keller. In this respect, our model suggests, to some extent counterintuitively, that a faster news cycle (the so-called 24-hour news cycle) need not be associated with less accurate news provision. As we explain in Section 5, a faster news cycle can act as coordination device for media outlets to reduce the risk of preemption and keep their incentives to fact-check intact.

[2]The quote can be found in the following article: https://www.newyorker.com/culture/annals-of-inquiry/the-urgent-quest-for-slower-better-news

Our paper mainly contributes to the theoretical literature on the effects of media competition.[3] Besley and Prat (2006) present one of the key channels making media competition beneficial for political accountability. In their framework, an increase in the number of media outlets makes capture more costly. A corrupt politician or interest group would have to pay monopolist profits to each outlet to prevent the publication of a scandal. We show that when the concern is reporting accuracy rather than capture, the relationship between competition and political accountability is more nuanced.[4]

As far as possibly negative effects of media competition are concerned, a channel emphasized by the existing literature is that of 'slant' (Bernhardt et al., 2008, Mullainathan and Shleifer, 2005, Sobbrio, 2014). Relatedly, in Perego and Yuksel (2021), media informativeness decreases due to the specialization on ideological instead of valence dimensions of policy.[5] Our paper differs from this strand of the literature since we derive the possibility of competition leading to inaccuracy in the absence of ideological considerations.[6]

[3] Gentzkow and Shapiro (2008) provide an excellent overview of the possible effects of media competition on the truthfulness of news, both from the supply and the demand side. However, the pressure to publish unverified news, which lies at the heart of our work, is absent from their discussion.

[4] Another model in which competition reduces the ability of governments to control the media is Gehlbach and Sonin (2014). Similarly, Germano and Meier (2013) show that media outlets are more likely to underreport topics sensitive to their advertisers in a market with high ownership concentration. Andina-Díaz and García-Martínez (2020), instead find that, when outlets care about their reputation, only the less reputable ones publish. Finally, Li et al. (2022) study how the presence of alternative media in the news market affects political accountability.

[5] Along similar lines, Innocenti (2022) studies the effect of pluralism instead of the effect of competition and shows that pluralism can be detrimental to the quality of the information because it endogenously creates echo chambers.

[6] Moreover, whereas in models such as Mullainathan and Shleifer (2005) and Chen and

Another channel that has been investigated by the literature is that of quality differentiation, as way to soften price competition in the presence of heterogeneous readers. This is what happens for example in Cagé (2020). In our model, this channel is muted, but our results indicate that competition can have effects on quality even absent differentiation.

Our study builds upon the existing literature on the dissemination and verification of information. In Gratton et al. (2018), fact-checking is modeled as an exogenous process occurring after the strategically chosen reporting of a scandal. In our model, on the contrary, the initial rumor is exogenous, whereas fact-checking is endogenously determined by the strategic choices of media outlets. Regarding the filtering of inaccurate information, an interesting result in Kranton and McAdams (2023) relates to our findings despite different modeling approaches. They show that news veracity is highest at a certain level of network density, while we find it peaks with an intermediate level of media competition. The key distinction is that in their model, readers filter the news by choosing whether to share it, whereas in our model, media outlets play this role.

Last but not least, our model contributes to a concurrent literature on the trade-off between speed and accuracy that arises from the competition to break news. Pant and Trombetta (2023) and Shahanaghi (2021) focus on the reputational consequences of timing in publishing. While in Shahanaghi (2021), media outlets care only about their reputation, in Pant and Trombetta (2023), the trade-off arises because of an exogenous value for being the first to publish that comes at the cost of a possible reputational loss.[7] Our article

Suen (2023), competition increases the informativeness of the media as a whole despite making each outlet less accurate, in our setup competition can be detrimental even to an agent with access to the reports of all media.

[7]Oliver (2022) considers a similar trade-off while studying how publication standards change when media outlets, as a consequence of the internet, can publish at any time rather than at fixed time slots. We study a related problem in one of the applications of our model in Section 5.

shares with Pant and Trombetta (2023) the preemption feature, but, in contrast to their model—a two-stage setup with up to two firms—we consider a dynamic setup with an arbitrary number of firms. There are several other differences between the models: our model does not require reputation, we make the value of publishing facts versus rumors endogenous, we allow all firms to fact-check (in their model, some firms always publish without fact-checking), and we consider the possibility of debunking, which is absent in their model. The closest paper to ours is Shahanaghi (2023). The model in Shahanaghi (2023) also features a dynamic model with multiple media outlets, with an endogenous value of publishing a scoop that depends on the equilibrium behavior of media. Albeit streamlined, her model has a substantially different (and more complex) architecture, as it allows media to publish in continuous time and to learn from the behavior of other media: her focus is therefore mostly on the dynamics of credibility. The simplicity of our model allows us to derive clear cut welfare comparisons and also gives us enough flexibility to explore extensions and applications, including the speed of the news cycle, debunking and a fixed electoral deadline.

