Manufactured Ignorance: How Media Competition Lowers News Quality*

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Abstract

We argue that media outlets may deliberately lower the quality of their reporting to fragment society and thereby reduce competition. In our model, consumers have no pre-existing biases and value news as a source of information about the world and about what their neighbors think. Broadcasters strategically reduce the informativeness of their reporting to make their products less interchangeable and soften price competition. This increases profits at the cost of consumer ignorance and social fragmentation. We show that increasing news quality may require limiting differentiation (e.g. through fairness regulations) or limiting some forms of competition.

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1. Introduction

In an age of unprecented access to news, trust in the news media is at an all-time low.[1] Two related concerns stand out in public discourse: First, the news media's role in the fragmentation of society – for example, 74% of Americans say that it is "increasing political divisions" (AP-NORC, 2023). Second, the quality and reliability of news reporting – in the same poll, 58% blame news media for the spread of misinformation.

It is hence of crucial importance to understand whether and how competitive media markets can mitigate these developments. A classical argument is that if citizens are interested in being well-informed, "competition among media firms assures that voters and consumers obtain, on average, unbiased and accurate information" (Djankov et al., 2003, p. 342). Some studies have suggested, however, that media outlets may prefer catering to pre-existing biases or tastes rather than provide unbiased information (Gentzkow and Shapiro, 2008; Gentzkow et al., 2014; Cagé, 2020).

In this paper, we argue that competitive forces themselves can incentivize media outlets to provide low-quality reporting and thereby *create* societal fragmentation. This makes the broadcasters less interchangeable, which reduces price competition and increases profits. All consumers are worse off, though there can be multiple equilibria that correspond to different market outcomes. In symmetric equilibria, all media outlets report medium-quality content and all consumers are equally half-informed. In asymmetric equilibria, some consumers get high-quality information while others consume content of low informational quality.

To make this argument, we construct a model with stylized assumptions that might intuitively be expected to lead to non-fragmented, high-quality reporting. In our model, two media outlets ("broadcasters") compete for consumers whom they can charge a variable price. Broadcasters can freely and costlessly report information of arbitrary precision (i.e. they can choose any information structure that maps the truth to any message space). Consumers can perfectly observe how informative a broadcaster's reporting is, and can freely choose which broadcaster to follow. Consumers have two simple goals: First, they want to learn as much as possible about the world (giving them an incentive to choose informative reporting). Second, they also want to learn about what other people in their neighborhood think about the world – giving them an incentive to seek out reporting that is non-polarized and widely consumed. They do not have pre-existing biases or demand slanted news.

Our main result is that under many parameter configurations, no equilibrium exists in which both broadcasters choose accurate, high-quality reporting. To see why, consider the situation of broadcaster B if broadcaster A perfectly reports the state of the world. If B

[1] For example, the number of US adults who trust news media "a great deal" or "fair amount" has more than halved since the 1970s (Gallup, 2024). Other countries have seen similar declines, albeit remaining at higher levels (Reuters Institute, 2024).

now chooses to also report perfectly, both broadcasters provide a virtually interchangeable product, so that consumers are highly price sensitive in their broadcaster choice and both broadcasters have low profits. If B provides reporting of lower quality, it provides a worse product and attracts fewer viewers. The remaining viewers, however, are less price-sensitive, since they watch B partially to learn what other viewers of B are thinking – a purpose for which the reporting of A is now an imperfect substitute. This reduced price sensitivity means that both broadcasters can charge higher prices in the market equilibrium.[2]

For the special case of normally distributed information structures, we can show that there exist symmetric equilibria (in which both broadcasters report with moderate noise) as well as asymmetric equilibria (in which one broadcaster reports the truth perfectly, while the other reports with large noise). We discuss these equilibria, and how they may map onto public perceptions of media reporting and bias, in section 3.2.

Our study has three main contributions. First, we extend models of media competition by considering the social function of news – i.e. the idea that people consume news not just to stay informed, but also to have things to talk about with others and to belong to a community. While this motivation is well-documented[3], its consequences on news choice and informativeness have been little explored.

Second, our main result establishes a mechanism by which broadcasters deliberately fragment and misinform the population to increase their profits.[4] We hence challenge conventional views that competition among broadcasters will lead to high-quality reporting, or that polarization and misinformation are caused by pre-existing demands for slanted or biased news.

Third, we use our framework to analyze the effects of policy responses. In section 4.2, we show that measures such as fairness mandates or reporting standards may improve news quality not by directly raising journalistic norms, but by increasing similarity in reporting. This locks broadcasters in stronger competition and forces them to report with high precision, rather than allowing them to create convenient niches in which they can extract resources from quasi-captive audiences. Conversely, seemingly anti-competitive policies – like limiting competition, suppressing the social function of news or making it harder to switch broadcasters – may also raise informativeness and welfare. While each approach comes with tradeoffs, a key insight from our analysis is that increasing informativeness may require limiting competition and differentiation.

[2]What we call "higher prices" can also mean lower amenities, more advertising or any other worsening along a dimension that lowers consumer surplus while increasing broadcaster revenue.

[3]For example, "talking about [the news] with family, friends and colleagues" is the most-cited reason for consuming news in a representative survey of US adults by Pew Research Center (2010).

[4]This mechanism also implies that politically motivated media owners may find divisive strategies and distortionary reporting not just ideologically appealing, but also profitable.

Connection to other research Our work is related to a large literature that studies the outcomes of media competition, in particular whether competitive media markets lead to informed citizens with accurate and unbiased information. It is also connected to a literature in industrial organization that considers vertical and horizontal product differentiation.

Research on "media competition" can often consider different types of "competition" – namely, the competition between ideas for political or societal influence (eg. Coase, 1974) and the competition for profit between media firms. Our focus is on the latter: Does competition among profit-driven media firms with no political agenda provide high-quality, accurate reporting at low prices (or, more generally, with large consumer surplus)?[5]

We also do not study "slant", which is commonly understood as reporting that is biased towards a political position (cf. Gentzkow and Shapiro, 2010 or Djourelova et al., 2024). Several authors have argued that media slant can be a form of horizontal differentiation among media companies (as different media firms segment the market along ideological lines). Gentzkow et al. (2014), using a model without informational aspects, argue that US newspapers in the early 20th century lowered their substitutability by differentiating along political lines. Gentzkow and Shapiro (2006), in an informational model, argue that if consumers find a source more believable in case it confirms with their pre-existing bias, media are incentivized to be biased – which can lower welfare but can be alleviated by competition. Mullainathan and Shleifer (2005) similarly consider a market in which newspapers can slant their coverage towards readers' beliefs. If readers are homogeneous, competing newspapers all slant their coverage in the same direction and reporting is not accurate even in aggregate. If readers are sufficiently heterogeneous, newspapers segment the market according to reader bias but the sum of all reporting gives an unbiased picture. Anand et al. (2007) consider a market in which media can use consumer's heterogeneous priors ("ideologies") to differentiate. Anderson and McLaren (2012) model a situation in which media companies want to push a certain political narrative. Since they do so by omitting certain news, rational consumers cannot fully compensate (since they do not know what is omitted); competition alleviates this problem. **?** show that competitive pressure might lead to specialization of media and polarization of the electorate along ex ante heterogeneous ideological preferences.

Our analysis differs from all such studies in that our consumers have no pre-existing biases, tastes for certain content or demand for slant. Broadcasters in our model can only choose how accurately to report and all consumers are identical in preferring more accurate broadcasts.[6]

[5]Of course, many studies consider a mixture of the two, since models of media slant and bias (see next paragraph) can also be argued to be about the "competition of ideas" – our model, however, is not.

