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"Competition in the media market and confirmatory news"

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Competition in the media market and confirmatory news.[*]

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Abstract

This paper extends reputational cheap-talk model to study the effect of competition in the media on quality of news. We find that competition helps sustaining informative reporting when it covers issues on which the follow-up quality assessment is likely to be possible, such as various forecasts. However, it increases the elasticity of demand and thereby creates the incentives to confirm the common priors on controversial issues, such as politics.
Key words: quality of news, competition, reputational cheap-talk.
JEL codes: L82, L10, D82.

1 Introduction.

The media plays a major role in providing citizens with information relevant to various private decisions (DeallaVigna and La Ferrara, 2015). It has a high degree of freedom in reporting[1] and may bias news in favor of some

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[1]It can "lie" if not by fabricating news, then at least by "slanting", that is, selectively reporting facts in favour of some view.

view. There is a growing evidence of various biases (Puglisi and Snyder 2015). Some of them originate on the supply-side of the media market (Durante and Knight 2012, Enikolopov and Petrova 2016, Beattie et al. 2021).[2] Others are demand-driven, for example, a bias towards readers' political partisanship (Gentzkov and Shapiro, 2010).

One demand-driven bias discussed in theoretical literature, is a tendency to confirm the common priors in attempt to appear competent. Competition has been proposed as a mean to decrease that bias, because consumers can better evaluate the quality of news by crosschecking reports by different outlets (Gentzkow and Shapiro 2006).

However, many consumers tend to buy news from just one outlet, which is termed "single homing" in the literature.[3] This paper studies the effect of competition on the above bias while allowing for both single- and multihoming. It considers two-period model in which news reported in period one affect consumer posteriors about the media quality, hence demand in period two. We find that, indeed, competition (weakly) improves the quality of news if it covers issues on which the follow-up quality assessment is likely to be possible, such as various forecasts. However, it increases the elasticity of demand which biases reporting towards the common priors when news covers controversial issues and its quality is likely to remain uncertain, such as various policy issues.

These insights contribute to the debate on the role of competition in mitigating the media bias (see survey by Gentzkow and Shapiro 2008). The general insight from this debate is that competition mitigates biases originating on the supply-side of the market, except if the quality of private information by the media is endogenous (as in Chen and Suen 2023).[4] However, it has an

[2]Durante and Knight (2012) find biases created by partisan control, Enikolopov and Petrova (2016) find biases created by politicians capturing the media, Beattie et al. (2021) find biases created by advertisers.

[3]For example, in the sample by Affeldt et al. (2021), an average of between 25% and 62% of the readers single-home depending on newspaper.

[4]In Chen and Suen (2023) new entry may drive reader attention away from the incumbent media news reducing its quality (yet, overall welfare effect is positive).

ambiguous effect on demand-driven biases. Burke (2008) proposes that the competition creates excessive differentiation and its effect depends on the distribution of consumer priors. In Perego and Yuksel (2022) competition may induce the media outlets to bias their coverage away from the issues of common interest. This paper shows that competition has an ambiguous effect on consumer information even if consumers are homogenous.

Our focus on reputation-driven bias of news content rather than on timing of reporting makes our paper complementary to growing literature studying the effect of competition on speed-accuracy trade-off (see Shahanaghi 2024, Pant and Trombetta 2023 and references therein).

2 A model of market for news.

Consider a two period model of the media market. In either period $t = 1, 2$, a continuum of identical consumers pick a decision from set $\{0, 1\}$. They receive a benefit normalized to 1 iff their decision matches period-specific hidden state of Nature x,[5] which is drawn anew in either period from Bernoulli distribution with parameter p:

$$\Pr(x = 0) = p;\ \Pr(x = 1) = 1 - p. \tag{1}$$

Without loss of generality, decision "0" is (weakly) more likely to be optimal than decision "1", that is, $p \geqslant \frac{1}{2}$.

The consumers can buy news about the prevailing state from the media. We consider two media market structures: a monopoly with an outlet indexed by $i = 1$, and a duopoly with outlets indexed by $i = 1, 2$.