2 A model of fact checking and news supply

Timing and Information Structure: We study a discrete time dynamic model of media competition and fact-checking. The model features N identical media outlets, each faced with the opportunity to publish a story that potentially casts one political candidate in a more favorable light than the other. At time $t = 0$, Nature selects a state of the world $\omega \in \{A, B\}$, which remains fixed throughout the game. State $\omega = A$ means that candidate A is 'congruent', i.e., better fit to govern, while state $\omega = B$ means that candidate B is congruent. For simplicity we assume that both states are equally likely.[8]

In period 0, all outlets receive a signal $s \in \{A, B\}$ about the state of the world ω,

[8]Our key insights remain valid when relaxing this.

which we will refer to as a rumor. We denote the rumor's precision as $p \in (\frac{1}{2}, 1)$, with $Pr(s = \omega|\omega)$ symmetric across both states, indicating that the rumor is only partially informative. In each period, media outlets decide whether to immediately publish the rumor or conduct fact-checking. Upon deciding to fact-check, media outlets learn the true state ω with a probability $q \in (0, 1)$, enabling them to publish a verified fact at the start of the following period. Otherwise, they gain no new information and move on to the following period with the rumor they already possess.

Each period t has two stages: in the first one, the publications related to previous successful fact-checks appear, if there are any (by construction, at $t = 0$ there cannot be any). In the second stage, media outlets that only possess the rumor decide whether to publish it or conduct fact-checking.[9] We assume that media can only publish once. This implies that a media that publishes an unverified rumor in a given period will not be able to publish a fact later. At the end of each period, the game continues for another period with probability $\delta \in (0, 1)$. This represents the probability, $1-\delta$, that the attention window for the story closes at the end of each period.

Payoffs: In order to determine media payoffs, we introduce a demand for news. There is a unit mass of citizens and media outlets earn a revenue of 1 for each individual who consumes the news they publish.[10] Individuals can be of two types – naïve and sophisticated – with the former constituting a share η of the population. Naïve citizens consume the first news presented to them, regardless of whether it is a rumor or a fact. In contrast, sophisticated citizens exclusively consume information that is fact-based, provided such news

[9]This ensures that the decision whether to publish or fact-check is the same across all periods $t \geq 0$, with the initial period ($t = 0$) naturally lacking any publications from prior fact-checking.

[10]In the baseline model, there are no costs of misreporting. In Appendix B.2, we introduce the possibility media outlets incurring costs if false rumors are debunked after publication.

is available from any media outlet in equilibrium. Thus, sophisticated citizens consume the news from the first outlet (or outlets) publishing fact-based information, which implies that they are capable of distinguishing between fact-based and rumor-based news, for example by paying attention to the presence of references to credible sources, data, or coherent logical arguments.[11]

Each citizen consumes the news at most once: if either the game ends before any news has reached citizens, or if it ends before sophisticated citizens have received fact-based news, citizens (or at least some of them) end up not consuming any news, and media outlets do not earn the corresponding revenue. For the sake of simplicity, we assume that the revenue of an outlet is not affected by the simultaneous publication of similar stories by other outlets.[12]

The timing of the model is depicted in Figure 1. We solve the game using Subgame Perfect Nash Equilibrium (SPNE) as equilibrium concept. All proofs, as well as the analysis of some extensions of the model, are relegated to the appendix, to be found in the online edition.

2.1 Analysis

We focus on symmetric equilibria in pure strategies, a natural choice given the symmetry between media outlets. The two focal equilibria are what we call Rumor Equilibrium and

[11]It is important to note that this model does not address fake news, where media outlets may fabricate false facts. Instead it focuses on the incentives for media to provide high quality, i.e., fact-checked news that refines the 'raw' rumor initially acquired by media.

[12]Beyond enhancing tractability, this assumption enables the isolation of the preemption effect. As we show in Appendix B.1, adding an additional 'market splitting' channel does not qualitatively change our results, but it makes the preemption channel quantitatively stronger, providing an additional, 'intensive margin' reason to deviate out of fact-checking and publish a rumor.

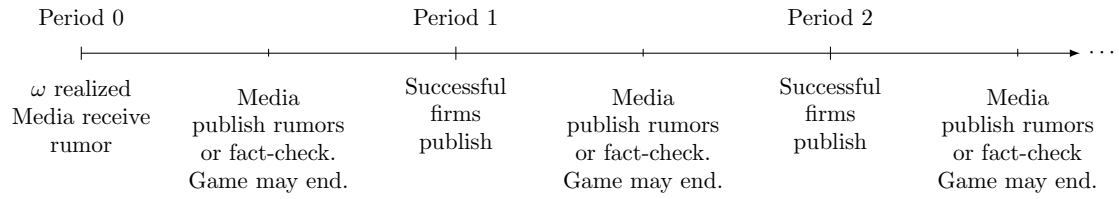

Figure 1: Timing of the model

Fact-Checking Equilibrium.

Definition 1. *We study the following equilibria:*

(i) A Rumor Equilibrium is an equilibrium where all media publish the rumor immediately, i.e., at $t = 0$, and all citizens read it.

(ii) A Fact-Checking Equilibrium is an equilibrium where all media fact-check the information and never publish rumors.

The Rumor Equilibrium establishes a self-reinforcing dynamic between citizens and media: sophisticated citizens have no incentives to wait for facts, because they know that media do not fact-check. At the same time, media have no incentives to fact-check, because they know that all citizens are willing to consume the rumor anyways. Hence, neither citizens nor media have any incentive to unilaterally deviate from this equilibrium, which always exists.

Lemma 1. *The Rumor Equilibrium always exists.*

We are now interested in the conditions such that a Fact-Checking Equilibrium exists. When all media fact-check, all citizens wait until a fact is published. If a media outlet manages to publish a fact, therefore, it captures the attention of all citizens and gets a revenue of 1. If instead a media outlet deviates and publishes a rumor, only the fraction η of naïve citizens consumes it. Publishing rumors offers the advantage of circumventing the risk of preemption: when multiple outlets are fact-checking, there is a chance another outlet could publish first, leaving those who didn't verify their information quickly enough without an audience.