[6]Of course one way to lower accuracy would be to introduce bias or slant. We allow broadcasters to choose any information structure that maps from the true state to any message space. Since consumers have no demand for slant or bias in our model, introducing any slant or bias simply lowers informativeness

Empirical studies differ on whether competition among media firms leads to more informative reporting. The classical argument that competition leads to precise and unbiased information (made e.g. by Djankov et al., 2003, p. 342) is empirically supported by Galvis et al. (2016) (in the context of newspaper entry in the US around 1900) and Hong and Kacperczyk (2010) (in the context of financial analysts). Evidence to the contrary is provided by Cagé (2020) (in the context of French newspapers in the second half of the 20th century) and Angelucci et al. (2024) (considering competition between TV and newspapers in the US). Our model clearly predicts that competition leads to less informative reporting; we discuss the relevance of our findings in sections 3.2 and 4.2.[7]

The major methodological innovation of our study is to explicitly model the social function of news. This is empirically well-documented – for example, in a representative survey of US adults, 72% state that "one reason they consume news is because they enjoyed talking about it with family, friends and colleagues". This is the most-named reason, ahead of such reasons as "find[ing] information in the news that helps them improve their lives" (61%). While this social function has been studied in communications research, for example in the context of uses and gratifications theory (cf. Palmgreen et al., 1980 or Vincent and Basil, 1997), its considerable impact on media competition has not been systematically studied before.

Our paper is also related to the industrial organization literature on product differentiation, with seminal papers Hotelling (1929); d'Aspremont et al. (1979) for horizontal and Gabszewicz and Thisse (1979); Shaked and Sutton (1982) for vertical differentiation. In our model, less accurate reporting simultaneously creates horizontal differentiation (as inferring the information of viewers of the other broadcaster becomes harder) and vertical differentiation (as broadcasts become less informative about the world). As in d'Aspremont et al. (1979), endogenous differentiation allows firms in our model to relax price competition. In our model, however, this comes at the cost of strictly lowering demand for one's own product, since consumers are (unlike in Shaked and Sutton (1982)) homogenous in their preferences along the vertical dimension.

Neven and Thisse (1989) analyze a model in which both product variety (horizontal differentiation) and quality (vertical differentiation) are chosen freely prior to price competition. They describe equilibria in which firms are maximally differentiated in one dimension and not at all differentiated in the other, see also Irmen and Thisse (1998) for a related result. The accuracy of reporting in our model affects both dimensions at the same time and as a consequence broadcasters are differentiated in both dimensions when reporting inaccurately.

In a similar IO spirit, some papers analyze differentiation in the context of subtle

and hence the value of a broadcast.

[7] Monopoly ownership of media platforms can improve welfare in **?**, however, through channels not covered by our model – namely its effects on advertising levels and programming.

mechanisms working through the advertising market, e.g. Gal-Or and Dukes (2003). Social aspects of media consumption and accuracy of reporting, the center of our analysis, do not play a big role in such analysis.

2. Model

Overview and timing There are two "broadcasters", called A and B, which disseminate information about the state of the world θ. A continuum of consumers uniformly distributed on $[0, 1]$ first decide which broadcaster to follow and then take actions based on the information they obtain from the broadcaster of their choice.

We will begin by giving a general overview of the timing; each part of the game is then explained in more detail below. We also discuss some of the main assumptions in detail in section 4.1. The timing is:

1. Broadcasters A and B simultaneously choose information structures which determine how they inform consumers about the state of the world.
2. Broadcasters A and B observe the information structure set by the other broadcaster and simultaneously set prices $p_i \in \mathbb{R}_+$ that consumers have to pay for following them.
3. Consumers observe the broadcasters' information structures and prices. Each consumer j chooses to follow one of the two broadcasters or none at all.
4. The state of the world θ as well as signals of the broadcasters realize and all consumers observe the signal of the broadcaster they are following. (No one observes θ.)
5. Each consumer j gets randomly matched with another consumer (whom we call $-j$). j observes the broadcaster that $-j$ follows and takes actions whose payoff depends on the state of the world θ and the actions of $-j$.
6. Payoffs realize.

The solution concept is perfect Bayesian equilibrium.[8]

State of the world The state of the world θ is distributed according to cumulative distribution function F on support Θ, where $\Theta \subseteq \mathbb{R}$ and $|\Theta| \geq 2$.

[8]Strictly speaking, our analysis only requires sequential rationality. The consistency requirement that is commonly seen as part of PBE has no implications here since there is no relevant private information at the time that actions are taken.

Broadcaster actions and payoffs Each broadcaster i takes two choices:

1. In stage 1: An *information structure* $\mathcal{I}_i = (\mathcal{S}_i, \phi_i)$, which consists of a signal space $\mathcal{S}_i \subseteq \mathbb{R}$ and a mapping $\phi_i : \Theta \to \Delta\mathcal{S}_i$. ϕ_A and ϕ_B are independent conditional on the true state θ. This information structure maps each state of the world to a distribution over messages and determines how the broadcaster informs its followers about the state of the world.

2. In stage 2: A price $p_i \in \mathbb{R}_+$, which is the price that a consumer needs to pay to follow i.

Information structures are costless, i.e. broadcasters can choose to report arbitrarily precisely or imprecisely about the world with no constraint. Broadcaster i's profit π_i is simply the revenue from all consumers that follow i, i.e.

$$\pi_i = \int_{\Psi_i} p_i dj$$

where $\Psi_i \subseteq [0, 1]$ is the set of consumers who have chosen to follow broadcaster i.

A consumer following broadcaster i will receive signal $s_i \in \mathcal{S}_i$ in stage 4, which is the result of the mapping ϕ_i.

Consumer actions and payoff Each consumer j makes three choices: Which broadcaster i to follow (in stage 3 of the timing, see above) and two actions a_j and b_j (in stage 5, after learning s_i). Consumer j's payoff (with $j \in [0, 1]$) from following broadcaster A and taking actions a_j and b_j is given by

$$U_j(A, a_j, b_j) = \underbrace{v - p_A}_{\text{Benefit and cost}} - \underbrace{\tau j}_{\text{Transportation cost}} - \underbrace{(a_j - \theta)^2}_{\text{Information part}} \underbrace{- \alpha(b_j - a_{-j})^2}_{\text{Interaction part}} \qquad (1)$$

where $\alpha > 0$ is a parameter indicating the relative importance of the interaction, and a_{-j} is the action of the consumer that j gets matched with. The payoff from consuming broadcaster B is identical, except that transportation cost is given by $\tau(1 - j)$. We will explain each part of this payoff in turn.

Benefit and cost Consumers derive an exogenous payoff of v from following any of the broadcasters. This assumption mainly guarantees that we can consider equilibria with a covered market (i.e. every consumer follows exactly one broadcaster); we will hence choose v to be in a range that guarantees the existence of covered market equilibria. When following broadcaster i, each consumer has to pay a cost of p_i (the price set by broadcaster i).

Transportation cost Consumers are also differentiated in their tastes, similar to a classical Hotelling model. More specifically, consumer $j \in [0,1]$ has cost τj when following broadcaster A (usually called "transportation costs" in Hotelling models) and cost $\tau(1-j)$ when following broadcaster B. Our main result only requires that $\tau > 0$. Methodologically, $\tau > 0$ introduces a (small) taste asymmetry among consumers which implies that broadcaster demand is continuous in price, such that our model has interior solutions in pure strategies.

Information part The first informational benefit that consumers derive from broadcasts is learning about the state of the world. Formally, each consumer j takes an action $a_j \in \mathbb{R}$ which she tries to choose as close to the state of the world as possible.

Interaction part The central theoretical innovation of our model is that consumers value knowing what others believe about the state of the world. This is the social function of news (whose empirical support we have discussed in the literature review): The ability to predict what other people believe, what they know about the world and which topics they care about.

