European Economic Review 83 (2016) 243–261

Contents lists available at ScienceDirect

European Economic Review

journal homepage: www.elsevier.com/locate/eer

Paying positive to go negative: Advertisers' competition and media reports

Andrea Blasco [a,*], Paolo Pin [b], Francesco Sobbrio [c]

[a] Harvard University, United States
[b] Università Bocconi and IGIER, Italy
[c] LUISS "G. Carli", Italy

ARTICLE INFO

Article history:
Received 31 July 2014
Accepted 14 January 2016
Available online 4 February 2016

JEL classification:
L82
D82

Keywords:
Advertising
Commercial Media Bias
Competition
Media accuracy
Two-sided market

ABSTRACT

This paper analyzes a two-sided market for news where two rival advertisers may pay a media outlet to conceal negative information about the quality of their own product (paying positive to avoid negative) and/or to disclose negative information about the quality of their competitor's product (paying positive to go negative). We show that competition in the product market does not necessarily prevent the emergence of commercial media bias. Whether or not competing advertisers end up having negative consequences on news accuracy ultimately depends on the extent of correlation in the quality of their products; the lower the correlation, the higher the expected accuracy of the media outlet's reports. These findings provide a rationale to explain the observed differences in the extent of commercial media bias across seemingly similar industries or products, within the same media market. The results are robust to the presence of multiple media outlets and to asymmetries between the advertisers. Overall, the paper provides theoretical insights for media regulators and for the empirical literature examining the link between advertising and news contents.

> "The one area in which the case for a [Federal Trade Commission] agency is stronger than previously suggested is where no seller has an incentive to furnish correct information […] An example is cigarettes […] Apart from sellers of other tobacco products, for whom a campaign of disparaging cigarettes would involve a palpable risk of being hoist with their own petard, no seller or group of sellers could anticipate a marked rise in sales as a result of a reduction in smoking. There is therefore no competitor with an incentive to supply information on the relationship between smoking and health that cigarette companies naturally try to withhold." (Posner, 1969, p. 68).

1. Introduction

The relationship between advertisers and media outlets may go well beyond simple sales of advertising space. More than just raising awareness of or curiosity about their products, advertisers may seek to specifically control the editorial content of a media outlet to influence the consumption decisions of its viewers.[1] In some instances, this relationship has evolved to

* Corresponding author.
E-mail addresses: ablasco@fas.harvard.edu (A. Blasco), paolo.pin@unibocconi.it (P. Pin), fsobbrio@luiss.it (F. Sobbrio).

[1] A recent survey of 27,000 individuals in 55 countries pointed out that, prior to choosing an electronic product, 57% of consumers read products' reviews. Similarly, 45% and 37% of individuals consult reviews before choosing a car and a software package, respectively. Source: Nielsen "Global Trends" June 2010.

http://dx.doi.org/10.1016/j.euroecorev.2016.01.005
0014-2921/

the point that many observers have accused advertisers of being responsible for a *commercial media bias* in news reports; interfering with the breadth and accuracy of media content to sway public opinion away from news that could reduce their profits (Herman and Chomsky, 1988; Baker, 1995; Bagdikian, 2004; Hamilton, 2004; Ellman and Germano, 2009; Germano and Meier, 2013). In the US, for instance, tobacco advertisers had successfully and for many years pressured the media to not disclose any information about the health-related risks of smoking (Chaloupka and Warner, 2000).

Yet, this view seems at odds with common experience showing that media frequently report news stories about product defects, i.e., news which are potentially harmful to the reputation and revenues of the firm whose product appears in such news reports.[2] Therefore, it is somewhat puzzling to observe that advertisers' influence on media contents has negatively affected the accuracy of news reports in some cases, but not in others. Under what conditions might commercial media bias arise? How to explain the observed differences in commercial media bias across industries within the same media market?

In addressing these broad questions, we focus on the role played by advertisers' competition. We contend that firms who pit themselves against each other in the product market are also likely to compete in the advertising market, as a means of obtaining news reports that will work out favorably for their products, and unfavorably for those of their rivals. We investigate to what extent this kind of competition may prevent the negative effects of advertisers' influence on media editorial content. To this end, we analyze a theoretical setting where two rival producers can influence via advertising fees the information that a media outlet will provide to its viewers about the quality of their products. We further consider what happens when product quality is positively correlated across firms. In such a case, advertisers have to make strategic decisions knowing that the disclosed information about one product can inform consumers about the quality of the other.

The analysis shows that product-market competition does not necessarily translate into a competition over the media outlet's editorial content. Our results indicate that whether or not competing advertisers end up having a negative influence on news accuracy ultimately depends on the extent of correlation in the quality of their products: the lower the correlation, the higher the expected accuracy of the media outlet's reports. And the reason is that high levels of correlation push advertisers to coordinate their actions to protect sales from *any* bad news that might convince consumers to leave the market, rather than to compete against each other to reveal news concerning the low quality of the rival's product. Another important finding is that the relationship may be *non-monotonic* because advertisers might not achieve the intended coordination when the correlation is sufficiently high, given that they face an incentive to free-ride associated with the positive externality of keeping *any* product defect, or issue, secret.

To put it differently, our approach suggests that when product quality is highly (positively) correlated across firms, advertisers may want to cooperate in order to influence media contents so as to keep *any* negative information about the quality of products (either their own or their rival's) secret. That is, even a high quality producer – competing in the downstream market with a low quality one – may not be inclined to offset any commercial media bias. In this case, competition over the media outlet's editorial content breaks down, and it culminates in a public good decision from the point of view of the advertisers: someone must pay the media outlet to keep any negative news out of readers' sight. Things stand quite differently when product quality correlation across firms is sufficiently low. In this case, showing evidence about the low quality of a rival's product can be only beneficial to sales, and advertisers will be competing with one another to induce the media outlet to hide any information about their own product defects while disclosing any bad news on the rival's product.

The following example illustrates the basic intuition of our theoretical model. Suppose there is a magazine that specializes in reviewing computer products (e.g., laptops). The magazine first collects evidence on the quality of two *ex-ante* symmetrical products made by two competing brands (e.g., Acer and Toshiba), and then decides what to report to its readers. In doing so, the magazine takes into account how the reported news will affect not only its reputation among its readers, but also its relationship with the two producers, who are valued as potential advertisers. Suppose one firm's product is found to be of low quality: it has a defect. To protect its sales, that firm may decide to try to persuade the magazine to suppress this damaging information by increasing its advertising expenditures. If the magazine has a lower concern for its reputation relative to the potential increase in advertising revenues, then the attempt will succeed, and the magazine will conceal the information about the product's defect. This decision may result in some consumers buying a low-quality product even when there are better products on the market. Suppose now that the rival firm is selling a high-quality product. This firm anticipates that it may be losing revenues due to a commercial media bias created by its rival. So it decides to offset the rival's influence by increasing its advertising expenditure as well, but with the intent of revealing the full information about the quality of the rival's product ("Paying Positive to Go Negative").[3] As a result producers will end up competing over the media outlet's editorial content through advertising.[4] Somewhat remarkably, we find that this kind of

[2] Recent examples are the news coverage of Boeing 787 Dreamliner Fuselage issues, the presence of horse-meat in Findus and Ikea's food products, Toyota's malfunctioning car accelerators, the iPhone 4's signal reception issues, and Toshiba's over-heating laptop series.

[3] We provide a link (http://goo.gl/NEUAuy) with a few examples consistent with the rationale of *"paying positive to go negative"*.

[4] Even though in the model advertisements do not provide any information *per se*, advertising expenditure may, then, end up representing an implicit payment aimed at: (*a*) compensating the media outlet for the expected dent to its reputation from misreporting information to its readers; and/or, (*b*) obtaining a "negative advertisement" in the editorial content of the media outlet (i.e., the disclosure of negative information about a competitor's product by the media outlet). Of course, there are other ways in which a producer can exert pressure on a media outlet, for example, through ownership. However, these other forms might be less flexible and more costly than advertising. So we maintain the underlying assumption that advertising would be preferred as a relatively more efficient way to influence the media.

competition is capable of preserving the accuracy of news reports – and, therefore, consumers' welfare – even in the absence of any concrete media pluralism and even when the media outlet has little concern for its reputation.

Unfortunately, this positive result does not hold in general. One important restriction is associated with the extent of correlation of product quality across firms. When the degree of correlation is sufficiently high, the disclosure of negative news about one firm's product will create a negative externality for the other firm, given that readers will revise downward their expectations about the quality of both products. This implies that even a high quality seller may generate commercial media bias. Indeed, both firms will be ready to influence the magazine in order to keep any negative news out of readers' sight, which becomes a sort of public good from the point of view of the advertisers. More specifically, within the context of our model, we show that there exists a threshold in the degree of correlation above which two different types of equilibria may arise. When advertisers adopt pure strategies, firms will always coordinate their actions in equilibrium and the media outlet does not disclose any negative information on any of the advertisers' products. At the same time, the advertisers' incentive to free-ride on the cost of influencing the media outlet may result in a (mixed-strategy) equilibrium where, with some positive probability, neither of them pay to silence the media outlet. Hence, in the presence of high product quality correlation across firms, an unbiased media outlet's news report may only be present thank to the lack of advertisers' coordination.

The presence of a positive correlation in product quality across firms is open to several possible interpretations. Within a given industry this correlation might capture the possible similarities among products' characteristics that result when different producers use common inputs in their production and, thus, a defect in a common input may result in all of them ending up with a low quality product.[5] A complementary interpretation is that products may have similar negative externalities on consumers. For example, different tobacco products are likely to create similar health risks for consumers; different cars may produce similar quantities of pollutants and thus have similar effects on global warming and so on. Hence, our analysis suggests that, even within an industry, media outlets are more likely to disclose negative news on issues upon which firms have conflicting preferences, rather than on issues where firms share the same preferences over news reports (e.g., disclosing news on specific defects in a car manufacturer's product rather than news on the effects of automobiles' CO2 emissions on global warming).

These results are consistent with the observed differences in the accuracy of media reports on consumer products across different industries. On one hand, there is plenty of evidence of significant under-reporting in news media coverage of specific product defects/issues due to advertisers' pressure to censor unfavorable contents.[6] There is strong evidence that, in the US, tobacco advertisers had successfully pressured the media to not disclose any information about the health-related risks of smoking (Baker, 1995; Bagdikian, 2004; Chaloupka and Warner, 2000). Pharmaceutical companies have likewise exerted significant pressure on the editorial decisions of medical journals (Fletcher, 2003; Fugh-Berman et al., 2006).[7] In a notorious case, the executive editor of *Transplantation and Dialysis* rejected a guest editorial that questioned the efficacy of Epoetin in the end-stage of renal disease, despite favorable peer review, because, as he wrote to the author, "it went beyond what our marketing department was willing to accommodate" (Dyer, 2004, p. 328).[8] On the other hand, the media frequently reports negative news about products. Recent examples of news reports disclosing product defects or negative side effects include the Boeing 787 Dreamliner Fuselage issues, the presence of horse-meat in Findus and Ikea's food products, Toyota's malfunctioning car accelerators, the iPhone 4's signal reception issues, and Toshiba's over-heating laptop series. These news stories are likely to negatively affect the revenues of the firm whose product is the subject of such news.[9] Our theoretical framework provides a simple economic rationale to explain this observed heterogeneity in the occurrence of a commercial media bias across advertisers' industries or products. The model predicts that in industries such as the tobacco one—where the "quality" (i.e., health risks) of products is almost perfectly correlated—the media are likely to hide any observed negative information. Instead, in the case of the electronics industry, where product quality is weakly correlated across firms, the model suggests that media are likely to disclose any observed negative information. Therefore, our results provide testable implications that could help to guide the empirical literature examining the link between advertising and news contents. Our theoretical insights also suggest that media regulators should target their monitoring efforts towards news contents/issues upon which advertisers are likely to share similar preferences.