A key feature of the model is that the more media outlets are fact-checking, the greater is the risk of preemption. By publishing a rumor, an outlet ensures it is the first to break the news to the naïve segment of the audience. Thus, the larger the proportion of naïve citizens, the more beneficial it is for an outlet to publish rumors over waiting for verified facts. As a result, the incentive to engage in fact-checking is greater the lower the number of competing media outlets (N), the lower the proportion of naïve agents (η), and the greater the probability of successful fact-checking (q). Specifically, within a Fact-Checking Equilibrium, the value of fact-checking is determined as follows:

$$V_{FC} = \delta(q + (1-q)^N V_{FC}) \Rightarrow V_{FC} = \frac{\delta q}{1 - \delta(1-q)^N} \tag{1}$$

which has to be larger than η in order for a Fact-Checking Equilibrium to exist. This is summarized in the following proposition.

Proposition 1 (**Existence of Fact-Checking Equilibrium in the supply model**).

(i) If $\eta \leq q\delta$, a Fact-Checking Equilibrium always exists.

(ii) If $\eta \in \left(q\delta, \frac{q\delta}{1-\delta(1-q)^2}\right]$, there exists a threshold N_S such that the Fact-Checking Equilibrium exists when $N \leq N_S$.

(iii) If $\eta > \frac{q\delta}{1-\delta(1-q)^2}$, the Fact-Checking Equilibrium does not exist.

In Figure 2, we depict the results of the previous proposition. The area below the line labeled $N \to \infty$ corresponds to the first statement of the proposition, implying that the Fact-Checking Equilibrium exists when the fraction of naïve citizens is sufficiently low and the probability of successful fact-checking is high enough, even under an infinite number of competing outlets. This occurs because the expected revenues from fact-checking are sufficient for media to have the incentive to fact-check, even knowing they will lose all revenues almost certainly if the first attempt of verification fails. Conversely,

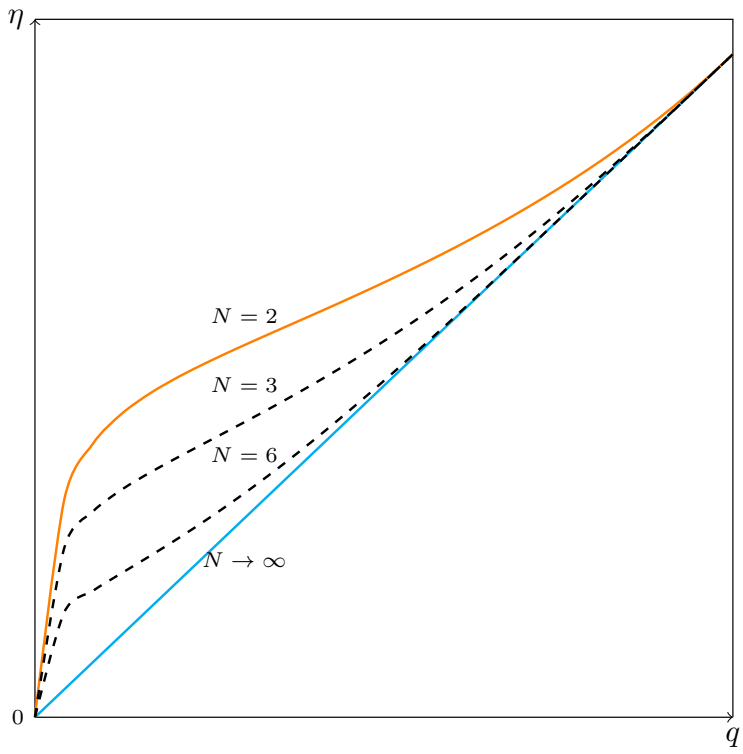

Figure 2: Equilibrium characterization in the (q, η) space, with $\delta = 0.95$. The curves represent, for different values of N, the upper bound on η below which the Fact-Checking Equilibrium exists.

the area above the curve labeled $N = 2$ corresponds to the third statement of the proposition, showing that when η is high and q is low, the risk of being preempted dominates the expected revenues, preventing the existence of the Fact-Checking Equilibrium, even if there is only one competitor that can possibly preempt them. Finally, the area between $N = 2$ and $N \to \infty$ corresponds to the second statement of the proposition; in this region, the existence of the Fact-Checking Equilibrium depends on the number of competing media outlets N: as N grows large, there is a point beyond which fact-checking stops being sustainable.

Another way to interpret the previous proposition is that an increase in the number of media outlets (N) diminishes the maximum proportion of naïve readers (η) for which a Fact-Checking Equilibrium can be sustained. This can also be observed in Figure 2. The region in which the Fact-Checking equilibrium exists when $N = 2$ is the region be-

low the corresponding curve. As N grows, the corresponding curve moves downwards, shrinking the region of existence of the Fact-Checking Equilibrium. Thus, in the model of fact-checking and news supply, competition is always detrimental to fact-checking due to the preemption channel.