Formally, each consumer j takes an action $b_j \in \mathbb{R}$ which she tries to take as close as possible to the action a_{-j} of another consumer $-j$ that she is randomly matched with. Of course, the optimal b_j depends on which broadcaster this consumer $-j$ is following and hence what kind of information she will have about the world. This is decided by the following matching algorithm:

Interaction matching Each consumer is randomly matched with another consumer in their "neighborhood". Specifically, consumer j is matched uniformly with another consumer in a $\tilde{\delta}_j$-neighborhood of j, so that each consumer is equally likely to interact with any consumer that is in $[j - \tilde{\delta}_j, j + \tilde{\delta}_j]$. We assume that $\tilde{\delta}_j = \min\{\delta, j, 1-j\}$ for some $\delta \in (0, 1/2)$. That is, the neighborhood from which consumer j is matched is a δ-ball around j unless j is so close to one of the boundaries that a δ-ball centered at j would not fit into $[0,1]$. In this case, the neighborhood is the largest ball centered at j in $[0,1]$.[9] For simplicity, we assume that interaction is one-sided and independently drawn, meaning that if j is matched with (and hence trying to predict the action by) j' and j' is matched with j'', it is almost surely $j' \neq j''$.

Committed consumers Finally, we assume that a share $\lambda \in (0,1)$ of the consumers at any location have a constrained choice and are "committed". Specifically, these consumers

[9]This latter assumption is to avoid artificial discontinuities near the endpoints of the $[0,1]$ interval, where a δ-neighborhood would include points outside of $[0,1]$. Our main results would stay the same if we defined neighborhoods as $[j-\delta, j+\delta] \cap [0,1]$ and assumed that δ is small enough (below 1/4), though our analysis would require more case distinctions.

choose to follow either broadcaster A or none at all if $j \in [0, 0.5)$ (in other words, they choose from set $\{A, \emptyset\}$ in step 3) and choose from set $\{B, \emptyset\}$ if $j \in (0.5, 1]$. These committed consumers are hence either unaware of the more "distant" broadcast, are unable to consume it for reasons of technology or regulation, or are unwilling to consume it due to preferences or ideology. The remaining share $(1 - \lambda)$ of consumers make an unconstrained broadcaster choice from the set $\{A, B, \emptyset\}$. Figure 1 visualizes this distribution of committed and uncommitted consumers.

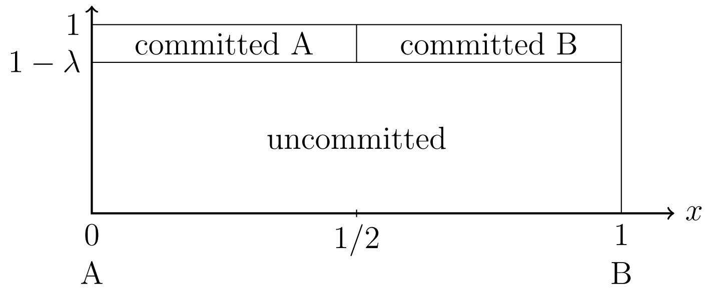

Figure 1: Distribution of consumers and "location" of broadcasts

Consumers' outside option A consumer who does not follow any broadcaster does not pay p_i or any transportation cost, but gets no signal s_i.

Reformulating the consumer's problem Before we continue with our main equilibrium analysis, we can reformulate the uncommitted consumers' utility function in a way that will be useful for our further analysis.

First, we can observe that the optimal a_j is given by $a_j^* = \mathbb{E}[\theta|s_i]$. (We write i for the broadcaster that j follows; in the following we will write $-i$ for the other broadcaster.) The optimal b_j depends on whether $-j$, the consumer that j interacts with, follows the same broadcaster as j or not. In the former case, it is then $b_j^* = a_j^* = \mathbb{E}[\theta|s_i]$, and in the latter case it is $b_j^* = \mathbb{E}[\mathbb{E}[\theta|s_{-i}]|s_i]$.

We can hence write the expected consumer utility of following broadcaster i, at the time of choosing broadcasters and focusing only on the informational parts, as

$$\begin{aligned} E[U_j(i)] &= const - \mathbb{E}\left[(\theta - \mathbb{E}[\theta|s_i])^2\right] - \alpha q_{-i}\mathbb{E}\left[(\mathbb{E}[\mathbb{E}[\theta|s_{-i}]|s_i] - \mathbb{E}[\theta|s_{-i}])^2\right] \\ &= const - V_i - \alpha q_{-i} C_i \end{aligned} \tag{2}$$

where

$$V_i = \mathbb{E}\left[(\theta - \mathbb{E}[\theta|s_i])^2\right], \qquad C_i = \mathbb{E}\left[(\mathbb{E}[\mathbb{E}[\theta|s_{-i}]|s_i] - \mathbb{E}[\theta|s_{-i}])^2\right],$$

q_{-i} is the consumer's belief that the consumer she will interact with follows the other broadcaster, and $const = v - p_A - \tau j$ if $i = A$ while $const = v - p_B - \tau(1 - j)$ if $i = B$.

3. Analysis

We write $\mathcal{I}^f$ for the fully informative information structure in which $\mathcal{S}_i = \Theta$ and $\phi_i(\theta)$ assigns probability 1 to θ for all $\theta \in \Theta$. Our main result states that if α is above a certain threshold, there is no equilibrium such that both broadcasters choose $\mathcal{I}^f$. We establish this result by showing that if one broadcaster chooses $\mathcal{I}^f$, the other broadcaster's best response is not $\mathcal{I}^f$ but an information structure with a small amount of noise.

In the spirit of backward induction, we begin by deriving equilibrium consumer choice and then equilibrium prices, which then allow us to state our main result about the precision choice of broadcasters.

Broadcaster choice by the consumer We focus on parameter values for which there is an equilibrium with a covered market (implying $q_{-i} = 1 - q_i$). In such an equilibrium, there is an indifference location $\hat{x}$ such that consumers located at $x < \hat{x}$ buy broadcast A and consumers located at $x > \hat{x}$ buy broadcast B. Consumers located at $\hat{x}$ are indifferent between both broadcasts, i.e.

$$\begin{aligned} & p_A + \tau\hat{x} + V_A + \alpha q_B(\hat{x}) C_A = p_B + \tau(1-\hat{x}) + V_B + \alpha q_A(\hat{x}) C_B \\ \Leftrightarrow\ & 2\tau\hat{x} - \alpha q_A(\hat{x})(C_A + C_B) = p_B - p_A + \tau + V_B - V_A - \alpha C_A. \end{aligned} \tag{3}$$

Our matching protocol implies that

$$q_A(\hat{x}) = \begin{cases} (1-\lambda)\frac{1}{2} + \lambda * 1 & \text{if } \hat{x} < \frac{1}{2} - \delta \\ (1-\lambda)\frac{1}{2} + \lambda \frac{1/2 - (\hat{x}-\delta)}{2\delta} & \text{if } \hat{x} \in [\frac{1}{2} - \delta, \frac{1}{2} + \delta] \\ (1-\lambda)\frac{1}{2} + \lambda * 0 & \text{if } \hat{x} > \frac{1}{2} + \delta. \end{cases} \tag{4}$$

In each of these expressions, the first summand represents the non-committed consumers – of whom, if $\hat{x}$ is indifferent, exactly half use each broadcaster. The second summand represents the committed consumers, whose average choice in $\hat{x}$'s δ-neighborhood depends on the location of $\hat{x}$ on the $[0, 1]$ interval.

Note that q_A is continuous, decreasing and piecewise linear. For given prices and parameters, there is therefore (at most) one location $\hat{x}$ at which the indifference condition (3) holds and this $\hat{x}$ is continuous in prices and parameters.