We conclude with one important caveat. Our analysis focuses on the case where the cost to the media outlet's reputation is not very high. While, as we discuss in Section 5, the presence of competing media outlets *per se* (or, even, the presence of

[5] For example, between 2009 and 2010 the Toyota Aygo, the Citroën C1, and the Peugeot 107 all experienced a defect in their accelerator pedals. This common shock was due to the fact that all three cars were produced at a joint venture factory. (Source: "Peugeot Citroën joins Toyota and Honda in recall", *The Times*, February 1, 2010).

[6] See Blasco and Sobbrio (2012) for a detailed review of the anecdotal and empirical evidence on "commercial media bias".

[7] In 2010, Pharmaceutical companies spent $326 millions on advertising in medical journals in the US (IMS Health 2010). Pharmaceutical companies may also finance medical journals through "sponsored subscriptions" (Fugh-Berman et al., 2006).

[8] The paper also suggested that the Medicare spending on this treatment was unjustified given the limited benefits for patients. Medicare spent over $7.6 billion on Epoetin between 1991 and 2002 (Dyer, 2004). The conspicuous advertisements of car manufacturers may also represent one of the factors leading the media to present evidence on the sources of global warming which appears to be largely unbalanced with respect to the consensus within the scientific community (Oreskes, 2004; Boykoff and Boykoff, 2004; Ellman and Germano, 2009).

[9] In 2012, "Toyota agreed to pay about $1.1 billion to settle the class-action lawsuit stemming from complaints of unintended acceleration in its vehicles that soured its reputation for quality and undermined its sales globally" (Source: "Toyota in $1.1 Billion Gas-Pedal Settlement", *Wall Street Journal*, December 27, 2012).

some ads-free media outlets) may not always protect media viewers against the perils of commercial media bias, the media outlet's concern for its reputation plays a crucial role. As we show in the Online Appendix, advertisers will fail to create any commercial bias in news reports when the media outlet's concern for its reputation is sufficiently high.[10] Hence, as expected, when a media outlet faces a strong threat in terms of potential damage from a loss to its reputation, consumers will be more likely to read unbiased news reports on advertisers' products.

The rest of the paper is structured as follows. The next section briefly summarizes the existing literature related to the topics in this paper. Section 3 introduces the main elements of the model. Section 4 characterizes the media outlet's equilibrium news reports as a function of the correlation in the product quality. Section 5 discusses the robustness of the results with respect to several possible extensions of the benchmark model. Section 6 presents the concluding remarks.

2. Literature

Our paper is closely related to the literature that analyzes how the accuracy of news reports may directly affect the purchasing decisions of consumers and therefore advertisers' profits (Ellman and Germano, 2009; Germano and Meier, 2013). Ellman and Germano (2009) show that, if an advertiser can commit to withdrawing its ads as a reaction to unfavorable news coverage, it may induce the media outlet to not publish this information. Germano and Meier (2013) focus on a similar issue by looking at n media outlets located on a network within the Chen and Riordan (2007) spokes model.[11] The authors show that if the number of media outlets is too small (or if there are very few owners), self-censorship by media outlets would arise endogenously.[12] The present paper contributes to the existing literature along two main dimensions.

First, both Ellman and Germano (2009) and Germano and Meier (2013) focus on the case where increased news accuracy has a net negative effect on a media outlet's advertising revenues (for a given level of circulation). However, we do not make any prior assumption to this effect. While any advertiser would want a media outlet to always conceal any negative information regarding its own products, such an advertiser may have different preferences regarding the disclosure of negative information about a competitor's products depending on the correlation structure. We show that, when allowing advertisers to compete over news contents, the media incentives to produce truthful reports are not necessarily misaligned with the advertisers' ones. Specifically, whether or not advertisers have a negative influence on the accuracy of media reports, is endogenously determined by the extent of the correlation in the products' industry.[13]

Second, while these papers look at how competition in the media industry may increase the accuracy of news reports, while keeping constant the preferences of advertisers for low accuracy, we focus on the complementary research question. That is, we show how and when competition between advertisers in the product market may increase the accuracy of media reports even in the presence of a monopolistic media outlet.

Overall, we contribute to the existing literature by analyzing and characterizing under which conditions competition among advertisers might alleviate commercial media bias.[14] The empirical literature provides supporting evidence for our theoretical model and results. In recent years, a growing number of studies have looked at the empirical relationship between advertising expenditure and media coverage (Reuter and Zitzewitz, 2006; Rinallo and Basuroy, 2009; Reuter, 2009; Gambaro and Puglisi, 2009; Di Tella and Franceschelli, 2011; De Smet and Vanormelingen, 2012; Focke et al., 2015). These contributions usually find a positive correlation between advertising expenditure and favorable media coverage. For example, in the context of Belgian Dutch-language newspapers, De Smet and Vanormelingen (2012) document that "every four to fourteen full page black and white advertisements generate one additional paper [about the advertiser] in the same month." (De Smet and Vanormelingen, 2012, p. 4).[15] At the same time, empirical studies also show that the link between ads and news coverage weakens or disappears in contexts where there is a higher level of competition among advertisers over media contents, or where advertisers' products are more differentiated. Reuter and Zitzewitz (2006) find a positive relation between mutual fund recommendations and advertising expenditures within personal finance media while they show that this is not the case for national newspapers. Rinallo and Basuroy (2009) find that preferential coverage of the advertisers' products is weaker when the media outlet's advertising revenues are more diversified. Reuter (2009) finds weak evidence of a correlation between wine ratings and advertising in *Wine Spectator*. Therefore, and consistent with the predictions of our model, this recent empirical evidence seems to suggest that the stronger the competition among advertisers with

[10] Furthermore, we also show that a Perfect Bayesian Equilibrium may not exist for intermediate values of the media outlet's concern for its reputation.

[11] See also Germano (2008) for an analysis of the "uncovered" case of the spokes model. Blasco and Sobbrio (2012) review the literature on commercial media bias and provide a simple model summarizing the main intuitions of the present paper and the ones of Ellman and Germano (2009) and Germano and Meier (2013).

[12] See also Petrova (2012) for a model of media bias analyzing the interaction between advertising revenues and special interests groups' subsidies.

[13] Ellman and Germano (2009) present an informal discussion, consistent with our results, of the case where advertisers have conflicting preferences over the accuracy of media reports. Germano and Meier (2013) consider in an extension a similar case, but they still assume that the overall (mean) effect of increasing accuracy on a media outlet's advertising revenues is negative. In line with the rationale behind our result, Petrova (2012) shows that media bias is lower when special interest groups have misaligned preferences.

[14] Notice that, as shown by DellaVigna et al. (2016), ads expenditure may also represent a tool to indirectly lobbying politicians in exchange for favorable regulations.

[15] See also Focke et al. (2015) for evidence of advertising bias in the context of US newspapers.

conflicting preferences (e.g., more advertisers competing over media content or a lower level of correlation amongadvertisers' products), the higher the probability that a media outlet will report accurate information.[16]

Finally, our paper is related to the model of Besley and Prat (2006) on media capture by incumbent politicians; specifically, the signal structure of our model builds upon the one outlined in their paper.

3. The model

Consider an economy with one single media outlet, two firms, and a unit mass of consumers. All agents are risk neutral. Each firm $i=1,2$ supplies to consumers a substitute product. Each product has a quality $q_i \in \{H, L\}$ that is high with probability $\nu > 0$ (the same for each product), and low with probability $1-\nu$. The product quality can be positively correlated across firms, and the degree of correlation $\rho \in [0, 1)$ is common knowledge.[17]

Each consumer demands at most one product, but he or she prefers not to purchase any product rather than consume a low quality one. Therefore, we characterize a consumer's preferences over goods as:

$$v_H \geq v_0 > v_L, \tag{1}$$

where: $v_H > 0$ is the net utility that she derives from consuming a high quality product; $v_0 > 0$ denotes the value of the outside option of not consuming any product; and v_L is the net utility of consuming a low quality product. Without loss of generality we normalize $v_L = 0$.

We assume that consumers want to maximize utility but they have incomplete information about the quality of products. Hence, without any additional information, they will make a consumption decision based solely on their initial prior beliefs ν. To simplify the exposition, we assume that such priors are sufficiently high in comparison to the relative value of the outside option: $\nu \geq v_0/v_H$. Therefore each consumer will *always* make the decision to consume one product (picked at random), unless he or she obtained additional information concerning the quality of each product. In other words uninformed consumers behave as if they are somewhat optimistic about the high quality of products.

To revise the initial beliefs, consumers may decide to obtain additional *hard* information by watching the media outlet's news report at a fixed price $p > 0$.[18] The media outlet can indeed detect issues or defects in each product, and will publish a report before consumers make their consumption choice. Formally, the media outlet observes a signal $z_i \in \{\varnothing, L\}$ for each product i, where $z_i = L$ occurs with probability $\theta \equiv \Pr(z_i = L | q_i = L) \in (0, 1)$ and perfectly reveals that the product is of low quality.[19] The signal $z_i = \varnothing$ occurs in all other cases: the product is of low quality but the media outlet has not detected any defect (this happens with probability $1-\theta$); or the product is of high quality.[20]

After obtaining this information, the media outlet chooses a message $m_i \in \{z_i, \varnothing\}$ for each product i, which can either contain the observed signal, $m_i = z_i$, or present no evidence at all: a null report $m_i = \varnothing$. Using Z, M to denote the sets of all possible signals and messages associated with all products, the news report simply consists of an element $m \in M$, and the reporting strategy of the media outlet can be characterized as the conditional probability of sending a given message m given the observed vector of signals $z \in Z$. We further assume that the media outlet incurs a reputation cost $\eta \geq 0$ when it conceals information from consumers, i.e., $m_i \neq z_i$ for some $i=1,2$.[21] Hence, the media outlet will face a trade-off between reducing accuracy and increasing advertising revenue through slanting its report to favor the advertisers.

Given that the realized signal z is private information to the media outlet, consumers who have chosen to watch the report will not know for certain whether the absence of any negative signal in the news report m truly reflects news about a product's quality or is the result of an intentional manipulation made by the media outlet. Nevertheless, they have *rational expectations* about the media outlet's reporting strategy, and they update their beliefs about the quality of each product according to Bayes' rule.