The Monopolist Case: In solving the model we always assume that $N \geq 2$. The case $N = 1$ corresponds to a monopoly and has the specific feature that if the only available outlet does not fact-check, the sophisticated reader is forced to consume the rumor, just like in a Rumor Equilibrium. Thus, as long as $\delta < 1$, the monopolist never fact-checks, so as to avoid not being able to fact-check in time before the attention window closes, and always gets the full revenue. An implication of this is that eliminating preemption by making consumers 'captured' by a single media outlet is not a solution to the lack of fact-checking. This occurs because the monopolist, while not concerned with preemption from other outlets, can still encounter 'preemption by nature' – i.e., the failure to fact-check before the attention window closes – and immediately publishing a rumor allows the monopolist to avoid this risk. The main implication of the monopolist case is that, despite the negative effects of excessive competition that we have discussed above, some competition is always at least weakly beneficial for fact-checking. As we will see, Section 3 will make the case in favor of competition even stronger.

3 Demand for news and political mobilization

In Section 2, the demand for news is assumed exogenous: naïve citizens consume the first available news, irrespective of its quality, whereas sophisticated citizens are always willing to wait for fact-based news. In this section, we extend the model by micro-founding the choice of sophisticated citizens between rumor and fact-based news, while keeping fixed the fact that naïve citizens consume the first available news.

We assume that citizens use news articles to inform their decision to mobilize in favor

of one of the two political parties. The decision to mobilize in favor of a political party is irreversible; this captures the fact that once mobilized, citizens shift their attention away from the topic, and therefore do not alter their stance, even when subsequent news contradicts earlier information.[13] Moreover, the mobilization can take place in each period, but if the game ends before a citizen has mobilized, such citizen loses the opportunity to mobilize.[14] In this sense, the 'attention window' mentioned in Section 2 can be now interpreted as a 'mobilization window'. As in a model of sincere voting, we assume that once the mobilization window closes, citizens derive utility from having mobilized in favor of the political side congruent with the state of the world. Specifically, the utility of a citizen at the end of the game, as a function of their mobilization decision $e \in \{A, B, \emptyset\}$, reads:

$$u(e) = \begin{cases} 1 & e = \omega \\ -1 & e \neq \omega \\ 0 & e = \emptyset \end{cases} \tag{2}$$

Given this context, and with the understanding that the mobilization window could imminently close, citizens must strategically choose whether to consume the news available in each period. We assume that if citizens are indifferent (for example because they anticipate that even if they consume the news they will delay the decision to mobilize), they choose not to consume the news: this captures the limited budget of available attention and, relatedly, the opportunity costs due to the presence of other (unmodeled) news to read. Finally, just like in the model in Section 2, when citizens consume the news, media outlets earn a revenue that is independent of how many other outlets are reporting

[13] Absent this assumption, all citizens would immediately mobilize following the rumor and then change camp if factual news contradicts the initial rumor.

[14] In Appendix B.3, we replace the probabilistic closing of the mobilization window with a 'mobilization deadline', such as an election, constituting the end of the game.

the same news: it is as if citizens consumed the news from all media outlets that provide it.

As a consequence of the setup introduced above, sophisticated citizens trade-off the informativeness of the news content with their impatience to mobilize before the mobilization window closes. This means that sophisticated readers always consume a fact as soon as it is published, and consequently mobilize in favor of the party congruent with the state of the world. If a rumor is published, instead, sophisticated readers trade off its limited informativeness with the advantage of an immediate mobilization. To focus on the interesting aspects of the model, from now on we impose the following assumption:

Assumption 1. *The rumor is sufficiently noisy:* $2p - 1 < \delta$.

This assumption guarantees that the rumor is noisy enough to make waiting for a fact not an a priori dominated choice, in which case the Rumor Equilibrium would be the trivial outcome of the game. Having set up the demand model, we proceed to the characterization of the equilibria.

3.1 The Demand Channel

By incorporating a micro-founded demand for news into the model, we introduce an important additional driving force. Suppose that media outlets fact-check, but one of them deviates and decides to publish the rumor. Naïve voters mobilize based on the rumor, just like in the exogenous demand model, but now also sophisticated voters may choose to do so, even if they know that other media outlets are fact-checking. The behavior of sophisticated citizens is crucial because if they also consume the rumor following a deviation by one outlet, media outlets no longer have any incentive to fact-check, and the Fact-Checking Equilibrium unravels.

Such dynamics yield significant implications for the comparative statics analysis with respect to the number of media outlets. Since the expected time until a fact is published

is shorter when more media outlets are fact-checking, the larger the number of media in the market, the greater are the chances that sophisticated citizens choose to wait for a fact. In other words, media competition makes voters more 'picky' about what kind of news they base their decisions on: when the number of media outlets is too low, fact-checking may fail not because of the preemption channel described in Section 2, but because sophisticated voters cannot resist the temptation to read a rumor when put in front of one, giving media outlets the incentive to immediately release rumors in order to avoid preemption. Unlike the preemption channel described in Section 2, which is active when the number of competitors N is too large, this type of preemption occurs when the number of competitors is too small, so that the deviation of one outlet is enough to convince sophisticated readers to consume a rumor. The following proposition characterizes the existence of the Fact-Checking Equilibrium:

Proposition 2 (Existence of Fact-Checking Equilibrium with endogenous fact demand). *Let* $\bar{q} := \frac{1-\delta}{\delta}\frac{2p-1}{2(1-p)} < 1$, *then:*

1. *For* $q \geq \bar{q}$, *the equilibrium characterization is equivalent to Proposition 1.*

2. *For* $q < \bar{q}$, *there is a threshold* $N_D > 2$, *such that:*

   (i) If $\eta \leq \delta q$, *the Fact-Checking Equilibrium exists when* $N \geq N_D$.