In either period t, media outlet i receives private signal s^i on the prevailing state. The quality of that signal depends on two random variables. The first variable θ_i drawn from Bernoulli distribution with parameter $\frac{1}{2}$ represents time-invariant competence by outlet i which is called "high" if $\theta_i = 1$ and "low" if $\theta_i = 0$. The second variable Δ drawn from the uniform distribution

[5] Here and below, we omit period-indicator for period-specific variables.

on interval $[0,1]$ indicates whether high competence is necessary to learn the state, which is true iff Δ realizes above a given threshold q. Hence,

$$s_i = \begin{cases} x, \text{ if } \theta_i = 1 \text{ or } \theta_i = 0 \text{ and } \Delta \leqslant q; \\ 1 - x, \text{ otherwise.} \end{cases} \tag{2}$$

Information structure (2), commonly termed "*nested*", guarantees that when the market is a duopoly, the outlets of the same competence receive the same signals. At the same time, different signals imply different competencies.

In order to make the game non-trivial, we focus on situation in which the common priors are more precise than the signal by a low competence outlet and less precise than the signal by an outlet of an "average" competence:

$$q < p < \tfrac{1+q}{2}. \tag{3}$$

In order to simplify an outlet's reporting strategy, we assume that outlet i has no other private information but its signal (in particular, it does not know its own competence). It can report any news n_i in set $\{0,1\}$ it wishes regardless of its signal. It sells news n_i at an arbitrarily small price taken to be null for notational convenience, and it receives a price per "eyeball" from advertisers.[6] Its objective is to maximize its advertising revenues which are proportional to its demand. Note that this demand is positive iff news n_i is perceived to be useful information for decision making. This perception depends on consumer beliefs about the media competence and reporting strategy.

At the end of the first period, consumers receive information upon which they update their beliefs on an outlet's competence. First, they learn news reported in period one. Second, with probability δ, they learn period one state, hence, they see whether news was true or false. This ex post feedback is represented by random variable φ which takes value $\varphi = x$ with probability δ, and $\varphi = \varnothing$ with probability $1 - \delta$.

[6] For simplicity, and without a qualitative impact on the insights, the price is the same regardless of whether or not the "eyeball" is "exclusive".

3 Media market structure and consumer information.

We solve the above game using the concept of Perfect Bayesian Equilibrium, restricting our attention to the most informative pure strategy symmetric equilibria. Note that in the most informative equilibrium, an outlet reports its signal in period two because the contents its news has no impact on its revenues. In period one, it reports so as to increase its expected demand in period two. There are two possible types of pure strategies equilibria: (i) "*babbling*", in which period one news is uninformative and (ii) "*informative*", in which news by outlet i reveals its signal, for concreteness, outlet i reports its signal. Babbling equilibrium exists for any parameter values. We compare two media market structures, monopoly and duopoly, in terms of efficiency in sustaining the informative equilibrium.

Monopoly media market. First, suppose that the media market is a monopoly. Suppose that consumers believe that the outlet reports its signal in period one. Their corresponding posteriors $\Pr(\theta_1 = 1 \mid \varphi,\ n_1)$ on the outlet's competence termed hereafter "*reputation*" are specified in appendix A. The outlet's reputation is the highest if consumers learn that period one news was true, and the lowest (null) if they learn that it was false. If the quality of news remains uncertain, the outlet's reputation is higher if its news is confirmatory, that is "0", rather than contradictory, that is "1". The reason (emphasized in the reputational cheap-talk literature pioneered by Ottaviani and Sørensen 2006*a*,*b*) is that the higher the outlet's competence, the closer are the realizations of its signal to the prior mean of the state: $p > pq + (1-p)(1-q)$.