Solving the indifference condition (3) for $\hat{x}$ yields

$$\hat{x} = \frac{p_B - p_A + Z}{Y} \tag{5}$$

where Z and Y depend on which case of equation (4) applies to $\hat{x}$. Analogously to a Hotelling model with quality differences, we can think of Z as describing the quality differences and Y as describing the price inelasticity of demand. In the absence of any informational effects, Z and Y would be τ and 2τ, respectively, but the choice of information structure affects both Z and Y. The exact expressions are as follows:

$$Z = \begin{cases} \tau + V_B - V_A + \alpha\frac{1+\lambda}{2}C_B - \alpha\frac{1-\lambda}{2}C_A & \text{if } \hat{x} < \frac{1}{2} - \delta \\ \tau - \alpha C_A + V_B - V_A + \alpha(C_A + C_B)\left(\frac{1}{2} + \frac{\lambda}{4\delta}\right) & \text{if } \hat{x} \in [\frac{1}{2} - \delta, \frac{1}{2} + \delta] \\ \tau + V_B - V_A + \alpha\frac{1-\lambda}{2}C_B - \alpha\frac{1+\lambda}{2}C_A & \text{if } \hat{x} > \frac{1}{2} + \delta \end{cases} \tag{6}$$

$$Y = \begin{cases} 2\tau & \text{if } \hat{x} < \frac{1}{2} - \delta \\ 2\tau + \alpha(C_A + C_B)\frac{\lambda}{2\delta} & \text{if } \hat{x} \in [\frac{1}{2} - \delta, \frac{1}{2} + \delta] \\ 2\tau & \text{if } \hat{x} > \frac{1}{2} + \delta. \end{cases} \tag{7}$$

Pricing At the pricing stage, broadcaster profits can be written as

$$\pi_A = p_A\left(\lambda\frac{1}{2} + (1-\lambda)\hat{x}\right) \qquad \text{and} \qquad \pi_B = p_B\left(\lambda\frac{1}{2} + (1-\lambda)(1-\hat{x})\right).$$

Equation (5) allows us to derive equilibrium prices and profits as functions of λ, Z and Y.[10] Equilibrium prices are given by

$$p_A^* = \frac{1}{2}\frac{\lambda}{1-\lambda}Y + \frac{1}{3}Z + \frac{1}{3}Y$$
$$p_B^* = \frac{1}{2}\frac{\lambda}{1-\lambda}Y - \frac{1}{3}Z + \frac{2}{3}Y$$

implying that the indifferent consumer is located at

$$\hat{x}^* = \frac{1}{3}\frac{Y+Z}{Y} \tag{8}$$

and profits are

$$\begin{aligned} \pi_A &= \left(\frac{1}{2}\frac{\lambda}{1-\lambda}Y + \frac{1}{3}Z + \frac{1}{3}Y\right)\left(\lambda\frac{1}{6} + \frac{1}{3} + (1-\lambda)\frac{1}{3}\frac{Z}{Y}\right) \\ &= \left(\frac{1}{9}\lambda + \frac{2}{9}\right)Z + \left(\frac{1-\lambda}{9}\right)\frac{Z^2}{Y} + \left(\frac{1}{12}\frac{\lambda^2+2\lambda}{1-\lambda} + \frac{1}{18}\lambda + \frac{1}{9}\right)Y \\ \pi_B &= \left(\frac{1}{2}\frac{\lambda}{1-\lambda}Y - \frac{1}{3}Z + \frac{2}{3}Y\right)\left(-\lambda\frac{1}{6} + \frac{2}{3} - \frac{1-\lambda}{3}\frac{Z}{Y}\right) \\ &= \left(\frac{1}{9}\lambda - \frac{4}{9}\right)Z + \left(\frac{1-\lambda}{9}\right)\frac{Z^2}{Y} + \left(-\frac{1}{12}\frac{\lambda^2-4\lambda}{1-\lambda} - \frac{1}{9}\lambda + \frac{4}{9}\right)Y. \end{aligned} \tag{9}$$

[10] The following derivations make use of first-order conditions that may not necessarily apply at the boundaries of case distinctions we have made above. Lemma 1 below, however, will show that only one of the cases is relevant for our main result, and that in particular there are no equilibria that involve boundary values, so that the following derivations are without loss of generality for our purpose.

Precision We now turn to the precision choice in stage 1 of the game. Our main result states that if consumers care sufficiently about their interaction with other consumers (i.e. if α is sufficiently large), it is not an equilibrium that both broadcasters perfectly inform their customers.[11]

Proposition 1. *Let $\alpha \geq 4\delta/(\lambda - 2\delta)$ and $\lambda > 2\delta$. Then there exists no equilibrium in which both broadcasters choose the perfectly informative information structure $\mathcal{I}^f$.*

Proof of proposition 1: Let broadcaster B choose information structure $\mathcal{I}^f$ which relays the true state with probability 1. We will show that broadcaster A achieves a higher payoff using a noisy signal structure than when choosing $\mathcal{I}^f$.

Consider a signal structure that sends signal $s_A = \theta$ with probability $1 - \varepsilon$ and sends a random signal drawn from F (but independently of the state) with probability ε. We will consider the effect of increasing ε from zero (which corresponds to the perfectly informative signal structure $\mathcal{I}^f$) to a small positive number. The following lemma shows that two common and intuitive properties of Hotelling games also hold in our context: First, arbitrarily small differences in noise (i.e. quality) mean that the indifferent consumer is arbitrarily close to 1/2. Second, the broadcaster offering a slightly worse product has slightly fewer customers.

Lemma 1. *For $\varepsilon > 0$ sufficiently small, the indifferent consumer location $\hat{x}^*$ in the equilibrium of the pricing subgame is in $(1/2 - \delta, 1/2)$. (Proof in the appendix.)*

Using (9), we can write

$$\pi_A'(\varepsilon) = \left(\frac{1}{9}\lambda + \frac{2}{9}\right)\frac{d\,Z}{d\varepsilon} + \left(\frac{1-\lambda}{9}\right)\left(2\frac{Z}{Y}\frac{d\,Z}{d\varepsilon} - \frac{Z^2}{Y^2}\frac{d\,Y}{d\varepsilon}\right) + \left(\frac{1}{12}\frac{\lambda^2 + 2\lambda}{1-\lambda} + \frac{1}{18}\lambda + \frac{1}{9}\right)\frac{d\,Y}{d\varepsilon}.$$

As $Z_{\varepsilon=0,\mathcal{I}_B=\mathcal{I}^f} = \tau$ and $Y_{\varepsilon=0,\mathcal{I}_B=\mathcal{I}^f} = 2\tau$, this expression simplifies to

$$\pi_A'(0) = \frac{1}{3}\frac{d\,Z}{d\varepsilon} + \left(\frac{1}{12}\frac{\lambda^2 + 2\lambda}{1-\lambda} + \frac{1}{12}\lambda + \frac{1}{12}\right)\frac{d\,Y}{d\varepsilon}.$$

By lemma 1, the expressions given in (6) and (7) apply for Z and Y and (given that B uses no noise) it is $V_B = 0$, $C_A = V_A \geq 0$ and $C_B \geq 0$. The latter inequalities are strict for $\varepsilon > 0$ and hold with equality if $\varepsilon = 0$. With the parameter restrictions of proposition 1, it is $Z \geq \tau$ and $Y \geq 2\tau$, where again the inequalities are strict for $\varepsilon > 0$ and hold with equality if $\varepsilon = 0$. Therefore, $d\,Z/d\varepsilon > 0$ and $d\,Y/d\varepsilon > 0$ at $\varepsilon = 0$ which implies that $\pi_A'(0) > 0$. □

To see how noise reduces consumers' price sensitivity, consider the broadcasters' pricing game if they both report perfectly (i.e. $\mathcal{I}_A = \mathcal{I}_B = \mathcal{I}^f$). Then the information and

[11] While we formulate proposition 1 by writing $\mathcal{I}^f$ for the perfectly informative information structure, it also applies to all information structures that differ from $\mathcal{I}^f$ only on a set of measure 0 and under which consumers can hence infer the state θ with probability 1.

interaction parts in the consumer's payoff (equation 1) are both zero and consumers are maximally price-sensitive: price is the only thing that matters for their broadcaster choice.

Now imagine that A introduces some noise (while $\mathcal{I}_B = \mathcal{I}^f$). This reduces all consumers' willingness to pay for A (since its broadcast becomes less informative about the state θ). In mixed neighborhoods, it further reduces consumers' willingness to pay for either broadcaster, since their reporting becomes less informative about the beliefs of some other consumers.