   (ii) If $\eta \in \left(q\delta, \frac{q\delta}{1-\delta(1-q)\chi}\right]$, *where* $\chi := \frac{\delta-(2p-1)}{\delta-\delta(2p-1)} < 1$, *a Fact-Checking Equilibrium exists if* $N \in (N_D, N_S]$, *with threshold* N_S *defined as in Proposition 1.*

   (iii) If $\eta > \frac{q\delta}{1-\delta(1-q)\chi}$, *the Fact-Checking Equilibrium does not exist.*

The first statement of the proposition considers the case when citizens are always willing to wait for facts as long as there is at least one outlet fact-checking. This means that no unilateral deviation – whereby a media outlet publishes the rumor instead of fact-checking – can lead sophisticated readers to consume a rumor. Naturally, this occurs when the probability q of successful fact-checking is higher than a threshold $\bar{q}$, which is

decreasing in the probability that the mobilization window keeps open (i.e., $1-\delta$) and increasing in the precision of the rumor p, the latter measuring the opportunity cost of waiting for a fact. Since no individual outlet can have an effect on the demand for facts by sophisticated readers, the demand channel is muted, and the analysis is identical to that of the supply-only model summarized in Proposition 1.

The heart of this section is in the second case of the proposition. When q is lower than the threshold $\bar{q}$, sophisticated citizens require a minimum number of media outlets N_D, with $N_D > 2$, in the market to be willing to wait for a fact and this restriction, together with the incentives of media to fact-check, shapes the characterization of the equilibrium.

First, in subcase (i), when the fraction of naïve citizens is low, media outlets always fact-check as long as sophisticated citizens do not consume rumors. Therefore, the Fact-Checking Equilibrium exists if the number of media outlets is sufficiently large. Interestingly, notice that this also holds when there are no naïve citizens, i.e., $\eta = 0$, meaning that a fully sophisticated readership is not enough to guarantee the exitence of a Fact-Checking Equilibrium. The polar opposite is considered in subcase (iii): when the fraction of naïve citizens is high enough, media outlets have the incentive to target them with rumors regardless of the behavior of sophisticated citizens. As a result, the Fact-Checking Equilibrium does not exist. Notice that given $q < \bar{q}$, the threshold on η above which the Fact-Checking Equilibrium does not exist is smaller than in the supply-only model. Finally, an intermediate level of naïve citizens is considered in subcase (ii). For these parameters, both the demand and the supply channels are active: therefore, the Fact-Checking Equilibrium exists only if the number of media is high enough so that sophisticated readers are not tempted to consume rumors, but at the same time low enough so that media outlets choose to fact-check despite the risk of preemption by a competitor.

To wrap up, when both the demand and supply of news are endogenously determined, the effect of competition on fact-checking is more nuanced: both excessive and insufficient competition can make fact-checking unsustainable.

4 Political Accountability

We quantify political accountability by comparing the expected proportion of citizens who mobilize for the party aligned with the state of the world once the game has ended, that is, after the mobilization window has closed and further mobilization is not possible. Formally, our measure of political accountability can be expressed as:

$$W := \mathbb{E}\left[Support^{\omega} - Support^{-\omega}\right] \tag{3}$$

The value of W – where expectations are taken over the realization of the state of the world ω and the possibility of the mobilization window closing – captures the expected net mobilization, calculated as the difference between the share of citizens who mobilize for the party congruent with the state of the world ($Support^{\omega}$) and those who support the opposing party ($Support^{-\omega}$). Our measure of political accountability therefore captures the ability of the media to make citizens mobilize in favor of the 'right cause', at the same time assigning social value to a faster news provision. Consequently, a scenario where all citizens mobilize for the congruent party results in a political accountability score of $W = 1$. Conversely, a full mobilization for the incongruent party results in a score of $W = -1$. No mobilization yields to $W = 0$, meaning that abstaining from mobilization is preferable to mobilizing for the party incongruent with the state of the world. Naturally, political accountability increases when citizens mobilize for the party congruent with the state of the world, and decreases when they mobilize for the incongruent one. This may be due to an increase in the party's share of votes in subsequent elections, or to the intensity of demonstrations influencing the decisions of the government.

This measure of political accountability also has the advantage that it coincides with social welfare, defined as the aggregation of individual utilities given by expression 2. Thus, all the results of this section have an alternative interpretation as citizens' welfare.

Before characterizing how media competition affects political accountability, we will

discuss the differences in political accountability between the Rumor and Fact-Checking Equilibrium. Under the Rumor Equilibrium, all citizens mobilize at $t = 0$. With probability p, all citizens mobilize in favor of the correct candidate, whereas with probability $1 - p$ all citizens mobilize in favor of the wrong one, leading to a political accountability of $2p - 1$, which increases in the precision of the rumor p. As far as the Fact-Checking Equilibrium is concerned, the risk is not a 'mistaken' mobilization, but rather a failure to mobilize in time before the closing of the attention window: in particular, political accountability in the Fact-Checking Equilibrium converges to 1 as δ goes to 1, and to zero as δ goes to zero. As a consequence of this, the Rumor Equilibrium may in principle be superior to the Fact-Checking Equilibrium.

Sophisticated readers internalize the risk of failed mobilization due to fact-checking delays, which means that in the model with endogenous demand, the Fact-Checking Equilibrium can never arise if it is dominated by the Rumor Equilibrium. After all, why would sophisticated citizens be willing to wait for facts if mobilizing with rumors guaranteed them a higher utility? In that case, sophisticated readers would prefer to read rumors, which media outlets would immediately supply to them.