The consumers buy news in period two iff the outlet's reputation is sufficiently high for its signal to be a better guidance for their period two decision than the common priors:[7]

$$q + (1 - q)\Pr(\theta_1 = 1 \mid \varphi,\ n_1) > p. \tag{4}$$

They do not buy news if period one news is false. They buy news if period one news is true or confirmatory. They also buy news if period one news is contradictory, but the associated reputational curse is sufficiently small because the prior probability p lies below threshold:

$$\underline{p}(q) = \tfrac{1+q^2-(1-q)\sqrt{1+q^2}}{2q}. \tag{5}$$

The media outlet panders its news in period one to the above demand. Trivially, it reports its signal when the signal confirms the common priors ($s_1 = 0$). Suppose the signal contradicts the common priors ($s_1 = 1$). If the precision of common priors lies below threshold (5), reporting its signal is the dominant strategy because it minimizes the probability of reporting false. Otherwise, the outlet's incentives are controversial. On the one hand, its signal is likely to be true and reporting it will help keeping consumers if they will discover the true state. On the other hand, contradicting the common priors creates a risk of loosing demand if the consumers will remain uncertain about the quality of news. Therefore, the outlet reports its signal if and only if

$$\delta \Pr(x = 1 \mid s_1 = 1) \geqslant \delta \Pr(x = 0 \mid s_1 = 1) + 1 - \delta, \tag{6}$$

which holds iff the quality of news is likely to be revealed, that is $\delta > \frac{1}{2}$, and the precision of common priors lies below threshold

$$p^m(q, \delta) = \tfrac{(2\delta-1)(1+q)}{(2\delta-1)(1+q)+1-q}. \tag{7}$$

Proposition 1. *A monopoly media market sustains the informative news equilibrium if and only if the precision of common priors p lies below the least of thresholds (5) and (7).*

The region in which monopoly media news is informative is marked with dark grey in Figure 1, left (see the end of the section).

[7]Recall that a report is sold at an arbitrarily small positive price.

Duopoly media market. Suppose now that the media market is a duopoly. Suppose that the consumers believe that both media outlets report their signals in period one. Then, their demand for news in period two is as follows (see details in Appendix B):

If the outlets report the same news in period one, they win the same reputations, and the consumers crosscheck their news unless period one news is clearly false or it contradicts the common priors which precision lies above threshold

$$\overline{p}(q) = \frac{1+3q^2-(1-q)\sqrt{1+3q^2}}{2q(1+q)}. \tag{8}$$

If the outlets report different news in period one, it becomes clear that only one of them has a high competence. News by the outlet with the highest reputation becomes sufficient for private decisions. If the consumers can assess the quality of news, they buy news only by the outlet which news was true. If they remain uncertain about the quality of news, they buy news only by the outlet which has confirmed the common priors.

Outlet i caters its period one news to the above demand. Clearly, it has strong incentives to report the signal confirming the common priors. Suppose it receives the signal contradicting the common priors. If the precision of common priors lies above threshold (*8*), the outlet is facing the same incentive trade-off as if it was a monopoly outlet in that situation. It reports its signal iff the incentive constraint (6) indexed by i is met, that is iff the precision of common priors lies below threshold (7). Otherwise, that incentive constraint is relaxed by the possibility to sell news if the competitor also contradicts the common priors (term $(1-\delta)\Pr(s_{-i}=1 \mid s_i=1)$ is added to the right-hand side of the incentive constraint (6)). Outlet i reports its signal iff:

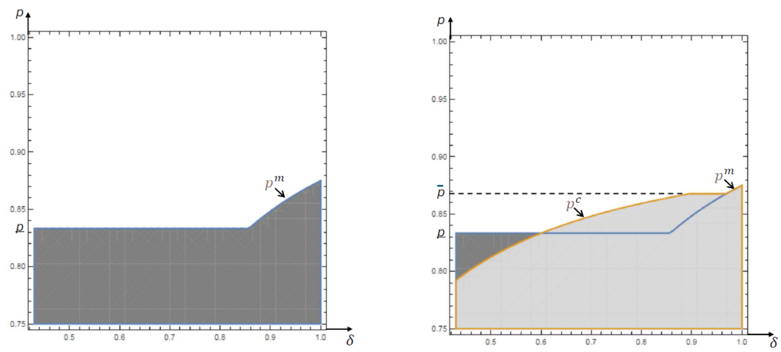
$$\begin{gathered}\delta \Pr(x=1 \mid s_i=1) + (1-\delta)\Pr(s_{-i}=1 \mid s_i=1) \geqslant \\ \delta \Pr(x=0 \mid s_i=1) + (1-\delta)\,,\end{gathered} \tag{9}$$

which holds iff p lies below threshold

$$p^c(q,\delta) = \frac{\delta(3+q)+q-1}{4\delta}. \tag{10}$$

Proposition 2. *A duopoly media market sustains equilibrium in which news is informative if and only if the precision of common priors p lies below threshold (7) or the least of thresholds (8) and (10).*