[16] Historical evidence also seems to suggest that the overall impact of advertising on the accuracy of media reports is not necessarily negative. Gentzkow et al. (2006) focus on the US newspaper industry between the end of the 19th century and the beginning of the 20th century. They show that technological changes (i.e., decreasing production costs) induced significant economies of scale and an increase in competitiveness within the newspaper industry. In turn, these changes increased advertising revenues which contributed to create an independent press. Petrova (2011) focuses on the US press in the 1880s and shows that a higher profitability of advertising in local markets leads to the presence of more independent newspapers. Poitras and Sutter (2009) look at the decline in muckraking by US magazines at the beginning of the 20th century. They find no evidence in support of the hypothesis that such a decline was the results of an advertisers' boycott as a reaction to adverse news coverage.

[17] As when products are manufactured with common inputs or use the same technology.

[18] This price may simply represent the sum of the opportunity cost of watching/reading the media outlet's contents, plus the monetary price charged by the media outlet to its users.

[19] Conditional on the realized quality of products, signals are independent. So the information obtained by the media outlet is analogous to the result of two independent tests of accuracy θ on the quality of each product.

[20] Notice that, like Besley and Prat (2006), we assume that signals can only be negative. However, as in their model, good news about the quality of products can be inferred from the absence of negative information on a product. At the same time, the framework could be extended to incorporate positive signals, as long as the probability of receiving a positive signal is lower than the probability of a negative one. That is, as long as not observing any signal increases the probability of a product being of high quality. Overall, this assumption is consistent with the empirical evidence provided by Focke et al. (2015) who show that US newspapers "mainly bias coverage of bad news, while there is no evidence of positively biased papers on good news." (Focke et al., 2015, p. 4).

[21] This cost η can be interpreted as the risk that in at same point in the future, the media outlet is found to have misreported its available information. It can be seen as a positive reputation loss multiplied by an exogenous (long-run) probability of being found to have misreported some information.

Formally we let $v(m)$ denote the expected utility from purchasing the product with the highest expected quality conditional on the report m. Therefore, the expected utility $U(m)$ of a consumer conditional upon viewing a report m is as follows:

$$U(m) = \max\{v(m), v_0\}. \tag{2}$$

From this definition, we can write down the expected utility from watching the media outlet's report:

$$EU(m) = \sum_{k \in M} U(k)\Pr(m = k). \tag{3}$$

Using the fact the consumers are Bayesian, we have that $\Pr(m) = \sum_{z \in Z}\Pr(m|z)\Pr(z)$ and therefore the demand for news in this market is directly affected by the media outlet's reporting strategy.

We additionally introduce heterogeneity into the demand for the media outlet's news report by assuming that consumers hold an idiosyncratic taste for the news report's generic content *per se* (e.g., entertainment, local news, national news) that is drawn randomly from a uniform distribution on the unit interval. For simplicity, we further impose the restriction $p < 1$ so that there will always be a strictly positive fraction of viewers who would watch the news report—even without any hard information about the product's quality.[22] Given that consumers learn their own idiosyncratic preferences before purchasing the report, the fraction of consumers demanding the media outlet's report $\alpha \in [0, 1]$ is as follows:

$$\alpha = \int_0^1 \mathbf{1}(EU(m) - p + x > v_H\nu)\, dx = 1 - p + EU(m) - v_H\nu, \tag{4}$$

where $\mathbf{1}(\cdot)$ is an indicator function.[23] Specifically, this is given by the sum of the utility from the content per se and the informative value of the report for consumption.

The commercial relationship between the media outlet and the firms can affect the demand for news in the following way. First, the media outlet wants to maximize profits, and it tries to monetize the interest of producers in concealing/revealing signals in order to affect viewers' consumption decisions. To this end, the media outlet (privately) shows its hard information to all of the producers.[24] Then, it auctions off one advertising slot along with the right of deciding which of the signal(s) are to be disclosed or concealed. Here we consider a specific selling mechanism: a complete information first-price auction with a positive *reserve price* that is equal to η (recall that η is the reputation cost that the media outlet pays for misreporting signals to its viewers). This mechanism, albeit not realistic, has the advantage of being simple to analyze, and it implements the efficient allocation from the point of view of the producers and the media outlet—although not necessarily of consumers. Later on, we will discuss how the results are influenced by different selling mechanisms.

To gain control over the news content, firms simultaneously make their bids $b_i \in [0, \infty)$ (as in Ellman and Germano, 2009). Here, we abstract from the standard rationales for advertising (i.e., persuasive or informative advertising), to explicitly focus on an environment where any additional expenses on advertising would not raise awareness or persuade more consumers *per se*, but can still affect consumption, indirectly, through its influence over the news content.[25]

Therefore, the media outlet's payoff π_{mo} is simply the sum of the sales of its report (assuming zero marginal costs) plus the highest bid made by the advertisers (above the reserve price) net of the (expected) reputation cost. That is:

$$\pi_{mo} = p\alpha + \begin{cases} \max\{b_1, b_2\} - \mathbf{1}(m \neq z)\eta & \text{if } \max\{b_1, b_2\} \geq \eta \\ 0 & \text{otherwise.} \end{cases} \tag{5}$$

When firms submit equal bids, the media outlet will pick the producer's offer that is consistent with the highest level of profits (eventually randomizing).

Finally, we let $\pi_i(b_i, b_j, \alpha)$ denote a firm i's payoff function which we assume to be linear. Therefore, the advertisers' payoff depends on their bids, which in turn affect the content of the media outlet's report, and on the equilibrium fraction of viewers.[26]

[22] Since the focus of the analysis is on the media incentives to reveal or not to reveal information on a specific category of products, p is considered exogenous. The implicit assumption is that it is determined by a more general maximization problem already solved by the media. More generally, the assumption of a fixed price captures well the structure of media markets where media outlets fix their price over a long period rather than modifying it on a daily basis depending on the news content. However, as also discussed in Section 5, an endogenous price would not qualitatively change our results.

[23] Note that the integrand of (4) is not greater than one. In fact, the expression $x = p - (EU(m) - \nu v_H)$ is the sum of two terms: the price p which is less than one by assumption, minus the difference between the expected utility from making the consumption decision after watching the report $EU(m)$ and that from picking a random product νv_H. This second term is non-negative because, even if consumers decide to ignore the information of the report, they are never worse off.

[24] We are implicitly assuming that a firm cannot directly communicate credible information to consumers regarding the low quality of its rival's product. Indeed, even if a firm did come to learn hard information about the presence of a defect in such a product, it would need to use the media platform to access media viewers and communicate this information to them. In addition, a firm may find it far more effective to let the media outlet deliver the bad news on the rival product while then placing its own advertisement next to such news.

[25] In a more general model, one can assume a first stage in which firms simultaneously pay a base level of advertising to the media outlet, and next an interim stage occurs in which the media outlet obtains information about products and firms can choose to increase their advertising expenses to influence the news content. Since there is no loss of generality in normalizing the base levels to zero, the predictions of our model will be valid more generally.

[26] Notice that the model easily generalizes to advertisers belonging to different industries. Indeed, the model directly applies to advertisers selling substitutes products even if they do not belong to the same industry (e.g., automobiles and motorbikes producers). However, a case where two advertisers

Timing of the game: The timing of the game is as follows:

1. First, nature determines the quality of products (q_1, q_2);
2. Then, the media outlet observes a vector of signals $z = \{z_1, z_2\}$;
3. The media outlet reports z to producers, and both firms independently and simultaneously choose their bids (b_1, b_2);
4. If $\max\{b_1, b_2\} \geq \eta$ the producer who submitted the highest bid selects the media outlet's news report m (consistent with z) and pays her bid to the media outlet. In a case of equal bids, the media outlet picks the bidder with a high quality product. If products are of the same quality, it chooses at random;
5. Every consumer decides whether to watch the media outlet's report (considering the realized idiosyncratic benefit she gets from doing so and the additional expected utility she might obtain from knowing something more about the quality of the products) and if so she updates her beliefs about the quality of each firms' product;
6. Each consumer chooses the product with the highest expected quality;
7. Payoffs are realized.

4. Advertisers' competition and media outlet's reports

The setting described above is a dynamic game of incomplete information, as actions are taken sequentially and there is asymmetric information between producers and consumers, as well as between consumers and the media outlet. The solution concept used for this game is the Perfect Bayesian Equilibrium (PBE).

In this section, we examine the situation where the media outlet's reputation cost η is small in comparison with advertisers' revenues. More specifically, we maintain throughout this section the following assumption: $\eta \leq (1-p)/2$. From which it follows that it is attractive for advertisers to try to influence the news report because they will always break-even by paying a bid above the reputation cost η, regardless of the effect of the media outlet's report on the demand for news.[27] The alternative case where the reputation cost η is above this threshold (which is covered in the Online Appendix) is more subtle to analyze and less insightful in terms of commercial media bias. In fact, when η is sufficiently high relative to the advertisers' revenues, a unique PBE occurs that does not involve any commercial media bias in the news report. Advertisers simply do not find it profitable to compensate the media outlet for its expected loss of reputation. At the same time, for intermediate values of η that are above the threshold, a PBE for this game may not exist. This is because (under some circumstances described in the Online Appendix) the media outlet may not be able to produce a report which would then be consistent with the (Bayesian) consumers' beliefs. To examine this situation one should make further assumptions about the behavior of the agents in our model, or focus on a different, weaker solution concept. However, the main economic insights discussed in this section would not change dramatically (we refer the reader to Section 5 for a fuller discussion).

4.1. Uncorrelated products

We begin the analysis by considering the case of uncorrelated product quality ($\rho = 0$). In this case, each signal that shows a product of low quality is not informative about the quality of the other product and, therefore, competing producers will have conflicting preferences over news reports at all times. The next proposition characterizes the unique PBE of the game, showing how the equilibrium report of the media outlet m^*, the equilibrium fraction of consumers who decide to watch the report α^* and the equilibrium bids b^* of the advertisers depend on these conflicting preferences.

Proposition 1. *There exists a unique PBE of the game in pure strategies when* $\rho = 0$ (*i.e., the product quality is perfectly uncorrelated across the firms*). *In equilibrium, the media outlet's report is*:

$$m^* = \begin{cases} (\varnothing, L) \text{ or } (L, \varnothing) \text{ with prob. } 1/2 \text{ each} & \text{if } z = (L, L) \\ z & \text{otherwise;} \end{cases} \tag{6}$$

the fraction of consumers who decide to watch the report is:

$$\alpha^* = (1-p) + \theta\nu(1-\nu)v_H; \tag{7}$$

(*footnote continued*)
sell non-substitutable products (e.g., automobiles and dish-washing detergents) is not relevant in this context. A firm in the car industry would not have any incentive to pay the media outlet to publish information regarding the presence of a defect in a dish-washing product. Indeed, a car manufacturer would not experience any increase in its market shares if this bad news was revealed by the media outlet.