Notably, the presence of higher political accountability in the Fact-Checking Equilibrium does not ensure its existence —a more complex dynamic underlies the equilibrium's viability. There are two reasons for this. First, a media outlet may have the incentive to forgo fact-checking and release rumors even knowing that it would only capture the attention of naïve readers. This is the supply-side effect discussed in Section 2. The second reason is more subtle and it has to do with the inability of sophisticated readers to commit to not reading rumors. Recall that the Fact-Checking Equilibrium being efficient means that sophisticated readers prefer to wait for a fact if *all* outlets fact-check. However, they may nonetheless switch to preferring a rumor if one outlet deviates from fact-checking, leaving only $N - 1$ outlets to conduct fact-checking. In other words, even if all readers were sophisticated, in such a way that the supply-side concerns of Section 2 would

be muted, the existence of an efficient Fact-Checking Equilibrium would not be assured. These results are summarized by the following Proposition 3.

Proposition 3 (Fact-Checking Equilibrium and Political Accountability). *In the model with endogenous demand for facts from sophisticated citizens:*

1. *When the Fact-Checking Equilibrium exists, it always provides greater political accountability than the Rumor Equilibrium.*

2. *The Fact-Checking Equilibrium might not exist even if it would provide greater accountability than the Rumor Equilibrium.*

Having analyzed the relationship between the existence of the Fact-Checking Equilibrium and political accountability, we can finally study how media competition (measured by the number of outlets N) affects political accountability. To do so, we start from three key observations following our model characterization: (i) political accountability is independent of N in the Rumor Equilibrium, since all media outlets have access to the rumor and release it immediately, (ii) political accountability is increasing in N in the Fact-Checking Equilibrium, because the more are the outlets fact-checking, the faster facts are delivered, and (iii) from Proposition 3, political accountability is strictly greater in the Fact-Checking Equilibrium compared to the Rumor Equilibrium, everything else given.

By combining these observations with Proposition 2's results, we derive the comparative statics concerning how media competition influences political accountability. First, notice that when $N_D > N_S$, that is, when the Fact-Checking Equilibrium does not exist for any N, only the Rumor Equilibrium exists, and hence, political accountability is constant. The interesting cases arise precisely when $N_D \leq N_S$. We summarize all these cases in Figure 3.

In subfigures (a) and (b) of Figure 3, we silence the demand channel by assuming $N_D < 2$. Absent the demand channel, competition increases political accountability as long as the preemption risk does not trigger a change from the Fact-Checking Equilibrium

to the Rumor Equilibrium. When $N_S = \infty$, this situation never occurs, and political accountability always increases with competition, as shown in subfigure (a). However, subfigure (b) shows that when $N_S < \infty$, political accountability increases with media competition whenever $N < N_S$ and it suddenly drops for higher values of N due to the switch to the Rumor Equilibrium. This implies that the optimal degree of competition is N_S, being the highest possible N compatible with fact-checking.

In subfigures (c) and (d) of Figure 3, we assume $N_D \geq 2$, which reintroduces the demand channel in our model. This generates a further possible discontinuity, i.e., an upward jump in accountability when N crosses N_D. When this is the case, only the Rumor Equilibrium exists when competition is lower than N_D, such that political accountability remains constant. Political accountability then jumps up at N_D and keeps increasing as long as the Fact-Checking Equilibrium exists. When $N_S = \infty$, supply-side incentives are not an issue for fact-checking and the more outlets are available, the higher political accountability, as we can observe in subfigure (c). Finally, in subfigure (d), we consider $N_S < +\infty$, which means that competition eventually destroys the incentives for the supply side to provide fact-based news. In this case, therefore, political accountability inversely U-shaped in N: excessive competition is harmful, but insufficient competition is equally detrimental, eroding readers' incentives to demand fact-based news.

5 Discussion

In this section we discuss various relevant applications of our model.

5.1 The impact of the Internet

The advent of the internet has drastically transformed the media landscape, affecting how news are produced, shared and consumed. In the context of our model, this transformation is reflected in two different ways.