Duopoly media market sustains the informative news equilibrium in the area marked with light grey in Figure 1, right.



Parameter areas of the informative equilibrium.

Note that competition introduces two countervailing effects. One the one hand, it relaxes the incentive constraint for reporting the signal contradicting the priors with precision above threshold (5), because when both outlets report contradictory news in period one and its quality remains uncertain they both sell their news in period two: threshold (10) lies above threshold (5).

On the other hand, reporting the signal contradicting the common priors stops being a dominant strategy, no matter how diffuse the common priors are. Sufficiently high probability of feedback on the quality of news (namely $\delta > \frac{1-q}{3+q}$ so that threshold (10) is positive) becomes a necessary condition for the informative equilibrium. The reason is that when the outlets report different news in period one and its quality remains uncertain, the outlet which has confirmed the common priors wins the entire market in period two while its competitor stays out of business.

Corollary (welfare implications). *Competition in the media increases* *information supplied to consumers in the light grey area in Figure 1, right. It decreases that information in dark grey area.*

Indeed, in the light grey region in Figure 1 right competing outlets supply two informative reports while monopoly outlet at most one. In the dark grey region in that Figure, monopoly media outlet supplies one informative report while reporting by the competing outlets is uninformative.

4 Conclusion.

We have analyzed the impact of market structure on consumer information focusing on one possible bias, namely reporting news confirming the common priors in attempt to appear competent. Our findings suggest that competitive outlets provide more information to consumers only if the probability of the follow up assessment of news quality is sufficiently high. Monopoly media performs better when that probability is relatively low and news concerns issues on which the common priors are diffuse. These insights comport nicely with the observed shift of news coverage away from controversial issues as government, legal affairs, environment, or education towards more entertaining news, such as crime, courts, accidents and disasters which accompanies increasing competition in the media industry (Cage, 2019).

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Appendix A: proof of Proposition 1.

Step 1 characterizes demand for news in period two. Suppose that the consumers believe that $n_1(s_1) = s_1$.

Step 1.1. Suppose that $\varphi = x$, $n_1 = 1 - x$. Hereafter we use the Bayes rule to find conditional probabilities. We find

$$\Pr\left(\theta = 1 \mid \varphi = x,\ n_1 = 1 - x\right) = 0,$$

hence, inequality (4) is violated (recall the lower limitation in set of inequalities (3)).

Step 1.2. Suppose that $\varphi = \varnothing$, $n_1 = 1$. Then,

$$\Pr\left(\theta = 1 \mid \varphi = \varnothing,\ n_1 = 1\right) = \tfrac{1-p}{(1-p)(1+q)+p(1-q)},$$

hence, inequality (4) holds for $p = q$, and fails for $p = \frac{1+q}{2}$. Furthermore,

$$\tfrac{\partial}{\partial p} \Pr\left(\theta = 1 \mid \varphi = \varnothing,\ s_1 = 1\right) = -\tfrac{1-q}{((1-p)(1+q)+p(1-q))^2} < 0,$$

which implies that there exist a threshold such that inequality (4) holds iff p lies below this threshold. We find this threshold by equalizing the left- and the right-hand-side of inequality (4). It is given by equation (5).
Step 1.3. Suppose that $\varphi = \varnothing$ and $n_1 = 0$ or $\varphi = n_1 = x$. Then,

$$\Pr\left(\theta = 1 \mid \varphi = x,\ n_1 = x\right) = \tfrac{1}{1+q},\ \Pr\left(\theta = 1 \mid \varphi = \varnothing,\ n_1 = 0\right) = \tfrac{p}{p(1+q)+(1-p)(1-q)},$$

$$\text{hence, } \Pr\left(\theta = 1 \mid \varphi = x, n_1 = x\right) > \Pr\left(\theta = 1 \mid \varphi = \varnothing, n_1 = 0\right) \geqslant \tfrac{1}{2}. \quad (11)$$