[27] As shown in the proof of Propositions 1 and 2, if the media outlet's report is uninformative about any product quality, then the demand for news drops to $(1-p)$ and the advertisers will equally share the sales in the market.

each advertiser $i=1,2$ *bids*:

$$b_i^* = \begin{cases} \alpha^* & \text{if } z=(L,L) \\ \alpha^*/2 & \text{if } z \in \{(\varnothing,L),(L,\varnothing)\} \\ \textit{less than } \eta & \textit{otherwise}; \end{cases} \tag{8}$$

and the winner of the auction asks the media outlet to hide any negative information about its own product, if any, while disclosing the negative information about the rival's, *if any*.

As a result, in the limiting case of perfectly uncorrelated product quality (and assuming a sufficiently low reputation cost), competition within the advertising market may help reduce, but does not entirely prevent the occurrence of commercial media bias. In fact, as shown by Eq. (6), one signal will be concealed in equilibrium by the media outlet every time that both products are found of low quality. In all other instances, the media outlet will correctly report all the signals to its viewers.

This finding illustrates quite clearly that competition in the lack of product quality correlation can effectively prevent the occurrence of commercial media bias only when the realized product quality varies across producers. In this case, the rivalry between the low-quality producer (who seeks to keep the negative signal out of the sight of consumers) and the high-quality rival (who seeks to expand sales in the market of viewers by damaging the rival) can be resolved in favor of the latter, as selling the auctioned slot to a high-quality advertiser spares the media outlet the expected cost associated with a loss of reputation. Another interesting finding concerns the effect of competition on the costs of commercial media bias for the advertisers. In fact, one may expect that each firm should be able to influence the news report by paying a sum equal to η, which would compensate the media outlet for the expected loss of reputation. Instead, as shown in Eq. (8), competing advertisers end up bidding in equilibrium amounts that are generally greater than the cost of reputation η, in much the same way that firms in a Bertrand pricing game bid away profits.[28]

The above situation shows its consequences in the equilibrium demand for news α^*, which exhibits the following features: (i) it reaches a maximum at $\nu=1/2$, where the uncertainty about product quality is highest; (ii) it is strictly increasing in the accuracy of the signal θ, as the media outlet is more likely to detect issues with products that are indeed of low quality; and (iii) it does not depend on the outside option v_0, as viewers realize they will always choose to buy one product, given that they are optimistic, and the equilibrium report of the media outlet does not reveal the correct information when the signals indicate that products are of low quality.

To better illustrate the negative effect of advertisers' influence on the demand for news, one may want to compare the equilibrium fraction of viewers of Proposition 1 against a benchmark in which the media outlet's report is unbiased or full, i.e., $m=z$ for every $z \in Z$. Therefore, we make the following remark[29]:

Remark 1 (*Full report* $\rho=0$). If $\rho=0$ and the media outlet's report is full (i.e., $m=z$ for every $z \in Z$), then the fraction of viewers is:

$$\alpha^{full} = (1-p)+\theta(1-\nu)\nu v_H+\theta^2(1-\nu)^2 v_0. \tag{9}$$

By comparing the above Eq. (9) with Eq. (7), one simple relationship emerges: the difference in the equilibrium demand for news between a full report and a partial report (i.e., one negatively influenced by advertisers) is given by $\theta^2(1-\nu)^2 v_0$. Therefore, it is strictly positive, and increasing in $1-\nu$, θ, and v_0. Intuitively, the drop in the demand for news due to the pressure exerted by the advertisers is highest when the consumers' initial beliefs are more pessimistic about either the quality of products (ν is lower or v_0 is higher) or the media outlet's ability to detect defects (θ is higher).

Finally, note that the decision to restrict attention to pure strategy equilibria does not affect the results discussed so far. This is because when $\rho=0$ there exists no PBE of the game in mixed strategies where advertisers randomize over the possible bids to the media outlet.[30] This conclusion, however, does not hold in general and mixed strategy equilibria play a much more important role when the product quality correlation is high, as we discuss next.

4.2. Correlated products

We now turn to the general case of arbitrarily positively correlated product quality. In this case, the signals reported by the media outlet may create a negative externality between the firms for the reason that viewers may believe that all products are of low quality, and therefore any negative news about one product may harm the sales of the other. If that is the case, then the competition to influence the media outlet's report becomes something akin to the private provision of a

[28] This result can be seen by comparing Eq. (7) with the assumption $\eta \leq (1-p)/2$.

[29] See a formal derivation in the proof of Step 7 of the main proof of Proposition 1 in the Appendix (available online).

[30] The proof of the non-existence of mixed strategy equilibria is formally presented in Step 3 of the proof of Proposition 1 in the Appendix (available online). Generally, the strategic sub game played by the advertisers to influence the media outlet is strategically equivalent to a Bertrand game where monopoly profits are bounded above by α, and, as shown by Baye and Morgan (1999), mixed strategy equilibria can occur only when monopoly profits are unbounded.

public good: each firm may want the media outlet to hide any negative information, regardless of which specific product the media outlet has found this information about. The next proposition characterizes the PBE under these circumstances.

Proposition 2. *There exists a PBE of the game in pure strategies for any* $\rho \in [0,1)$. *In equilibrium, the media outlet's report* m^*, *the fraction of viewers* α^*, *and the advertisers' bids depend on a threshold in the degree of product quality correlation. Specifically, let*

$$\overline{\rho} \equiv 1 - \frac{(2-\theta)v_0}{\nu(2v_H - \theta v_0)} \tag{10}$$

then:

- *If* $\rho \leq \overline{\rho}$, *there exists a unique PBE of the game in pure strategies such that the report* m^* *and the bids* b^* *are as in Eqs. (6) and (8) of Proposition* 1, *and the demand for news is*

$$\alpha^* = (1-p) + (1-\rho)\theta\nu(1-\nu)v_H. \tag{11}$$

- *If* $\rho > \overline{\rho}$, *then*: *if* $\eta > 0$, *there exist two PBE of the game in pure strategies where the advertisers' bids are asymmetric*: *one advertiser bids just the reserve price* (*equal to* η) *while the other bids any amount less than the reserve price, and viceversa*; *if instead* $\eta = 0$, *all advertisers bid zero. All equilibria are such that* $m^* = (\varnothing, \varnothing)$ *for all* $z \in Z$ *and the demand for news is* $\alpha^* = 1-p$.

This result shows that the equilibrium of Proposition 1 carries over for any degree of correlation up to $\overline{\rho}$. Under these circumstances, the equilibrium actions played by the advertisers and the media outlet remain unchanged. The only difference is that the equilibrium fraction of viewers, which is described by Eq. (11), depends also on the degree of correlation ρ, and the relationship is inversely proportional.

Things stand differently when the degree of correlation is above $\overline{\rho}$. In this case, the competition for influencing the media outlet becomes a game of voluntary contribution to a public good for the advertisers. At least one firm must pay an advertising fee equal to the reserve price (η) in order to conceal any negative information about the low product quality from the viewers, but each producer would rather free-ride and let the other pay for this service. Despite the incentive to free-ride, firms manage to coordinate their bids and the media outlet always conceals any signal in the unique PBE of the game in pure strategies. Therefore, since all signals are concealed, the report becomes uninformative to consumers and the demand for news drops to its minimum value $(1-p)$.

As is well known in the literature on public good games (Palfrey and Rosenthal, 1984), when the public good is discrete (e.g., if a sufficient number of contributions are made, then it will be provided, if not it will not be) and there are two or more possible contributors, then there is a sharp difference in outcomes between pure and mixed strategy equilibria. While the public good – as we have just seen – is always provided in the pure strategy equilibria, the same result cannot be taken for granted in the mixed strategy equilibria, because firms will fail to coordinate their contributions with some positive probability. The next proposition characterizes the PBE of the game in mixed strategies:

Proposition 3. *Let*

$$\overline{\overline{\rho}} \equiv 1 - \frac{(1-\theta)v_0}{\nu(v_H - \theta v_0)} \tag{12}$$

then, there exists no PBE of the game in mixed strategies for any $\rho \in [0, \overline{\overline{\rho}})$, *and there exists a unique PBE of the game in mixed strategies for any* $\rho \in [\overline{\overline{\rho}}, 1)$. *In equilibrium, the media outlet's report* m^* *and the fraction of viewers* α^* *are jointly determined by the following two relationships*:

$$m^* = \begin{cases} (\varnothing, \varnothing) \text{ with probability } 1 - \dfrac{\eta^2}{(\alpha^* - \eta)^2} & \text{if } z \in Z \setminus (\varnothing, \varnothing) \\ z & \text{otherwise;} \end{cases} \tag{13}$$

and the equation

$$\alpha^* = (1-p) + \frac{\eta^2}{(\alpha^* - \eta)^2}\theta(1-\nu)\left\{v_H\nu(1-\rho) - v_0[2-\theta(1-\nu(1-\rho))]\right\}, \tag{14}$$

which admits only one real solution. Each advertiser $i = 1,2$ *bids either* $b_i^* = \eta$ *with probability*

$$\Pr(b_i^* = \eta) = 1 - \frac{\eta}{(\alpha^* - \eta)}, \tag{15}$$

or anything less than the reserve price with the complementary probability; *and the winner of the auction asks the media outlet to hide any negative information about all products.*[31]

As indicated by the literature on discrete public goods, producers moving simultaneously and randomizing between the choice of paying a fixed amount (equal to η) and of free riding, may fail to coordinate in order to influence the media outlet, and so it is possible that the report will disclose all the realized signals to its viewers without any negative commercial

[31] If $\eta = 0$, the PBE in mixed strategies may be "degenerate", i.e., coincides with that in the case of a pure strategy equilibrium.

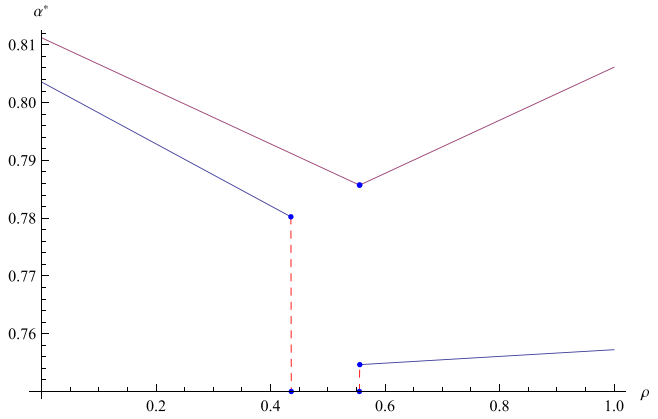

Fig. 1. The lower curve is the PBE fraction of viewers α^* (see Propositions 2 and 3) and the upper one is the benchmark α^{fulll} (see Remark 3) with the following parameters: $\nu=1/2$; $\theta=3/7$; $v_H=1/2$; $v_0=1/6$; $\eta=1/5$; and $p=1/4$.

media bias.[32] Compared to the case of pure strategies, this situation appears more favorable to consumers and the demand for news should be higher. But the equation that characterizes the demand for news α^* in mixed strategies is rather complex to analyze, and we will return to it at the end of this section.