But noise also adds an additional consideration to broadcaster choice: Consumers now consider which broadcast is consumed by people they are likely to interact with. The more neighbors follow A, the higher a consumer's willingness to pay for A. For the indifferent consumer, half of all non-committed neighbors follow each broadcaster. How many *committed* neighbors follow A, however, depends on the location of the indifferent consumer $\hat{x}$: The lower $\hat{x}$, the higher the proportion among committed neighbors who follow A – and hence the higher the value of broadcaster A's reporting.

This means that if we consider indifferent consumers in two different locations, their willingness to pay for following A differs for two reasons: Because they differ in transportation cost *and* in the composition of their neighborhoods. The second effect softens the impact of price changes on the location of the indifferent consumer. Since in a covered market, the location of the indifferent consumer determines both broadcaster's demand, this hence also lowers the price elasticity of either broadcaster's demand.

This allows the broadcasters to charge higher prices in equilibrium. A gains from introducing noise if the gain from lower price sensitivity outweighs the decrease in demand for its broadcast – which is true if the conditions at the beginning of proposition 1 are fulfilled.

Formally, equation (3) shows that without noise, a change of Δ in p_A or p_B shifts the location of the indifferent consumer by $\Delta/2\tau$. With noise, $C_A, C_B > 0$ and this shift becomes $\Delta/\left(2\tau + \alpha\left(C_A + C_B\right)\frac{\lambda}{2\delta}\right) < \Delta/2\tau$. Noise hence dampens price sensitivity of the indifferent consumer's location, and hence the price sensitivity of demand.

As a complement to this result, we can show that for sufficiently small α, there exists an equilibrium in which both broadcasters choose the perfectly informative information structure $\mathcal{I}^f$:

Lemma 2. *There exists an $\underline{\alpha} > 0$ such that for all $\alpha \leq \underline{\alpha}$, there exists an equilibrium in which $\mathcal{I}_A = \mathcal{I}_B = \mathcal{I}^f$.*

Proof of lemma 2: First consider the extreme case $\alpha = 0$. We will show that full information is the essentially unique best response to $\mathcal{I}_B = \mathcal{I}^f$ in this case. Given $\alpha = 0$ and $\mathcal{I}_B = \mathcal{I}^f$, the indifferent consumer is given by

$$\hat{x} = \frac{p_B - p_A - V_A + \tau}{2\tau}.$$

Equilibrium prices can then be readily determined as

$$p_A = \tau - \frac{V_A}{3} + \frac{\lambda}{1-\lambda}\tau \qquad p_B = \tau + \frac{V_A}{3} + \frac{\lambda}{1-\lambda}\tau$$

which implies that the indifferent consumer at equilibrium prices is $\hat{x} = 1/2 - V_A/(6\tau)$. As both equilibrium quantity and equilibrium price of broadcaster A are strictly decreasing in V_A, profits of A are strictly decreasing in V_A (with strictly negative derivative at $V_A = 0$). Hence, only information structures with $V_A = 0$ are best responses, i.e. information structures that transmit full information with probability 1.

Profits of the pricing stage are smooth in all parameters around equilibria with interior $\hat{x}$. Profits of A given $\mathcal{I}_B = \mathcal{I}^f$ are therefore also strictly decreasing in V_A if α is positive but sufficiently small. As the game is symmetric, the same applies to B. Consequently, information structures $\mathcal{I}_A = \mathcal{I}_B = \mathcal{I}^f$, where $V_A = V_B = 0$, are equilibrium choices for positive but sufficiently small α. □

3.1. Normally distributed state and noise

In our main model, broadcasters were free to use arbitrary signal structures. In this section, we simplify this framework and assume that (i) the state of the world θ is standard normally distributed and (ii) broadcasters can only use signals normally distributed around the state, i.e. $s_i = \theta + \varepsilon_i$ where ε_i is normally distributed with mean 0 and variance σ_i^2. We assume that ε_A and ε_B are independent and that broadcaster i chooses $\sigma_i^2 \in \mathbb{R}_+$ in stage 1 (instead of choosing an arbitrary information structure $\mathcal{I}_i$).

The proofs of our earlier results readily apply to this restricted setup. If α is small, both broadcasters choose $\sigma_i^2 = 0$ in equilibrium, but no such equilibrium exists if α is sufficiently large. In fact, the special structure allows us to derive a tighter version of proposition 1:

Proposition 2. *Let θ be standard normally distributed. Full information, i.e. $\sigma_A^2 = \sigma_B^2 = 0$, does not occur in equilibrium if $\alpha > \frac{4\delta(1-\lambda)}{3\lambda}$.*

Proof of proposition 2: See supplementary material. □

3.2. Symmetric and asymmetric equilibria

While general analytical statements about equilibrium noise levels are intractable, numerical simulations can show us what equilibria look like in this model. Figure 2 illustrates the equilibrium noise levels in an example with normally distributed state and noise. In line with proposition 2, noise emerges in equilibrium if α is sufficiently large. Noise levels are also monotonic in α: the more important the social function of news, the larger are equilibrium noise levels.

Figure 2 also shows that for sufficiently high values of α, there are symmetric equilibria (in which both broadcasters use noise, left panel) as well as asymmetric equilibria (in which only one broadcaster uses noise, right panel).

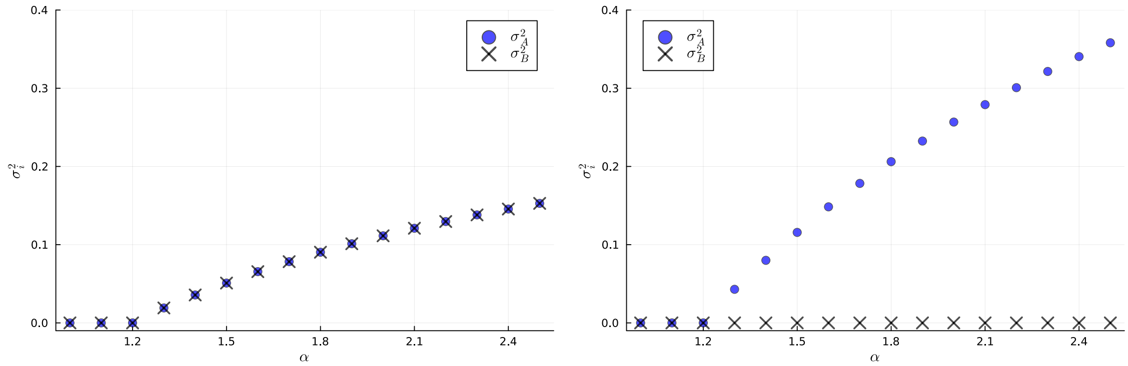

Figure 2: Equilibrium noise levels as a function of α (for $\delta = 0.1$, $\lambda = 0.1$, $\upsilon = 3$, $\tau = 1$).

In choosing a noise level, a broadcaster intuitively trades off the downside of less precise reporting (leading to lower demand) with the upside of differentiation (leading to lower price sensitivity). Each broadcaster benefits if the other broadcaster increases the noise in its reporting, as this differentiates the broadcasters, relaxes price competition and also makes the other broadcaster inferior in terms of learning about the state of the world. In asymmetric equilibria, broadcaster A's noise level is so high that the best response of B is to report with zero noise (or vice versa). At the same time, A's noise level is a best response to zero noise, since choosing a lower noise level would reduce differentiation so much that it would lower A's profit.

Whether B best responds with zero noise, however, also depends on the level of A's noise. If A uses only a small amount of noise, then the additional differentiation induced by noise in B's reporting outweighs B's loss in demand through reduced accuracy. Symmetric and asymmetric equilibria can hence coexist for the same model parameters.