By the upper limitation in set of inequalities (3), inequality (4) holds if $\Pr\left(\theta = 1 \mid \varphi, n_1\right)$ is replaced with $\frac{1}{2}$. By set of inequalities (11), inequality (4) holds.
Step 2 describes conditions for informative reporting. Suppose first that $s_1 = 0$. Then,

$$\Pr\left(x = 0 \mid s_1 = 0\right) = \tfrac{p(1+q)}{p(1+q)+(1-p)(1-q)},\ \Pr\left(x = 1 \mid s_1 = 0\right) = \tfrac{(1-p)(1-q)}{p(1+q)+(1-p)(1-q)},$$

$$\text{which implies } \Pr\left(x = 0 \mid s_1 = 0\right) > \Pr\left(x = 1 \mid s_1 = 0\right). \quad (12)$$

By step 1, the outlet reports $n_1 = s_1$ iff

$$\delta \Pr\left(x = 0 \mid s_1 = 0\right) \geqslant \delta \Pr\left(x = 0 \mid s_1 = 0\right) + 1 - \delta,$$

which is true by inequality (12). Suppose now that $s_1 = 1$. Then,

$$\Pr\left(x = 1 \mid s_1 = 1\right) = \tfrac{(1-p)(1+q)}{(1-p)(1+q)+p(1-q)},\ \Pr\left(x = 0 \mid s_1 = 1\right) = \tfrac{p(1-q)}{(1-p)(1+q)+p(1-q)}.$$

By set of inequalities (3),

$$\Pr\left(x = 1 \mid s_1 = 1\right) > \Pr\left(x = 0 \mid s_1 = 1\right). \quad (13)$$

Suppose first that p lies below threshold (5). By step 1, the outlet reports $n_1 = s_1$ iff

$$1 - \delta + \delta \Pr\left(x = 1 \mid n_1 = 1\right) \geqslant 1 - \delta + \delta \Pr\left(x = 0 \mid n_1 = 1\right),$$

which is true by inequality (13). Suppose now that p lies above threshold (5). Then, the outlet reports $n_1 = s_1$ iff the incentive constraint (6) holds. This is true iff both $\delta \geqslant \frac{1}{2}$ and p lies below threshold (7) which equalizes the left- and the right-hand-side of inequality (6). Note that threshold (7) is increasing in δ and it is null at $\delta = \frac{1}{2}$. Therefore, inequality $\delta > \frac{1}{2}$ holds whenever threshold (7) lies above threshold (5).

A Appendix B: proof of proposition 2.

Step 1 characterizes demand for news in period two. The consumers buy news by outlet with the highest reputation iff

$$q + (1-q)\max_{i=1,2}\{\Pr(\theta_i = 1 \mid \varphi, n_1, n_2)\} > p. \tag{14}$$

They crosscheck reports by different outlets in order to pick a priori efficient decision "0" if it is endorsed by at least one outlet iff both:

$$\begin{array}{c}(1-p)\Pr(\theta_1 = \theta_2 = 1 \mid \varphi, n_1, n_2) + \\ +p\left(1 - \Pr(\theta_1 = \theta_2 = 0 \mid \varphi, n_1, n_2)\right) > \max_{i=1,2}\{\Pr(\theta_i = 1 \mid \varphi, n_1, n_2)\}\end{array} \tag{15}$$

$$\begin{array}{c}\text{and } q + (1-q)((1-p)\Pr(\theta_1 = \theta_2 = 1 \mid \varphi, n_1, n_2) + \\ +p\left(1 - \Pr(\theta_1 = \theta_2 = 0 \mid \varphi, n_1, n_2)\right)) > p.\end{array} \tag{16}$$