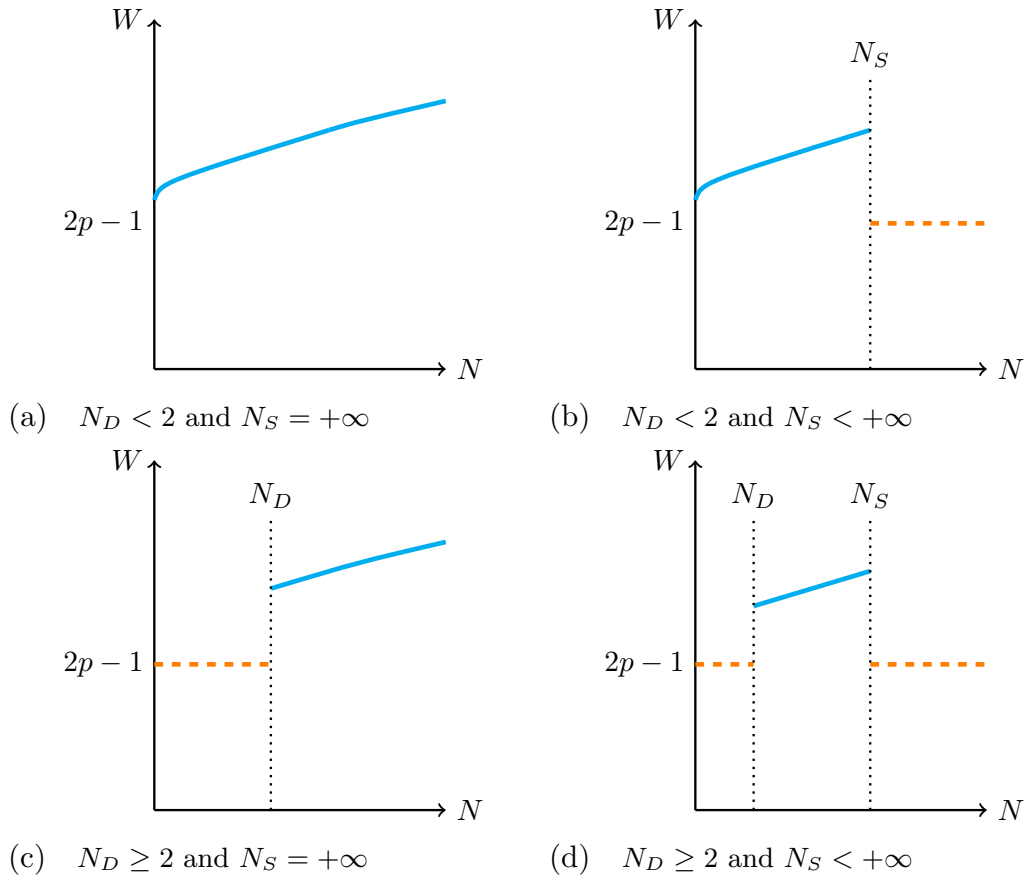

Figure 3: Political Accountability as a function of media competition when $N_D \leq N_S$ for different parameters combinations. The solid curves represent political accountability when media fact-check. The dashed curves represent political accountability when media report the rumor.

The proliferation of information sources and new consumers of news: The internet has disrupted traditional news markets by enabling a diverse array of competitors to emerge, a change represented in our model as an increase in the number of media outlets N. This increase has negative consequences for the supply-side incentives to provide accurate reporting, but can also foster a demand for verified information among sophisticated citizens. Additionally, the internet has expanded the reach of traditional media through social media platforms, exposing a broader audience to news content, consisting for a good part of readers lacking the skills or the focus to differentiate between facts and rumors. We can characterize this change in our model by increasing the fraction η

of naïve citizens, which unambiguously undermines fact-checking since it increases the incentives to publish without fact-checking of media outlets. Following the same logic, the recent tendency of social media to abandon their central role as distributors of news content may translate into a decrease in η, improving the quality of reporting.[15]

The internet has also changed the ability of media outlets to verify information through two opposing channels. The reduction in advertising revenues, a consequence of digital competition, has pressured many outlets into downsizing editorial staff and resources, implying a decrease in q in our model, which adversely affects the quality of fact-checking. On the flip side, the advent of digital tools has the potential to significantly enhance the efficiency and speed of fact-checking processes, leading to an increase in q that could make fact-checking more sustainable.

The 24-hour News Cycle: The transition to the internet has also intensified the shift – already started with television – towards the so-called 24-hour news cycle, enabling continuous news reporting far beyond the traditional once- or twice-daily newspaper cycles. According to notable journalists such as Kovach and Rosenstiel (1999), this shift has contributed to the decline in publication standards of media. However, it is difficult to isolate the effects of a faster news cycle, given the presence of concurrent changes in the media environment, such as those we have discussed above. Our model allows us to examine the effects of a faster news cycle on fact-checking in isolation, showing that the implications for fact-checking are not necessarily negative.

In order to allow for the possibility of a faster news cycle, we denote by μ the num-

[15]The reasons behind this trend include the disputes between social networks and newspapers about sharing news-related revenue (as the lawsuits filed by newspapers around the world against Google and Facebook testify), the stigma following the spread of misinformation (especially in the case of Facebook) or choices by the management of social media (e.g., Elon Musk after his acquisition of Twitter).

ber of fact-checking vs. publication decisions per unit of time: in the benchmark model, $\mu = 1$, i.e., media outlets take one publication decision in every period. In order to isolate the effects of a faster news cycle, q and δ still denote respectively the probability of successful fact-checking and of the attention window remaining open per unit of time. This means that, as μ increases, and the time between publication decisions shortens, the corresponding values of q and δ in the time interval between publication decisions – which we denote by q_μ and δ_μ – change. Specifically, a faster news cycle decreases q_μ, representing a lowered probability of successful fact-checking between each publication decision, and increases δ_μ, indicating a reduced likelihood of the attention window closing between each publication decision. The latter assumption, in particular, amounts to analyzing the effects of a faster news cycle fixing the 'attention span' δ of readers, therefore not considering the possible effects of a faster news cycle on the duration of the attention span. Our main result concerning the acceleration of the news cycle is summarized by the following Proposition 4.