Now we need to discuss the reason why the equilibrium in mixed strategies does not exist for any level of correlation below $\overline{\overline{\rho}}$. This is due to two facts. First, when $\rho<\overline{\rho}$ there is no mixed strategy equilibrium in the sub-game played by the advertisers and the media outlet, as we have already discussed for the case of $\rho=0$ (see discussion at the end of the previous section). Second, $\overline{\overline{\rho}}$ is greater than $\overline{\rho}$ and when $\rho\in(\overline{\rho},\overline{\overline{\rho}})$ the above equilibrium in mixed strategies is not perfect Bayesian. In fact, we have $\overline{\overline{\rho}}>\overline{\rho}$ because consumers anticipate that advertisers might not achieve the intended coordination in mixed strategies. This implies that those consumers who watched the news report will be also more willing to buy a product even when the report m shows that the other is of low quality. To put it differently, consumers' level of indifference is higher in mixed strategies compared to pure strategies.[33] Then, if $\rho\in(\overline{\rho},\overline{\overline{\rho}})$, and if consumers believe that the report is sometimes unbiased because of the lack of coordination, as discussed before, then advertisers have an incentive to bid some value above the reserve price η in order to influence the report, pretending it was miscoordination. But this plan cannot happen in any PBE of the game because it is not consistent with the viewers' beliefs.

We now turn to examine the demand for news in mixed strategies. To this end, the main properties are summarized by the following remark (formally discussed in the proof of Step 9 in the Appendix).

Remark 2. In the PBE of the game in mixed strategies, the equilibrium fraction of viewers α^* is strictly increasing in the media outlet's reputation cost η and in the degree of product quality correlation $\rho\in[\overline{\overline{\rho}},1]$. If $\eta>0$, then $\alpha^*>1-p$. If instead $\eta=0$, then $\alpha^*=(1-p)$.

When analyzed with the results of Proposition 2 and for the case where $\eta>0$, the demand for news exhibits a discontinuity in the degree of correlation in two points. First, when the degree of correlation moves from below $\overline{\rho}$ to above it, the demand for news drops from the level of equation (11) to $1-p$. This drastic reduction occurs because viewers realize that the media outlet's reporting strategy has changed and, as a result, it will hide any negative information about products. A second discontinuity occurs at $\overline{\overline{\rho}}$; when the correlation is sufficiently high to support the mixed strategy equilibrium. In this case, viewers anticipate that the media outlet's report is going to reveal the true signal with some positive probability (that is decreasing in η) and, therefore, the demand for news goes above $1-p$, and it is increasing in ρ afterward.[34] Therefore, we have shown that overall the demand for news can be non-monotonic in the degree of correlation.

This result is shown graphically in Fig. 1, where one can visually compare α^* to the benchmark level of the demand for news that would arise if the media outlet's report was always unbiased (full), which is formally characterized below (see Remark 1, and Eq. (14) in the limit of η approaching infinity):

[32] This is true only if $\eta>0$, otherwise the problem of free-riding is trivial.

[33] In fact, the threshold level $\overline{\overline{\rho}}$ constitutes the degree of correlation that makes a viewer indifferent between purchasing and not purchasing a good, conditional upon viewing at least one signal of low quality and given that she expects the media outlet's report to be unbiased or full.

[34] This part of the curve is increasing in ρ for the reason that viewers will not purchase any product if they know that at least one is of low quality, even when the report is the realized signal with probability one. Hence, they do not care that much about news covering situations in which products are of different quality, because one negative signal is enough for them to decide not to consume any product.

Remark 3. (*Full report*). If the media outlet's report is full (i.e., $m=z\ \forall z\in Z$) then the fraction of viewers is:

$$\alpha^{full}=(1-p)+\begin{cases}\theta(1-\nu)\nu v_H+\theta^2(1-\nu)^2 v_0 & \text{if } \rho<\overline{\overline{\rho}}\\ \theta(1-\nu)\{v_H\nu(1-\rho)-v_0[2-\theta(1-\nu(1-\rho))]\} & \text{otherwise}\end{cases} \tag{16}$$

The comparison shown in Fig. 1 can best illustrate the negative impact of commercial media bias on the demand for news; when this demand is mostly driven by a consumer's uncertainty about the product quality across the whole industry (e.g., is driving SUVs damaging for the environment? Is smoking cigarettes harmful to health?)—that is, when product quality correlation is high—then the pressure exerted by the advertisers on the media outlet's report will be at its highest and the report will be mostly uninformative. This is because producers will anticipate the negative externality of a fully truthful news report published by the media outlet, and so even a fierce competition in the product market may co-exist with some form of hidden cooperation in the advertising market.

Overall, our results suggest that the degree of correlation in product quality influences the accuracy of the media outlet's reports. These results can provide a micro-foundation and an economic rationale behind the assumption of Ellman and Germano (2009) and Germano and Meier (2013) that advertisers share the same preferences for low accuracy of news reports. The tobacco industry, which the two papers use as an archetypal example of negative advertisers' influence on news accuracy, is clearly a case in point. Arguably, the correlation of product quality within the tobacco industry (i.e., the negative effects on consumers' health of different tobacco products) is very high. Thus, our model predicts that tobacco companies would pay the media outlet to hide any possible negative information about their products.

5. Discussion and extensions

At this stage, it is worth discussing some important points about our model.

We have assumed throughout that the media outlet's reputation concerns are not too large (i.e., $\eta\leq(1-p)/2$). While this assumption affects the scope of the results of the model, the cases where η is above this threshold are less insightful in terms of commercial media bias (the Online Appendix provides a formal analysis). When the reputation cost of the media outlet is high relative to the advertisers' revenues, there is a unique equilibrium without any commercial media bias in the news report. At the same time, a Perfect Bayesian Equilibrium may not exist for intermediate values of the media outlet's concern for its reputation. Formally this occurs because of a discontinuity in the fraction of viewers. The intuition for this result is the following. Let α^{bias} denote the fraction of viewers that occurs when the media outlet misreports some of the signals (i.e., when $m\neq z$ for some $z\in Z$). Since α^{bias} is lower than the fraction of viewers under a full report α^{full}, it is possible to have such an η where $\alpha^{full}>\eta>\alpha^{bias}$. That is, advertisers would not find it profitable in equilibrium to influence the media outlet's report because α^{bias} is too small relative to the reputation cost of the media outlet. At the same time, α^{full} is too large for consumers to believe that advertisers have not influenced the media outlet's report. In other words, the media outlet would not be able to produce any report which would then be consistent with the (Bayesian) consumers' beliefs. To examine this situation one should make further assumptions about the behavior of the agents in our model, or focus on a different, weaker solution concept. Even so, we have no reason to believe that the main economic insights of our model would change dramatically.

One should also keep in mind that firms, in spite of the fact that they are symmetric, behave symmetrically only in the Perfect Bayesian Equilibrium in mixed strategies and for sufficiently high correlation. This situation is not uncommon in standard anti-coordination games, such as public good games (as in Palfrey and Rosenthal, 1984). It is important to remark that when there are only two firms this condition is not a restriction imposed to pin down a particular equilibrium from a larger set, but the only equilibrium of the game in mixed strategies. Even so, in a more general setting, asymmetric equilibria in mixed strategies are likely to arise (for example, when there are more than two firms contributing to the public good).

Another critical assumption is that of the auction mechanism to sell the advertising slots (described in Section 3). This particular mechanism is not new, as it has already been applied to lobbying and rent seeking settings (e.g., with a slightly more complicated structure, by Hillman and Samet, 1987). However, it is not inconceivable to imagine other selling or bargaining mechanisms that could be used instead. It is important to note that, our results do not crucially depend on the selection of these mechanisms. When the media outlet perfectly internalizes all the externalities that it imposes on the firms with its report, independently of how the transfers between these economic agents are determined, this would provide the same result in terms of the equilibrium media outlet's news reports; the report maximizes the aggregate payoffs of the media and the firms, i.e., the aggregate profits of the firms plus the reputation cost of the media outlet.[35] It should be further noted that, by restricting our attention to one particular example within this class of “efficient” mechanisms, we do not intend to give the most accurate account of any real-life situation, but to provide a benchmark case of what would happen if firms behaved rationally and with no waste of resources (from their point of view, not that of consumers).

[35] See the accompanying working paper version of our work (Blasco et al., 2012 – http://ssrn.com/abstract=238819) for a bargaining mechanism involving a take-it-or-leave-it offer by the media outlet to the advertisers.

A further assumption that needs to be carefully discussed regards the non-negative reputation cost η and the role it plays in the selection of the winner of the auction. Under this assumption, the media outlet will always break ties in favor of high-quality producers, because it saves the expected cost associated with the loss of reputation. While this seems a reasonable assumption to make, it leaves open the possibility that very different outcomes might arise in the limit of a null reputation cost and for arbitrary tie-breaking rules. Even so, we believe that our analysis is robust to some important alternative scenarios. For example, even a media outlet with no reputation concerns may decide to break ties in favor of a high-quality producer because, by eliminating the rival from the market of viewers, the producer obtains monopoly profits which may lead to higher ads fees for the media outlet.

It is also perhaps worth noticing that the model assumes an exogenous price p for the news report, but the results do not hinge on this assumption, as long as the price is positive (i.e., one could extend the timing of the game by adding an initial step in which the media outlet sets a price to maximize its expected profits).[36] We also implicitly assume that the media outlet will be committed to delivering the message determined in the auction, so it cannot "game" the advertisers after the bids have been paid.[37] A similar commitment applies to firms, in that they cannot report any signal themselves to consumers (e.g., credibly), after the auction is over. Finally, the assumptions about rational and Bayesian consumers might not be realistic in some cases. Quite often, consumers fail to investigate how the production of new goods actually operates, and therefore they might not fully understand/be aware of the correlation across firms. However, it is important to remark that our results are not based on any "true" correlation but just on the correlation as it is perceived by consumers.

The main insights of the model are robust to several extensions which are informally discussed below (a formal discussion can be found in the Online Appendix).

Multiple media outlets: The presence of multiple media outlets does not necessarily increase the level of information within the news reports for consumers. Intuitively, consider two or more symmetric media outlets that obtained the same signals about products, then in the limit where the degree of correlation approaches the value of one, producers would have to "bribe" more agents simultaneously, but the basic results of our model would remain unchanged. As the number of media outlets raises, however, the aggregate reputation cost that firms have to pay will also increase, and so there may be a threshold in the number of media outlets above which firms would not have enough resources to "silence" all of them (similar to the role played by transaction costs in the model of Besley and Prat, 2006).

Nevertheless, as pointed out by Germano and Meier (2013), if media outlets could, instead, increase their audience share by increasing the accuracy of their news reports (i.e., media outlets committing to a given accuracy level), then competition in the market for news may also increase the expected accuracy of news reports. One can further imagine a case in which one media outlet makes a commitment not to be financed by advertising fees and to specialize in reporting all defects to consumers (e.g., as in the case of *Consumer Report, Zagat,* or a public news media entirely financed through subscription fees/general taxation). If consumers can purchase either or both of the news reports, we find that there will still be a subset of them who will prefer to buy just a bundle of possibly biased information plus news contents and entertainment provided by the ads-sponsored media outlet, rather than the factually correct information provided by the ads-free media outlet (or both). This only happens when the bias is not too pronounced relative to the value of the information. Therefore, under these circumstances, the reasoning and results of the model would also still apply.