Suppose that the consumers believe that $n_i(s_i) = s_i$.
Step 1.1. Suppose first that $n_1 = 1 - n_2$. Then, $\Pr(\theta_1 = \theta_2 \mid \varphi, n_1 = 1 - n_2) = 0$, which implies that inequality (15) is violated (no crosschecking). Suppose that $\varphi = x$. Then inequality (14) holds if $s_i = x$, because

$$\Pr(\theta_i = 1 \mid \varphi = x, n_i = x, n_{-i} = 1 - x) = 1,$$

and it fails if $s_i = 1 - x$, because

$$\Pr(\theta_i = 1 \mid \varphi = x, n_i = 1 - x, n_{-i} = x) = 0.$$

Suppose now that $\varphi = \varnothing$. Then, inequality (14) holds if $n_i = 0$ because

$$\Pr(\theta_i = 1 \mid \varphi = \varnothing, n_i = 0, n_{-i} = 1) = p$$

and it fails if $n_i = 1$ because

$$\Pr(\theta_i = 1 \mid \varphi = \varnothing, n_i = 1, n_{-i} = 0) = 1 - p.$$

Step 1.2. Suppose now that $n_1 = n_2$.
Step 1.2.1. Suppose first that $\varphi = x$ and $s_i = 1 - x$, $i = 1, 2$. Then, both inequalities (14) and (16) are fail (demand for news is null) because

$$\Pr(\theta_i = 1 \mid \varphi = x, n_1 = 1 - x, n_2 = 1 - x) = 0.$$

Step 1.2.2 shows that inequality (15) holds for any triple φ, n_1, n_2 other than those in step 1.2.1. Indeed, by true equations

$$\Pr(\theta_1 = 1 \mid \varphi, n_1, n_2) = \Pr(\theta_2 = 1 \mid \varphi, n_1, n_2) \text{ and } \tag{17}$$

$$\Pr(\theta_1 = 1 \mid \varphi, n_1, n_2) = \Pr(\theta_1 = 1, \theta_2 = 1 \mid \varphi, n_1, n_2) + \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2), \tag{18}$$

inequality (15) is equivalent to

$$\begin{gathered} p\left(1 - \Pr(\theta_1 = \theta_2 = 0 \mid \varphi, n_1, n_2) - \Pr(\theta_1 = \theta_2 = 1 \mid \varphi, n_1, n_2)\right) > \\ \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2). \end{gathered} \tag{19}$$

By true equations

$$\Pr(\theta_1 = 0, \theta_2 = 1 \mid \varphi, n_1, n_2) = \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2) \text{ and } \tag{20}$$

$$\begin{gathered} 1 - \Pr(\theta_1 = 0, \theta_2 = 0 \mid \varphi, n_1, n_2) - \Pr(\theta_1 = 1, \theta_2 = 1 \mid \varphi, n_1, n_2) = \\ = \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2) + \Pr(\theta_1 = 0, \theta_2 = 1 \mid \varphi, n_1, n_2), \end{gathered} \tag{21}$$

inequality (19) is equivalent to inequality

$$2p \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2) > \Pr(\theta_1 = 1, \theta_2 = 0 \mid \varphi, n_1, n_2),$$

which holds for any $p > \frac{1}{2}$.
Step 1.2.3. Suppose that $\varphi = n_i = x$, $i = 1, 2$. By true equations

$$\Pr(\theta_1 = \theta_2 = 1 \mid \varphi = x, n_1 = x, n_2 = x) = \tfrac{1}{1+3q},$$

$$\Pr(\theta_1 = \theta_2 = 0 \mid \varphi = x, n_1 = x, n_2 = x) = \tfrac{q}{1+3q},$$

$$\Pr\left(\theta_i = 1 \mid \varphi = x, n_1 = x, n_2 = x\right) = \tfrac{1+q}{1+3q},$$

inequality (16) because its left-hand-side lies above the right extreme of the interval (3).