These equilibria cannot easily be ordered in terms of informativeness (since they also differ in terms of which consumers follow which broadcaster), but they yield substantially different levels of inequality, both in information and welfare. In symmetric equilibria, the entire population is moderately well-informed (even though of course there is a welfare loss compared to an outcome in which both broadcasters report perfectly). In asymmetric equilibria, one part of the population is perfectly informed about the state of the world while the other consumes very low-quality reporting. Note, however, that even the well informed consumers suffer from the low-quality reporting of the other broadcaster due to a reduced value of interacting with consumers following the low-quality broadcast.[12]

Which (if any) of these equilibria is a better description of real-life outcomes is, of course, up for debate and beyond the scope of this study. The main point of our model is to illuminate mechanisms and not to create testable predictions. We can, however, note that in the U.S., Democrats and Republicans broadly agree that the media is increasing political divisions, but differ significantly in whether they trust the media to report "fully,

[12]Furthermore, average transportation costs are higher in asymmetric equilibria as some consumers consume the more distant broadcast.

accurately, and fairly".[13] News consumption habits similarly differ between the two groups (Pew Research Center, 2024b).

3.3. Public option

Many countries have public, tax-financed broadcasters. How does the presence of such a public broadcaster (which ideally provides high-quality reporting at zero cost) affect the incentives of a private broadcasters? In the model with normally distributed noise, suppose that broadcaster B is committed to fully accurate news at zero price, i.e. $\sigma_B^2 = p_B = 0$.

Proposition 3. *Let $\sigma_B^2 = p_B = 0$. $\sigma_A^2 > 0$ in an equilibrium with full coverage if $\alpha > \frac{4\delta(1-\lambda}{\lambda}$.*

Proof of proposition 3: See supplementary material. □

That is, inaccurate reporting by the private broadcaster can still be a best response (although the threshold for α is three times as high as in proposition 2). The main difference to our main setup is that reducing accuracy does not increase the competitor's price (as $p_B = 0$ regardless of A's accuracy) and is therefore less attractive. However, less accurate news still reduces the elasticity of (own) demand and can be attractive for this reason alone.

4. Discussion

4.1. Model assumptions

We will briefly discuss some key modeling assumptions and whether models with slightly different assumptions could produce similar results.

Social function of news The main theoretical innovation of our model is the social function of news, represented by the "interaction part" of the consumer's utility function. As we have argued in our literature review, it is well-established that the consumption of news media has some social function, though our precise functional form is of course only one way to model it.

Our functional form (as the "interaction part" $-\alpha(b_j - a_{-j})^2$ of the consumer's utility function, equation (1)) gives consumers an additional action b_j with which they try to match the action a_{-j} of another consumer. This in effect rewards j for being able to anticipate how $-j$ sees the world (which is represented by her choice of a_{-j}). We see this as an intuitive way of describing that j benefits from knowing what $-j$ believes as j can then adjust to $-j$'s views on topics when discussing them, or choose topics appropriately. The informational formulation means that this is not just a model of

[13] 72% of Democrats vs 81% of Republicans believe that the news media is increasing political divisions in the U.S.; 26% of Democrats vs 60% of Republicans report "little or no" trust in the media to report the news "fully, accurately, and fairly" (AP-NORC, 2023).

product differentiation or network effects, as j reasons about what she knows and what $-j$ knows about the world.

Transportation costs We introduce the "transportation cost" τ to represent heterogeneity in consumer preferences among broadcasters. This assumption mainly serves to make our model tractable. Without it (i.e. if $\tau = 0$), demand would be discontinuous and marginal changes in price would make all non-committed consumers switch. There would be no pure-strategy equilibria and we would have to resort to a mixed-equilibrium analysis similar to Varian (1980), with substantial costs in tractability. Our results do not require a minimum τ – in fact, if λ and δ are small (see also next paragraph), τ can be arbitrarily small for our main results to apply. Empirically, such small differentiation in tastes for broadcasters is a fact of life and could reflect local or cultural affinities, preferences for a broadcaster's style, or simply the marginal ease of tuning into a broadcaster (cf. Martin and Yurukoglu, 2017). Of course, our result also applies for large τ as long as the market is covered.

Committed consumers Our model assumes that a proportion λ of consumers is committed to a broadcaster, i.e. they consume either that broadcaster or none. These consumers are placed near their preferred broadcasters in transportation-cost terms. The main effect of these committed consumers is that they introduce heterogeneity in neighborhood composition: The indifferent consumer is no longer equally likely to meet followers of both broadcasters, regardless of how the market is split among broadcasters.

A small fraction of committed consumers means that changes in precision or price also change the equilibrium neighborhood composition around the indifferent consumer. For example, a small increase of $\hat{x}$ (e.g. due to noisier information by A) implies that the indifferent consumer is slightly more likely to interact with others who follow B – which reduces her price elasticity.

The existence of committed consumers is empirically well-established.[14] Importantly, our solutions do not depend on the size of this group: Even a small λ leads to our main result if neighborhood size (δ) is sufficiently small. A large set of alternative assumptions (e.g. allowing the fraction λ to vary smoothly by location, or heterogeneous switching costs among consumers) could replicate our main mechanism, but we adopt the simplest functional form that captures the key dynamics while maintaining tractability.

Independent signals We assume that broadcasters' reports must be independent conditional on the state, i.e. their reporting cannot be correlated. This slightly simplifies our analysis but broadcasters would not benefit from correlating their signals even if

[14] See e.g. Pew Research Center (2016), section 3, on the loyalty and constancy of US news consumers. Consumers can be committed for different reasons, e.g. to their local news media (Pew Research Center, 2024a) or to a specific ideological outlook (e.g. Iyengar and Hahn, 2009).

they could. The entire point of choosing a noisy information structure is to ensure that consumers using the other broadcaster cannot forecast one's signal well. Any type of correlation would counteract this.

No costs of precision We assume that broadcasters pay no direct costs for increasing signal precision. This creates a best-case environment for accurate reporting: if broadcasters still avoid perfect precision under these conditions (as shown in proposition 1), they would be even less likely to do so in more realistic settings where accuracy requires costly investment.

One-dimensional state of the world Our model assumes a one-dimensional state of the world and does not allow broadcasters to differentiate themselves by topic. This could be achieved by assuming multiple substates of the world and allowing broadcasters to selectively report on different dimensions. We expect that this would lead to an equilibrium in which broadcasters avoid price competition through topic-based differentiation. There would be no "noise" as in our model, but each consumer would only learn about some substates and therefore still lack valuable information. The basic inefficiency – as well as the strategic motive behind it – would remain the same.

4.2. Possible policy responses

We may consider an equilibrium with noise undesirable for three reasons: First, it leaves consumers badly informed. Second, it is inefficient in terms of transportation cost minimization. Finally, it has high broadcaster profit and relatively low consumer surplus.[15] A policy intervention could hence aim to improve any of these dimensions – either because the dimension itself is of interest, or because it has implications that go beyond our model (as we discuss in the conclusion).

Our model suggests various ways to improve outcomes along these dimensions. Since the problem is caused by competition itself, some solutions may involve lowering competition – which goes against common economic intuition and may cause other problems. We briefly discuss several approaches.

Monopoly Instead of competition, we can consider the behavior of a monopolist (e.g. by simply removing broadcaster B from the model). Such a monopolist will always choose the fully informative information structure, for two reasons: First, noise directly lowers consumers' willingness to pay. Second, noise increases the benefit from not following the broadcaster, since it makes the belief of followers easier to predict for non-followers.

[15] Informativeness and efficiency are closely related and are both maximized if broadcasters report perfectly and consumers choose freely which broadcaster to follow. But they are not the same thing: For example, an outcome in which both broadcasters are perfectly informative but not all consumers follow the broadcaster that minimizes their transportation cost is most-informative but not efficient.

(More formally, noise increases the interaction utility of non-buyers without affecting the interaction utility of buyers.) Even if a monopolist were to price some consumers out of the market, it would hence have no incentive to report with any noise.