More than two producers: Increasing the number of competing producers is another important extension of the model that we explore. When correlation is sufficiently high, it suffices to apply existing results in the literature on discrete public goods (Palfrey and Rosenthal, 1984). In pure strategies, the negative influence over the media outlet does not depend on the number of producers, as every equilibrium involves one firm paying the reputation cost η in order to silence the media outlet. In the mixed strategy equilibria, by contrast, the equilibrium with truthful reporting disappears as the number of possible contributors increases, and the probability of miscoordination goes to zero. When instead correlation is low, an increase in the number of firms (holding constant the average product quality) may or may not reduce the occurrence of any negative commercial media bias depending on the ability of high-quality firms to form coalitions in order to influence the media outlet reporting. In this sense, the effect of an increase in the number of firms with highly correlated product quality is mixed, as it does not necessarily reduce (or increase) the likelihood of commercial media bias.[38]

Asymmetric producers: Finally, another possible extension of our model is to consider the competition between asymmetric producers, such as firms with different level of bargaining power. For example, consider the case of an incumbent—a firm with an already established base of customers—and an entrant. When the correlation is low, a high -quality entrant may succeed in outbidding a low-quality incumbent, because it saves the media outlet the cost to its reputation. However, when the correlation is high, viewers may be willing to risk purchasing a low-quality product from an incumbent, but they would not be willing to risk the purchase of a low-quality product from an entrant. Therefore, for intermediate values of product

[36] A positive price avoids situations where consumers are indifferent that would allow multiple Nash equilibria. A positive price could result, for example, just from non-null production costs, even under competition between the entertaining industries.

[37] This is a standard assumption in any one-shot auction where the auctioneer and the buyer are implicitly assumed to have entered into a legally binding agreement. Alternatively, it is possible to see this implicit commitment mechanism as a reduced form of the withdrawal commitments *á la* Ellman and Germano (2009). That is, as if the advertisers could withdraw their ads (and their payments) if the media outlet fails to deliver the message offered in the auction.

[38] See also the accompanying working paper version of our work for a model with $N > 2$ competing advertisers (Blasco et al., 2012 – http://ssrn.com/abstract=2388196).

quality correlation ρ, a competitive advantage in the products market translates into a competitive advantage in inducing the media outlet to report favorable news, which may prevent entry. This case also serves to highlight that the degree of correlation across firms is an important determinant of the media outlet's report.

6. Conclusions

Consumers typically watch media for their entertainment and informational value. The informational value includes news about consumer products. Therefore, the information supplied by the media ultimately affects the purchasing decisions of consumers. Since producers are also potential advertisers, there may be a subtle relationship between the editorial contents of the media (i.e., news on firms' products) and advertising. Specifically, adverting fees may represent a form of hidden transfer to induce media to hide negative information about the advertiser's own product and/or to disclose negative information about the competitors' products (*paying positive to go negative*).

The results of the analysis show that whether or not advertisers' pressure on media has negative consequences for the accuracy of news reports ultimately depends on whether the competition within the product market also translates into a competition over media content, which crucially depends on the degree of correlation of the firms' products. When the correlation is high, all firms share the same preferences over media reports—they want media to refrain from disclosing any negative information about any product since this news would hurt all of their sales. However, when the correlation is low, firms will have conflicting preferences over media contents—low-quality firms will want to *pay positive to avoid negative* and high-quality firms will want to *pay positive to go negative*. Therefore, our results suggest that the media are likely to report more accurate information (i.e., disclose relatively more "bad news") on products belonging to industries where the correlation among firms' products is lower.

This also suggests a clear direction for empirical studies aimed at testing the influence of advertisers on media contents. These empirical investigations should take into account that media are more likely to accurately report news on issues where competing producers have conflicting preferences. Therefore, the empirical identification strategy should control for differences across industries in the degree of correlation in product quality and also for the extent of competition among producers.

The main policy implication of our results suggests implementing a transparency regulation, by which media outlets are required to publicly disclose the ads fees obtained from each firm. Indeed, this public disclosure policy would allow consumers to infer what type of information the media outlet might have actually received and which information it may have decided to withhold. Moreover, we show that the urgency to implement such a policy is not likely to be uniform across markets. Our analysis suggests that the potential for commercial media bias might represent a more serious concern in the presence of a high degree of correlation in the quality of the advertisers' products. In contrast, when advertisers' products are weakly correlated, commercial media bias is less likely to arise thanks to the competition between advertisers over news contents. To conclude, media regulators should target their monitoring efforts towards news contents/issues upon which advertisers are likely to share similar preferences.

Acknowledgments

We are very grateful to the associate editor and two anonymous referees for their insightful remarks. We also thank Mark Armstrong and seminar audiences at the University of Amsterdam, Université catholique de Louvain, University of Essex, Copenhagen Business School, CERGE-EI, University of Bologna, IMT Lucca, the 10th journées Louis-André Gérard-Varet, Max Weber Programme Lustrum Conference, the 2nd Ravello Workshop, Bomopa Economics Meetings 2011, the EUI-FSR Workshop "Economics of Communication and Media Markets", and at the 2010 Workshop in Media Economics and Public Policy for useful comments. The usual disclaimers apply.

Appendix A

In this section we prove Propositions 1–3 from the main text. It is clear that, even if they are presented separately for the sake of clarity, Proposition 1 is a special case of Proposition 2, where $\rho=0$, and Proposition 3 is the case with mixed equilibria. For this reason we provide a single proof.

Proof of Propositions 1, 2 and 3

Proof. We start by writing down the joint density of the products quality for future reference. Let $s=(q_1,q_2)$ denote the realized vector of product quality. Then the joint distribution is:

$$\Pr(s=H,H)=[\nu+(1-\nu)\rho]\nu,$$

$$\Pr(s=L,L)=[1-\nu(1-\rho)](1-\nu)$$
$$\Pr(s=H,L)=\Pr(s=L,H)=(1-\nu)\nu(1-\rho)$$

We now characterize a viewer's optimal consumption decision conditional on the signals reported by the media outlet. If the media outlet reports no low product quality, $m=(\varnothing,\varnothing)$, the viewer will always consume a (randomly selected) product, because $\nu\geq v_0/v_H$; if the media outlet reports both products being of low quality, $m=(L,L)$, the viewer will not consume any product; and if the media outlet reports just one low quality product, say, $m=(\varnothing,L)$, the viewer will consume one product only if:

$$\Pr(s=H,L|m=\varnothing,L)v_H\geq v_0. \tag{17}$$

Using the chain rule and because the report m and the state s are conditionally independent given the signal z, the above inequality becomes:

$$\frac{\Pr(s=H,L\cap m=\varnothing,L|z=\varnothing,L)\Pr(z=\varnothing,L)}{\Pr(m=\varnothing,L)}\geq\overline{v},$$
$$\frac{\Pr(s=H,L|z=\varnothing,L)\Pr(m=\varnothing,L|z=\varnothing,L)\Pr(z=\varnothing,L)}{\Pr(m=\varnothing,L)}\geq\overline{v}.$$

where $\overline{v}=v_0/v_H$.

We can further use the chain rule to rearrange the above inequality as follows:

$$\frac{\Pr(m=\varnothing,L|z=\varnothing,L)\Pr(z=\varnothing,L|s=H,L)\Pr(s=\varnothing,L)}{\Pr(m=\varnothing,L)}\geq\overline{v},$$

where the denominator is

$$\Pr(m=\varnothing,L)=\Pr(m=\varnothing,L|z=\varnothing,L)\Pr(z=\varnothing,L)+\Pr(m=\varnothing,L|z=L,L)\Pr(z=L,L).$$

Thus, the reporting strategy of the media outlet affects the viewer's decision through the conditional probabilities $\omega_1\equiv\Pr(m=\varnothing,L|z=\varnothing,L)$ and $\omega_2\equiv\Pr(m=\varnothing,L|z=L,L)$. Using this notation and the joint density written above, we can express inequality (17) as follows:

$$\frac{\omega_1\theta\Pr(s=H,L)}{\omega_1[\theta\Pr(s=H,L)+\theta(1-\theta)\Pr(s=L,L)]+\omega_2\theta^2\Pr(s=L,L)}\geq\overline{v}. \tag{18}$$

We can now turn to characterize m^* the media outlet's report in the PBE of the game in pure and mixed strategies. To this end, we first consider the PBE for a given exogenous $\alpha>0$, and then we characterize the PBE when α is endogenous.

Exogenous $\alpha>0$: To characterize the PBE for a given α, we start from (the beliefs of) inequality (18), assuming first that is verified and then that it is not.

Case 1: Eq. (18) is verified. We solve this case proceeding in steps.

Step 1: In pure strategies, if $z=(L,L)$, then we have: if $\eta\leq\alpha$, then $m^*=(\varnothing,L)$ or $m^*=(L,\varnothing)$ with probability 1/2 each; and if instead $\eta>\alpha$, then $m^*=L,L$.

Proof. Given (18) is verified, an advertiser i who makes a bid (above the reputation cost η) higher than j's bid would maximize profits by concealing the negative signal on its own product, while reporting the rival's. Thus, an advertiser i's payoffs function is as follows:

$$\pi_i(b_i,b_j,\alpha)=(1-\alpha)/2+\begin{cases}\alpha-b_i & \text{if } b_i>\max\{b_j,\eta\}\\ (\alpha-b_i)/2 & \text{if } b_i=b_j\geq\eta\\ 0 & \text{otherwise.}\end{cases} \tag{19}$$

If $\eta>\alpha$, then $m^*=(L,L)$ all signals are revealed, because the reputation cost of the media outlet is too high for the advertisers to break even and $b_i^*=0$.

If instead $\eta\leq\alpha$, there is a unique equilibrium in pure strategies where both advertisers bid $b_i^*=\alpha$. This is because any bid $b_i<\alpha$ is weakly dominated and the only strategy that survives iterated elimination of these strategies is $b_i=\alpha$. Since ties are broken at random, the media outlet's report is $m^*=(\varnothing,L)$ or $m^*=(L,\varnothing)$ with probability 1/2.□

Step 2: In pure strategies, if $z\in Z\backslash(L,L)$, then $m^*=z$ for any $\alpha>0$.