Proposition 4 (**News Cycle Acceleration**). *Increasing μ has the following effects:*

1. *If δ is sufficiently low, the set of parameters such that a Fact-Checking Equilibrium exists expands.*

2. *If δ is sufficiently high, the set of parameters such that a Fact-Checking Equilibrium exists shrinks.*

A key insight is that transitioning to a 24-hour news cycle (by increasing μ) does not inherently undermine fact-checking efforts. In particular, this holds when δ is initially low, that is when the attention window of readers is short. The intuition for this possibility result rests on the presence of two opposite forces at play when the interval between publications shortens. The first one is related to the increase in δ_μ: the shorter the interval between publications, the higher is the probability that the attention window is still open when the next decision to publish must be taken. This increases the incentives to fact-

check as the news cycle accelerates. The second and opposite force concerns instead the success probability of fact-checking q_μ: the faster the news cycle, the lower is the probability of successful fact-checking in each publication interval, discouraging media outlets from fact-checking. Which one of the two forces dominates depends on the parameters: when δ is low, accelerating the news cycle is beneficial because it gives media outlets a chance to fact-check before the attention window likely closes. On the contrary, if δ is high accelerating the news cycle is detrimental because it makes fact-checking too unlikely to succeed in the short time interval between each publication decision. This observation aligns with the findings of Oliver (2022), where, via a different mechanism based on a monopolistic scenario, the ability to continuously update reports may lead to higher journalistic standards compared to a regime restricted to less frequent publications. A slightly different way to see our result is that there are situations in which what is needed in order to sustain fact-checking is not for media to be able to launch (and hence commit to) long fact-checking investigations, but on the contrary an environment in which the decision on whether to keep fact-checking is taken more frequently.

5.2 Media Market Structure

Market Concentration: Additionally, our model contributes to the ongoing debate concerning market concentration in the media sector. From the supply-side perspective, our findings suggest that greater market concentration generally promotes better fact-checking practices, except in the case of a complete monopoly (as detailed in Section 2). While our model does not account for other possible adverse effects of media concentration – such as potential capture by special interest groups – the force we describe would still be active, even in a richer model.

On the demand side, however, the model introduces a nuanced view: excessive concentration could destroy sophisticated readers' commitment to read facts, effectively turning them into naïve readers willing to consume the first available rumor. The predomi-

nance of either the positive supply-side effect versus the negative demand-side effect hinges on the initial conditions of the media landscape and the degree of concentration. Hence, understanding which effect dominates is an empirical question that requires further investigation.

Market Segmentation: An interesting implication of the demand-side model is that segmenting the media market may not be the solution to the lack of fact-checking: first, suppose that the number of media outlets is too large for fact-checking to be sustainable, and consider a segmentation such that some media outlets specialize in targeting naïve readers, and others specialize in targeting sophisticated ones. In this world, naïve and sophisticated readers get fully targeted messages and live in their own bubbles. Viewed solely from the supply side, market segmentation appears as a potential solution: in the sophisticated bubble, there are no naïve voters to capture by releasing a rumor. However, from the analysis of the demand-side we know that by decreasing the number of fact-checking media, the 'commitment' power of sophisticated readers may fail, making them act as naïve readers: hence, segmenting the market may be not just useless, but even counterproductive.

6 Conclusion

This paper analyzes the incentives of media outlets to fact-check before publishing, emphasizing the trade-off between speed and accuracy. Publishing without fact-checking allows media outlets to break the news, thereby securing at least the audience comprised of naïve readers. Fact-checking enables media outlets to also reach more sophisticated readers, but it comes at the cost of delaying the publication time, which in turn exposes a media outlet to the risk of being preempted if another media outlet successfully fact-checks and breaks the news before them.

One of our main contributions is to show that an increasing competitive pressure

can lead media outlets to adopt worse reporting standards and disseminate non-verified news. The reason why competition crowds out fact-checking is that it magnifies the risk of preemption. In addition to the intensity of competition, the efficacy of fact-checking and the composition of the readership also influence media outlets' behavior: a better fact-checking technology and a larger share of sophisticated readers who demand facts are both elements that contribute to sustaining higher levels of fact-checking.

Our model predicts that a highly competitive media sector is likely to become more susceptible to unfounded scandals, a phenomenon for which there is evidence in the works of media scholars. For example, Thompson (2013) argues that "*the pressure to run a story before one's competitors acts as an incentive to disclose information that could spark off a scandal, or which could fuel a scandal which is already underway.*"[16]

If on one hand our model highlights the potentially detrimental effects of competition on the incentives of media outlets to provide facts, on the other hand it also uncovers a channel for competition to be beneficial: a sufficient degree of competition may be necessary in order for sophisticated readers to be 'picky', i.e., willing to wait for facts even when facing a published rumor. Ultimately, therefore, in our model fact-checking often relies on the presence of enough competition.

The results of our model offer a lens through which to better understand the effects of the internet on media behavior. In this regard, the public debate has mostly focused on the spread of outright misinformation facilitated by the internet – especially by social

[16]Similarly, Garrard and Newell (2006) claim that: "*[...] modern scandals are mediated, shaped to varying degrees by the priorities of those reporting them. This has rightly led some commentators to wonder whether the priorities of capitalist (even public-service) media competition have produced behavior dysfunctional for the liberal democracies that modern industrial capitalism tends to produce. [...] Whilst the latter requires the spread of serious information and debate, the competitive priorities of the former, particularly mass-circulation tabloids, point increasingly to sensationalism, titillation, entertainment and trivialisation.*"

media – the so called 'fake news'. Our paper emphasizes the existence of an additional possible problem, concerning the quality of the information provided by media outlets regarded as 'serious'. Quoting the web page of Tortoise media, a British news-website focused on high quality journalism[17]: "The problem is not just fake news or junk news, because there's a lot that's good – it's just that there's so much of it, and so much of it is the same. In a hurry, partial and confusing. Too many newsrooms chasing the news, but missing the story."

Finally, alongside the effects of media competition, our results also address the often stigmatized acceleration of the news cycle towards which the internet played an important role: interestingly, we show that a faster news cycle is not necessarily detrimental for fact-checking.

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[17] https://www.tortoisemedia.com/about-us/our-story/

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