Monopoly hence maximizes informativeness, albeit with small consumer surplus and with a possible loss in efficiency (due to transportation cost unless the monopolist operates both broadcasters, and the possibility that the monopolist may price consumers out of the market). It may, of course, create other problems that are not in our model – for example, a monopolist may become increasingly inefficient or may be subject to government capture in ways that competing broadcasters are not.

Enforced similarity Broadcasters in our model reduce informativeness because it allows them to differentiate themselves, which softens competition. Policies that limit this differentiation may hence also reduce incentives to lower reporting quality.

One approach is to mandate similarity in broadcasting, for example through journalistic standards or requirements for balance. A well-known example is the U.S. Federal Communications Commission's "fairness doctrine" (1949–1987), which required broadcasters to cover controversial public issues and present contrasting viewpoints.

Such regulation is neither simple nor unproblematic: Defining "controversial issues" and ensuring balance is inherently subjective, and enforcement can open the door to direct government influence on reporting. The fairness doctrine was controversial throughout its lifetime and was ultimately repealed.[16] Still, media in many developed democracies continue to operate under similar principles. ARCOM in France ensures pluralism in broadcasting by mandating how much airtime must be given to different groups. The U.K.'s Ofcom enforces broadcast impartiality, especially before elections. German public broadcasters are legally required to offer balanced reporting while being removed from direct government control; private German media are part of a self-regulatory consortium with a similar mandate.[17]

The intention of such rules is usually to directly improve the informativeness of broadcasts – but our model allows us to understand that there is another mechanism: Fairness regulation may constrain differentiation and increase correlation between reporting. Broadcasters cannot increase noise or lower correlation by strategically omitting topics or reporting with large slant or bias. This then increases competition between broadcasters, leading them to offer high-quality reporting at low prices in equilibrium. If effective, such similarity-enhancing policies can increase informativeness, welfare and consumer surplus simultaneously.

[16]See US General Accounting Office (1979) for official background and Simmons (2022) for a detailed discussion.

[17]ERGA (2018) has an overview for EU countries. See Cage et al. (2024), sections 5 and 6 of the U.K. Broadcasting Code and §26 of the German *Medienstaatsvertrag* for details on national frameworks.

Changes in the social function of news In our model, broadcaster differentiation reduces price sensitivity due to the social function of news. Formally, proposition 1 requires a sufficiently large α, which represents the social function of news. Our numerical simulations shown in figure 2 suggest that the equilibrium level of noise can be monotonic in α also when no perfectly informative equilibria exist.

Changes in the social importance of news can hence also change the equilibrium informativeness of news. An increasing willingness to share news stories on social media, for example, may represent an increase in the social function of news that could ultimately cause broadcasters to choose worse reporting. Social media would hence worsen the information available to citizens through an indirect effect on the incentives of news media rather than the direct effects (such as the sharing of misinformation) that are usually discussed.

This also suggests a provocative question: Can outcomes be improved by reducing the social importance of news (in effect, reducing α)? Then consumers would be more willing to switch to a more informative broadcaster even if others in their neighborhood do not follow it (yet), and a fully informative equilibrium may exist.

We do not exactly know how such an effect could be achieved, since underlying preferences matter as much as societal norms and customs. Effects on consumer surplus and efficiency, however, would certainly be ambiguous, since humans very clearly seem to derive direct benefits from being able to share and discuss news with their social environment.[18]

Changing the difficulty of switching broadcasters In our model, broadcasters lower the quality of their products in order to differentiate themselves and make it harder for consumers to switch broadcasters. Trying to make it easier for consumers to switch broadcasters, however, might not have the desired effect: It would only work if it completely eliminated small idiosyncratic preferences for one broadcaster over another, represented by τ in our model. Our main result merely requires τ to be positive. Similarly, reducing the proportion of committed consumers would only reduce incentives to differentiate if it significantly reduces differences between neighborhoods (as the proportion λ can be quite small for our main results as long as there are many neighborhoods).

We could hence consider a somewhat counterintuitive intervention: Making it *harder* for consumers to switch broadcasters. This could "crowd out" broadcasters' needs for differentiation and hence lower their incentive to report with noise. For example, an increase in τ (without a corresponding increase in v) could mean that the market is no longer covered and a group of consumers in the middle of the market does not follow any broadcaster. The two broadcasters would effectively become local monopolists, who no

[18] These benefits are not reflected in the consumer utility given in equation (1) which is purely reduced by larger α. Our consumer utility is of course a reduced-form expression that includes only the losses from disagreement, but not the overall gains from socializing over news.

longer compete with each other but with the option to not follow any broadcaster. They then maximize consumers' willingness to pay (and hence their own profit) by choosing maximal informativeness.

Once again, such a change would have ambiguous effects on effiency (since higher τ means direct welfare loss) and consumer surplus (since all consumers are now captive), but could increase equilibrium informativeness.

5. Conclusion

Conventional wisdom suggests that competition between profit-driven media companies should improve their news coverage: Accurate reporting could be expected to boost willingness to pay and broaden audience appeal, both of which should increase profits. We argue that under general, intuitive and empirically supported assumptions, profit-maximizing media may provide low-quality reporting which increases societal fragmentation – since this eases competitive pressures.

This can result in two types of outcomes: Symmetric equilibria, in which nobody is well-informed, and asymmetric equilibria, in which society is split into groups that vastly differ in how well they understand the world they live in.

Policy responses may seek to increase efficiency, raise consumer surplus or increase the informativeness of news content. Each of these objectives is important in its own right but has implications beyond our model. A poorly informed electorate is less able to select effective leaders and hold a government to account. Fragmentation of the media landscape has real political consequences (DellaVigna and Kaplan, 2007, Caprini, 2023). Over time, it may progressively polarize citizens (cf. Levendusky, 2013) and increase affective polarization (cf. Iyengar et al., 2019) in ways that our simple one-shot model does not capture. Ultimately, such a process may leave even well-meaning citizens unable to agree on simple facts.[19]

[19] See e.g. Pew Research Center (2020) for a survey showing that Democrats and Republicans disagree on simple facts about the US election system and other topics and Bullock and Lenz (2019) for an overview on the topic.

Appendix

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Supplementary material

Proof of lemma 1: Recall that $\pi_A = p_A(\lambda/2 + (1-\lambda)\hat{x})$. $\hat{x}$ is differentiable at all combinations of prices except those that result in $\hat{x} = 1/2 - \delta$ and $\hat{x} = 1/2 + \delta$. At all but these two price vectors it is

$$\frac{d\pi_A}{dp_A} = \frac{1}{2}\lambda + (1-\lambda)\hat{x} + p_A(1-\lambda)\frac{d\hat{x}}{dp_A}.$$

Note that it follows from (5) that $d\hat{x}/dp_A = -1/Y$, which has a discontinuous upward jump at the price p_A that leads to $\hat{x} = 1/2 + \delta$ (for a given p_B). Therefore, a price p_A such that $\hat{x} = 1/2 + \delta$ cannot be a best response by broadcaster A (as the upward jump of $\partial\pi_A/\partial p_A$ implies that π_A is "locally convex", i.e. π_A is higher either at prices slightly below or slightly above this prices). A similar argument shows that (for given p_A) the price p_B that leads to $\hat{x} = 1/2 - \delta$ cannot be a best response by broadcaster B. Consequently, prices (p_A, p_B) that lead to either $\hat{x} = 1/2 + \delta$ or to $\hat{x} = 1/2 - \delta$ cannot be equilibrium prices and $\hat{x} \notin \{1/2 - \delta, 1/2 + \delta\}$ in equilibrium.

We can therefore concentrate on prices at which the first order conditions are satisfied with equality. Note that $lim_{\varepsilon\to 0}Y = 2\tau$ and $lim_{\varepsilon\to 0}Z = \tau$ (regardless of where $\hat{x}$ lies and which of the expression determines Y and Z). This implies together with equation (8) that $\lim_{\varepsilon\to 0}\hat{x}^* = 1/2$ and therefore $\hat{x} \in (1/2 - \delta, 1/2 + \delta)$ for sufficiently small $\varepsilon > 0$.