Proof. This is straightforward for $z=(\varnothing,\varnothing)$. If instead $z=(\varnothing,L)$ (or $z=(L,\varnothing)$), advertisers have asymmetric payoffs. Given (18) is verified, the payoffs function for the firm selling a high quality product, say, firm 1 is:

$$\pi_1(b_1,b_2,\alpha)=(1-\alpha)/2+\begin{cases}\alpha-b_1 & \text{if } b_2<\eta\\ \alpha-b_1 & \text{if } b_2\geq\eta \quad \text{and} \quad b_1\geq b_2\\ \alpha/2 & \text{otherwise.}\end{cases} \tag{20}$$

The payoffs function for firm 2 is instead:

$$\pi_2(b_2,b_1,\alpha)=(1-\alpha)/2+\begin{cases}\alpha/2-b_2 & \text{if } b_2>\max\{b_1,\eta\}\\ 0 & \text{otherwise.}\end{cases} \tag{21}$$

If $\eta>\alpha/2$, then $m^*=\varnothing,L$ because the reputation cost of the media outlet is too high for firm 2 to break even and so $b_2^*=0$ (and the best response for firm 1 is to simply bid $b_1^*=0$).

If instead $\eta\leq\alpha/2$, there is a unique equilibrium in pure strategies where both advertisers bid $b_i^*=\alpha/2$. This is because any bid $b_i<\alpha/2$ is *weakly dominated* and the only strategy that survives iterated elimination of these strategies is $b_i=\alpha/2$. Then the media outlet will break ties in favor of firm 1, by assumption, to report $m^*=(\varnothing,L)$.□

Step 3: There exists no mixed strategy equilibrium in which advertisers randomize the bids for the media outlet for any $\alpha>0$.

Proof. We prove by contradiction that there is no mixed strategy equilibrium when $\eta\leq\alpha$ (the case $\eta>\alpha$ is trivial), given (18) is verified. Consider first that all products are of low quality: $z=(L,L)$. Suppose there is a mixed strategy equilibrium characterized by two distributions (F_1^*,F_2^*) over some intervals (S_1^*,S_2^*). Then firms must draw bids from the same interval $S_1^*=S_2^*=[\underline{b},\overline{b}]$. If not, agents would be choosing bids that have zero probability of being picked by the rival in equilibrium, and they could increase payoffs by either bidding something equal or lower than $\overline{b}$ in order to increase revenues without affecting the probability of winning, or bidding something equal or higher than $\underline{b}$ to have a positive probability of winning the auction. By the definition of mixed strategies, the expected payoff of an agent i from each bid $b_i\in[\underline{b},\overline{b}]$ must be equal to some $k>0$. This implies that $\underline{b}\geq\eta$ and $\overline{b}<\alpha$, otherwise the payoff is zero. Hence, each agent i will choose a bid b to maximize the following expected utility:

$$F_j^*(b)(\alpha-b)=k>0.$$

By inverting this expression and because $F_j^*(\overline{b})=1$ we obtain the equilibrium distribution for j:

$$F_j^*(b)=\begin{cases}0 & \text{if } b<\underline{b}\\ (\alpha-\overline{b})/(\alpha-b) & \text{if } b\in[\underline{b},\overline{b})\\ 1 & \text{otherwise.}\end{cases} \tag{22}$$

This implies that the distribution F_j^* must have an atom at $\underline{b}$, i.e., $F_j^*(\underline{b})=(\alpha-\overline{b})/(\alpha-\underline{b})>0$ for any $\underline{b}<\infty$. But this result violates the constancy of payoffs on the interval. Indeed, by bidding $b_i=\underline{b}$ an agent i would obtain

$$k=F_j^*(\underline{b})(\alpha-\underline{b})/2=(\alpha-\overline{b})/2<(\alpha-\overline{b})=F(\overline{b})(\alpha-\overline{b})=k$$

which is impossible. Thus, agent i's best response would be to draw bids from an interval $S'=(\underline{b},\overline{b}]$, but this contradicts the fact that bids should be drawn from the same interval in equilibrium.

The same proof applies when only one of the products is of low quality, e.g., $z=(\varnothing,L)$ (it is trivial when $z=(\varnothing,\varnothing)$).□

Now we are ready to characterize m^* the media outlet's report in the PBE of the game for a given $\alpha>0$ where the viewers' beliefs are consistent with (18).

Step 4 [PBE with low correlation]: If the degree of product quality is sufficiently low

$$\rho\leq\overline{\rho}\equiv 1-\frac{(2-\theta)v_0}{\nu(2v_H-\theta v_0)}, \tag{23}$$

then for any PBE of the game given $\alpha>0$ in pure strategies, m^* the equilibrium media outlet's report is as follows. If $\eta\leq\alpha$, then

$$m^*=\begin{cases}(\varnothing,L) \text{ or } (L,\varnothing) \text{ with probability } 1/2 \text{ each} & \text{if } z=(L,L)\\ z & \text{otherwise.}\end{cases} \tag{24}$$

If instead $\eta>\alpha$, then $m^*=z$ for all $z\in Z$.

Proof. By considering together Steps 1 and 2 we can compute the media outlet's equilibrium report of Eq. (24). Then, in any PBE we need to check that viewers' beliefs are consistent with the equilibrium actions of the media outlet and the advertisers that we have just derived. Using (24) and since the viewer's beliefs must be correct in the PBE, we have that when $\eta \leq \alpha$, then $\omega_1 = 1$ and $\omega_2 = 1/2$. By plugging these values into inequality (18) and rearranging terms, we obtain the inequality (23).

If instead $\eta > \alpha$, then we have $\omega_1 = 1$ and $\omega_2 = 0$ and so:

$$\rho \leq \overline{\overline{\rho}} \equiv 1 - \frac{(1-\theta)v_0}{\nu(v_H - \theta v_0)}. \tag{25}$$

Note that $\overline{\rho} < \overline{\overline{\rho}}$ and therefore for any $\rho \leq \overline{\rho}$, both inequalities are satisfied, which proves that this reporting strategy constitutes a PBE of the game for given $\alpha > 0$ when product quality is not (too positively) correlated across firms, as stated in the step (as well as in the main propositions).□

Case 2: Assume now that (18) is not verified.

In this case, both advertisers have an incentive to conceal *all* signals of low product quality, because viewers would not purchase any product conditional upon viewing any negative news. Thus, we can now examine any signal $z \in Z \backslash (\varnothing, \varnothing)$ as a single case ($z = \varnothing, \varnothing$ is trivial).

Step 5: If $z \in Z \backslash (\varnothing, \varnothing)$, then, in pure strategy, $m^* = (\varnothing, \varnothing)$ when $\eta \leq \alpha/2$, and $m^* = z$ otherwise. In mixed strategy, $m^* = (\varnothing, \varnothing)$ with probability $1 - \eta^2/(\alpha - \eta)^2$ when $\eta \leq \alpha/2$, and $m^* = z$ otherwise.

Proof. Given that (18) is not verified, all advertisers cannot earn more than $\alpha/2$ each. Thus, if $\eta > \alpha/2$, then $m^* = z$ all signals are published in the report, because the media outlet's reputation cost is too high for the advertisers to break even.

If $\eta \leq \alpha/2$, we can exclude all bids above η, because are strictly dominated strategies, to focus on the following 2×2 sub game:

	offer η		offer less	
offer η	$\frac{\alpha-\eta}{2}$,	$\frac{\alpha-\eta}{2}$	$\frac{\alpha}{2} - \eta$,	$\frac{\alpha}{2}$
offer less	$\frac{\alpha}{2}$,	$\frac{\alpha}{2} - \eta$	0,	0

.

This sub-game has two asymmetric equilibria in pure strategy, where one advertiser pays $b_i^* = \eta$ and the other "free rides", $b_j^* = 0$ and a symmetric equilibrium in mixed strategy where each firm offers $b_i^* = \eta$ with probability $\Pr(b_i = \eta) = \frac{\alpha - 2\eta}{\alpha - \eta}$ (as in Palfrey and Rosenthal, 1984).

Thus, in pure strategy, the media outlet's report is always uninformative for consumers: $m^* = (\varnothing, \varnothing)$. By contrast, in mixed strategy firms may not be able to coordinate, and the report is $m^* = z$ with probability:

$$\Pr(b_1 < \eta)\Pr(b_2 < \eta) = \left(1 - \frac{\alpha - 2\eta}{\alpha - \eta}\right)^2 = \frac{\eta^2}{(\alpha - \eta)^2}.\square \tag{26}$$

Now we are ready to characterize m^* the media outlet's report in the PBE of the game for a given $\alpha > 0$ where the viewers' beliefs are consistent with (18) not verified.

Step 6 [PBE with high correlation]: If the degree of product quality is sufficiently high

$$\rho > \overline{\overline{\rho}} \equiv 1 - \frac{(1-\theta)v_0}{\nu(v_H - \theta v_0)}, \tag{27}$$

then in the PBE of the game in pure strategy given $\alpha > 0$, m^* the media outlet's report in equilibrium is $m^* = (\varnothing, \varnothing)$ for all $z \in Z$ when $\eta \leq \alpha/2$; and $m^* = z$ when $\eta > \alpha/2$. And for the PBE of the game in mixed strategy given $\alpha > 0$, we have:

$$m^* = \begin{cases} (\varnothing, \varnothing) \text{ with probability } 1 - \dfrac{\eta^2}{(\alpha - \eta)^2} & \text{if } z \in Z \backslash (\varnothing, \varnothing) \\ z & \text{otherwise,} \end{cases} \tag{28}$$

when $\eta \leq \alpha/2$; and there is no mixed strategy PBE when instead $\eta > \alpha/2$.

If the degree of product quality is instead $\rho \in (\overline{\rho}, \overline{\overline{\rho}})$ with $\overline{\rho}$ defined in (23), then for any PBE of the game in pure strategy given $\alpha > 0$, m^* the media outlet's report in equilibrium is $m^* = (\varnothing, \varnothing)$ for all $z \in Z$ when $\eta \leq \alpha/2$; and there is no PBE for $\eta > \alpha/2$, or in mixed strategy.

Proof. Using Step 5 we can derive the media outlet's reporting strategy in mixed and pure strategy, assuming the inequality (18) is not verified. Again we need to check that viewers' beliefs are consistent with the equilibrium actions of the media outlet and the advertisers that we have derived.

In pure strategy, when $\eta \leq \alpha/2$, observing a negative signal has probability zero for consumers (i.e., it is an "off equilibrium path" event). Hence, we need to ensure that viewers beliefs (off the equilibrium path) are such that (18) is not verified. Here it is reasonable to restrict viewers beliefs to be $\omega_1 = 1, \omega_2 = 1/2$ (as in the case of low correlation). That is, viewers will expect the media outlet to report at most one negative signal out of equilibrium (i.e., the report is only partially truthful). Then, when $\rho > \overline{\rho}$, there are no profitable deviations for the advertisers, because firms would earn a payoff of zero by revealing any of the negative signals out of equilibrium. Thus, this is a PBE of the game.

In mixed strategy, for any $\eta > 0$, the equilibrium media outlet's report implies that $\omega_1 > 0$ and $\omega_2 = 0$ (just because when $z = L, L$, then only $(\varnothing, \varnothing)$ and (L,L) are possible outcomes for m). By plugging these values into inequality (18) and rearranging terms, we obtain inequality (27). Thus, when this inequality is satisfied, the (mixed strategy) equilibrium just derived is a PBE of the game for a given $\alpha > 0$.