Step 1.2.4. Suppose that $\varphi = \varnothing$, $n_i = 0$, $i = 1, 2$. By true equations

$$\Pr\left(\theta_1 = \theta_2 = 1 \mid \varphi = \varnothing, n_1 = 0, n_2 = 0\right) = \tfrac{p}{p(1+3q)+(1-p)(1-q)},$$

$$\Pr\left(\theta_1 = \theta_2 = 0 \mid \varphi = \varnothing, n_1 = 0, n_2 = 0\right) = \tfrac{pq+(1-q)(1-p)}{p(1+3q)+(1-p)(1-q)},$$

$$\Pr\left(\theta_i = 1 \mid \varphi = \varnothing, n_1 = 0, n_2 = 0\right) = \tfrac{p(1+q)}{p(1+3q)+(1-p)(1-q)},$$

inequality (16) holds because its left-hand-side lies above the right extreme of interval (3). Indeed,

$$q + \tfrac{(1-q)p(1+(1+q)q)}{p(1+3q)+(1-p)(1-q)} > \tfrac{1+q}{2} \text{ or, equivalently, } 2p(1-q) + 2pq^2 > 1 - q.$$

Step 1.2.5. Finally, suppose that $\varphi = \varnothing$, $n_i = 1$, $i = 1, 2$. By true equations (17) and

$$\Pr\left(\theta_1 = \theta_2 = 1 \mid \varphi = \varnothing, n_1 = 1, n_2 = 1\right) = \tfrac{1-p}{(1-p)(1+3q)+p(1-q)},$$

$$\Pr\left(\theta_1 = \theta_2 = 0 \mid \varphi = \varnothing, n_1 = 1, n_2 = 1\right) = \tfrac{p(1-q)+q(1-p)}{(1-p)(1+3q)+p(1-q)},$$

$$\Pr\left(\theta_i = 1 \mid \varphi = \varnothing, n_1 = 1, n_2 = 1\right) = \tfrac{(1-p)(1+q)}{(1-p)(1+3q)+p(1-q)},$$

inequality (16) holds at the left extreme of the interval (3), that is, for $p = q$:

$$q + \tfrac{1-q}{1+4q}(1 + 2tq) > q,$$

and it fails at the right extreme of the interval (3), that is for $p = \frac{1+q}{2}$:

$$q + (1-q)\left(\tfrac{1-q}{2}\tfrac{1}{1+4q} + \tfrac{1+q}{2}\left(1 - \tfrac{1+2q}{1+4q}\right)\right) < \tfrac{1+q}{2} \text{ or, equivalently, } 2q < 3.$$

Inequality (16) is the tighter, the higher p:

$$\begin{gathered} sign\left(\tfrac{\partial}{\partial p}\left((1-p)\Pr\left(\theta_1 = \theta_2 = 1 \mid \varphi = \varnothing, n_1 = 1, n_2 = 1\right) - \right.\right. \\ \left.\left. p\Pr\left(\theta_1 = \theta_2 = 0 \mid \varphi = \varnothing, n_1 = 1, n_2 = 1\right)\right)\right) = \\ = sign\left[1 - 2pq + q^2\left((1-2p)^2 + 2 - 2p\right)\right] > 0 \text{ for } p \leqslant \tfrac{1+q}{2}, \end{gathered}$$

which implies that there exist a threshold of parameter p such that inequality (16) is true if and only if p lies below this threshold. We find this threshold by equalizing the left- and the right-hand-side of inequality (16). It is given by equation (8).

Step 2 describes conditions for informative reporting. Outlet i has strong incentives to report its signal if $s_i = 0$. Suppose that $s_i = 1$.

Step 2.1. Suppose first that p lies weakly above threshold (8). By step 1, the incentives constraint for informative reporting is given by inequality (6) indexed with i instead of 1.

Step 2.2. Suppose now that p lies below threshold (8). By step 1, the incentives constraint for informative reporting is given by inequality (9). Using true equation

$$\Pr\left(s_{-i} = 1 \mid s_i = 1\right) = \frac{(3q+1)(1-p)+p(1-q)}{2((1-p)(1+q)+p(1-q))},$$

we find that inequality (9) holds iff p lies above threshold (10) which equalizes its right- and left-hand sides.