Finally, $\hat{x}^* < 1/2$ is by (8) equivalent to $2Z < Y$. For $\hat{x}^* \in (1/2-\delta, 1/2+\delta)$, expressions (6) and (7) can be plugged into this inequality, which yields $V_B - V_A - \alpha C_A + \alpha C_B < 0$. This inequality is true if B uses $\mathcal{I}^f$, since then $V_B = 0$ and $C_B \leq C_A$ while $V_A > 0$ if $\varepsilon > 0$. □

Proof of proposition 2: Let B choose $\mathcal{I}^f$ by choosing $\sigma_B^2 = 0$. We will show that $\sigma_A^2 = 0$ is not a best response for A if $\alpha > \frac{4\delta(1-\lambda)}{3\lambda}$ by showing that the derivative of A's profits with respect to σ_A^2 is positive at $\sigma_A^2 = 0$ (given that B chooses $\mathcal{I}^f$).

For $\varepsilon > 0$ sufficiently small, the arguments in the proof of lemma 1 imply that $\hat{x}$ will be in $(1/2 - \delta, 1/2)$. We can therefore work with the middle cases of expressions (6) and (7) for Z and Y when considering a marginal increase of σ_A^2 from 0.

As $\mathcal{I}_B = \mathcal{I}^f$,

$$C_A = \frac{\sigma_A^2}{1+\sigma_A^2} = V_A \qquad \text{and} \qquad C_B = \frac{\sigma_A^2}{(1+\sigma_A^2)^2}.$$

Therefore,

$$Z = \tau - (1+\alpha)\frac{\sigma_A^2}{1+\sigma_A^2} + \alpha\frac{2\sigma_A^2 + \sigma_A^4}{(1+\sigma_A^2)^2}\left(\frac{1}{2} + \frac{\lambda}{4\delta}\right)$$
$$Y = 2\tau + \alpha\frac{\lambda}{2\delta}\frac{2\sigma_A^2 + \sigma_A^4}{(1+\sigma_A^2)^2}$$

with derivatives

$$\frac{dZ}{d\sigma_A^2} = -(1+\alpha)\frac{1}{1+\sigma_A^2} + \alpha\frac{2}{(1+\sigma_A^2)^3}\left(\frac{1}{2}+\frac{\lambda}{4\delta}\right)$$
$$\frac{dY}{d\sigma_A^2} = \alpha\frac{\lambda}{2\delta}\frac{2}{(1+\sigma_A^2)^3}.$$

We are only interested in the derivatives evaluated at $\sigma_A^2 = 0$ and at this point

$$\frac{dZ}{d\sigma_A^2}(0) = -1 + \frac{\alpha(\lambda)}{2\delta}$$
$$\frac{dY}{d\sigma_A^2}(0) = \frac{\alpha(\lambda)}{\delta}.$$

Using (9), we can write

$$\pi_A'(\sigma_A^2) = \left(\frac{1}{9}\lambda + \frac{2}{9}\right)\frac{dZ}{d\sigma_A^2} + \left(\frac{1-\lambda}{9}\right)\left(2\frac{Z}{Y}\frac{dZ}{d\sigma_A^2} - \frac{Z^2}{Y^2}\frac{dY}{d\sigma_A^2}\right) + \left(\frac{1}{12}\frac{\lambda^2+2\lambda}{1-\lambda} + \frac{1}{18}\lambda + \frac{1}{9}\right)\frac{dY}{d\sigma_A^2}.$$

As $Z_{\sigma_A^2=0,\mathcal{I}_B=\mathcal{I}^f} = \tau$ and $Y_{\sigma_A^2=0,\mathcal{I}_B=\mathcal{I}^f} = 2\tau$, this expression simplifies to

$$\pi_A'(0) = \frac{1}{3}\frac{dZ}{d\sigma_A^2} + \left(\frac{1}{12}\frac{\lambda^2+2\lambda}{1-\lambda} + \frac{1}{12}\lambda + \frac{1}{12}\right)\frac{dY}{d\sigma_A^2}.$$

Plugging in the expressions of the derivatives evaluated at 0 above, we obtain

$$\begin{aligned}\pi_A'(0) &= \frac{1}{3}\left(-1 + \frac{\alpha\lambda}{2\delta}\right) + \left(\frac{1}{12}\frac{\lambda^2+2\lambda}{1-\lambda} + \frac{1}{12}\lambda + \frac{1}{12}\right)\left(\frac{\alpha\lambda}{\delta}\right)\\ &= \frac{1}{3}\left[-1 + \alpha\frac{\lambda}{4\delta}\left(2 + \frac{1+2\lambda}{1-\lambda}\right)\right]\\ &= \frac{1}{3}\left[-1 + \alpha\frac{3\lambda}{4\delta(1-\lambda)}\right].\end{aligned}$$

For $\alpha > (4\delta(1-\lambda))/(3\lambda)$, we get $\pi_A'(0) > 0$ and therefore $\sigma_A^2 = 0$ is not a best response to $\mathcal{I}_B = \mathcal{I}^f$. □

Proof of proposition 3: Profits for A in a full coverage equilibrium equal $p_A * (\lambda/2 + (1-\lambda)(-p_A + Z)/Y)$ and A's first order condition for the optimal price is therefore

$$\lambda/2 + (1-\lambda)\frac{-2p_A + Z}{Y} = 0 \qquad \Leftrightarrow \qquad p_A = \frac{Y}{4}\frac{\lambda}{1-\lambda} + \frac{Z}{2}.$$

Plugging the optimal price back into profits yields

$$\pi_A = \left(\frac{Y}{4}\frac{\lambda}{1-\lambda} + \frac{Z}{2}\right)\left(\frac{\lambda}{4} + (1-\lambda)\frac{Z}{2Y}\right) = \frac{\lambda^2}{1-\lambda}\frac{Y}{16} + \frac{\lambda}{4}Z + \frac{1-\lambda}{4}\frac{Z^2}{Y}.$$

The derivative of π_A with respect to σ_A^2 is

$$\begin{aligned}\frac{d\,\pi_A}{d\sigma_A^2}(\sigma_A^2) &= \frac{\lambda^2}{1-\lambda}\frac{1}{16}\frac{d\,Y}{d\sigma_A^2} + \frac{\lambda}{4}\frac{d\,Z}{d\sigma_A^2} + \frac{1-\lambda}{4}\frac{2ZY\frac{d\,Z}{d\sigma_A^2} - Z^2\frac{d\,Y}{d\sigma_A^2}}{Y^2} \\ &= \frac{d\,Y}{d\sigma_A^2}\left(\frac{\lambda^2}{16(1-\lambda)} - \frac{1-\lambda}{4}\frac{Z^2}{Y^2}\right) + \frac{d\,Z}{d\sigma_A^2}\left(\frac{\lambda}{4} + \frac{1-\lambda}{2}\frac{Z}{Y}\right).\end{aligned}$$

At $\sigma_A^2 = 0$, $Z = \tau$ and $Y = 2\tau$ which then yields

$$\frac{d\,\pi_A}{d\sigma_A^2}(0) = \frac{d\,Y}{d\sigma_A^2}\left(\frac{2\lambda-1}{16(1-\lambda)}\right) + \frac{d\,Z}{d\sigma_A^2}\frac{1}{4}.$$

Plugging in the expressions derived in the proof of proposition 2 for the derivatives Y and Z with respect to σ_A^2 evaluated at $\sigma_A^2 = 0$ yields

$$\frac{d\,\pi_A}{d\sigma_A^2}(0) = \frac{\alpha\lambda}{\delta}\left(\frac{2\lambda-1}{16(1-\lambda)}\right) + \left(-1 + \frac{\alpha\lambda}{2\delta}\right)\frac{1}{4} = \frac{\alpha\lambda}{16\delta(1-\lambda)} - \frac{1}{4}$$

which is greater than 0 if $\alpha > 4\delta(1-\lambda)/\lambda$. □