In pure or mixed strategy, when $\eta > \alpha/2$ then $\omega_1 = 1$ and $\omega_2 = 0$ and so $\rho > \overline{\overline{\rho}}$ is the condition that needs to be satisfied for a PBE.□

Now we turn to characterize the PBE of the game in pure and mixed strategy, making endogenous the value of α.

Endogenous α: To simplify exposition we use the following notation:

- m_z is the media out's full report $m = z$ for any $z \in Z$;
- $m_{\neq z}$ is the media out's partial report m defined by (24);
- $m_{\varnothing}$ is the uninformative report $m = (\varnothing, \varnothing)$ for any $z \in Z$;
- and m_{mix} is the report defined by (28).

We also write down the general expression of the equilibrium fraction of viewers for future reference:

$$\alpha^* = (1-p) + [EU(m^*) - \nu v_H]. \tag{29}$$

Then notice that the equilibrium results for the case of exogenous α apply also when α is endogenous. This is because a consumer's decision to watch the media outlet's report takes place only after the media outlet and the advertisers have made their moves. Thus, for the purpose of characterizing the PBE of the game with endogenous α, we only need to check all the conditions under which the beliefs of all players in the game are consistent. We proceed in steps.

Step 7: In pure strategy, if $\rho \in [0, \overline{\rho}]$, then m^* the media outlet's report in the PBE of the game (with endogenous α) is the partial report $m_{\neq z}$ and the equilibrium fraction of viewers is

$$\alpha^* = (1-p) + (1-\rho)\nu(1-\nu)\theta v_H. \tag{30}$$

Proof. If $\rho \in [0, \overline{\rho}]$, then, by Step 4, we need only to consider two types of reports: the full report m_z when $\eta > \alpha$, and the partial report $m_{\neq z}$ when $\eta \leq \alpha$.

A viewer's expected utility from watching the full report m_z is:

$$EU(m_z) = \Pr(s = H, H)v_H + 2\Pr(s = H, L \cap z = \varnothing, L)v_H + \Pr(s = H, L \cap z = \varnothing, \varnothing)v_H + \Pr(s = L, L \cap z = L, L)v_0. \tag{31}$$

Using (29) with (31) and after substituting the following equations:

$$\Pr(s = H, H) + \Pr(s = H, L) = \nu, \tag{32}$$

$$\Pr(s = H, L \cap z = \varnothing, L) = \theta\nu(1-\nu)(1-\rho), \tag{33}$$

$$\Pr(s = L, L \cap z = L, L) = \theta^2[1 - \nu(1-\rho)](1-\nu), \tag{34}$$

we obtain α_z the fraction of viewers for the report m_z:

$$\alpha_z = (1-p) + (1-\rho)\theta(1-\nu)\nu v_H + v_0\theta^2(1-\nu)[1-\nu(1-\rho)]. \tag{35}$$

By Step 4, for the full report m_z to be a PBE of the game we need to have $\eta > \alpha_z$. But this condition is impossible for $\eta \in [0, (1-p)/2]$, because α_z is not less than $(1-p)$. Therefore m_z is not a PBE of the game in pure strategy (with endogenous α).

Let us now turn to consider the partial report $m_{\neq z}$.

The expected utility from watching the partial report $m_{\neq z}$ is the same as (31) excluding the last term with v_0, because viewers will always purchase at least one product under a partial report. Then, $\alpha_{\neq z}$ the fraction of viewers under a partial report is:

$$\alpha_{\neq z} = (1-p) + (1-\rho)\nu(1-\nu)\theta v_H. \tag{36}$$

By Step 4, for the partial report $m_{\neq z}$ i to be a PBE of the game we need to have $\eta \leq \alpha_{\neq z}$. But this condition is always verified for $\eta \in [0, (1-p)/2]$, because $\alpha_{\neq z}$ is not less than $(1-p)$ for any $\rho \in [0\overline{\rho}]$. Therefore $m_{\neq z}$ is a PBE of the game in pure strategy (with endogenous α).□

Step 8: In pure strategy, if $\rho \in (\overline{\rho}, 1]$, then m^* the media outlet's report in the PBE of the game (with endogenous α) is the empty report $m_\varnothing$ and the equilibrium fraction of viewers is $\alpha^* = (1-p)$.

Proof. If $\rho \in (\overline{\rho}, 1]$, then, by Step 6, we need only to consider two types of reports in pure strategy: the full report m_z when $\eta > \alpha/2$, and the empty report $m_\varnothing$ when $\eta \leq \alpha/2$.

Clearly, all the conditions for the full report m_z as described for the case of $\rho \in [0, \overline{\rho}]$ must hold also in this case. Therefore for $\eta \in [0, (1-p)/2]$ the full report is not a PBE of the game (with endogenous α).

Instead, as regards the uninformative report $m_\varnothing$, the fraction of viewers is simply $\alpha_\varnothing = (1-p)$, which is greater than any $\eta \in [0, (1-p)/2]$. Thus, the uninformative report $m_\varnothing$ is a PBE of the game in pure strategy.□

Step 9: In mixed strategy, if $\rho \in [\overline{\overline{\rho}}, 1]$, then m^* the media outlet's report in the PBE of the game (with endogenous α) and α^* the equilibrium fraction of viewers are jointly determined by $m^* = m_{mix}$ and the following equation:

$$\alpha^* = (1-p) + \frac{\eta^2}{(\alpha^* - \eta)^2}\theta(1-\nu)\{v_H\nu(1-\rho) - v_0[2-\theta(1-\nu(1-\rho))]\}, \tag{37}$$

which has only one real solution for any $\eta \in [0, (1-p)/2]$.

Proof. If $\eta < \alpha/2$, then, by step 6 we have that $m^* = m_{mix}$. By applying the chain rule, a viewer's expected utility from watching the report m_{mix} is

$$EU(m_{mix}) = [\Pr(s = H, H \cap m = \varnothing, \varnothing) + \Pr(s = H, L \cap m = \varnothing, \varnothing)]v_H + [1 - \Pr(m = \varnothing, \varnothing)]v_0. \tag{38}$$

The above expression can be simplified by noting the following facts:

$$\Pr(s = H, H \cap m = \varnothing, \varnothing) = \Pr(s = H, H); \tag{39}$$

$$\Pr(m = \varnothing, \varnothing) = \zeta + (1-\zeta)\Pr(z = \varnothing, \varnothing); \tag{40}$$

$$\text{and } \Pr(s = H, L \cap m = \varnothing, \varnothing) = \Pr(s = H, L)[\zeta + (1-\zeta)(1-\theta)] \tag{41}$$

where we call $\zeta = 1 - \eta^2/(\alpha - \eta)^2$ the probability of at least one of the advertisers makes a bid above η.

Using Eq. (29) and the simplified (38), we obtain:

$$\alpha^* = (1-p) + \frac{\eta^2}{(\alpha^* - \eta)^2}\Delta, \tag{42}$$

where we call $\Delta = \theta(1-\nu)\{v_H\nu(1-\rho) - v_0[2-\theta(1-\nu(1-\rho))]\}$.

Note that, when $\Delta > 0$ and $\eta \in [0, 1-p]$, Eq. (42) has always a unique solution for α_{mix} in the interval $[1-p, 1-p+\Delta]$:

- because LHS is increasing in α, and RHS is decreasing in α as long as $\alpha \geq \eta$,
- RHS goes to infinity for $\alpha \to \eta$, and is more than $1-p$ when $\alpha = 1-p > \eta$,
- RHS is less or equal than $(1-p)+\Delta$ for $\alpha = (1-p)+\Delta$,

this solution is increasing in η; but also, by the statement above, this solution is more than 2η for any $\eta < \frac{1-p}{2}$.□

□

Appendix B. Supplementary data

Supplementary data associated with this paper can be found in the online version at http://dx.doi.org/10.1016/j.euroecorev.2016.01.005.

References

Bagdikian, B.H., 2004. The New Media Monopoly. Beacon Press, Boston.
Baker, C.E., 1995. Advertising and a Democratic Press. Princeton University Press, Princeton.
Baye, M.R., Morgan, J., 1999. A folk theorem for one-shot Bertrand games. Econ. Lett. 65, 59–65.
Besley, T., Prat, A., 2006. Handcuffs for the grabbing hand? Media capture and government accountability. Am. Econ. Rev., 720–736.
Blasco, A., Pin, P., Sobbrio, F., 2012. Paying Positive to Go Negative: Advertisers' Competition and Media Reports. Extended Version, (March 1, 2012). ⟨http://dx.doi.org/10.2139/ssrn.2388196⟩.
Blasco, A., Sobbrio, F., 2012. Competition and commercial media bias. Telecommun. Policy 36, 434–447.
Boykoff, M.T., Boykoff, J.M., 2004. Balance as bias: global warming and the US prestige press. Global Environ. Change 14, 125–136.
Chaloupka, F.J., Warner, K.E., 2000. The economics of smoking. Handbook of Health Economics 1, 1539–1627.
Chen, Y., Riordan, M.H., 2007. Price and variety in the Spokes model. Econ. J. 117, 897–921.
De Smet, D., Vanormelingen, S., 2012. The Advertiser is Mentioned Twice. Media Bias in Belgian Newspapers. HUB Research Papers 2012/05.

DellaVigna, Stefano, Ruben Durante, Brian, Knight, Eliana, La Ferrara. 2016. Market-based lobbying: evidence from advertising spending in Italy. Am. Econ. J. Appl. Econ. 8(1), 224-256. ⟨http://dx.doi.org/10.1257/app.20150042⟩.
Di Tella, R., Franceschelli, I., 2011. Government advertising and media coverage of corruption scandals. Am. Econ. J. Appl. Econ. 3, 119–151.
Dyer, O., 2004. Journal rejects article after objections from marketing department. BMJ 328, 244.
Ellman, M., Germano, F., 2009. What do the papers sell? A model of advertising and media bias. Econ. J. 119, 680–704.
Fletcher, R.H., 2003. Adverts in medical journals: caveat lector. Lancet 361, 10–11.
Focke, F., Niessen-Ruenzi, A., Ruenzi, S., 2015. A Friendly Turn: Advertising Bias in the News Media. Tech Report, Universität Mannheim.
Fugh-Berman, A., Alladin, K., Chow, J., 2006. Advertising in medical journals: should current practices change? PLoS Med. 3, e130.
Gambaro, M., Puglisi, R., 2009. What do ads buy? Daily coverage of listed companies on the Italian press, Daily Coverage of Listed Companies on the Italian Press (December 21, 2009).
Gentzkow, M., Glaeser, E.L., Goldin, C., 2006. The rise of the fourth estate. How Newspapers Became Informative and Why it Mattered, in Corruption and Reform: Lessons from America's Economic History, University of Chicago Press, Chicago and London, pp. 187–230.
Germano, F., 2008. On Commercial Media Bias. Tech. Report, Universitat Pompeu Fabra.
Germano, F., Meier, M., 2013. Concentration and self-censorship in commercial media. J. Publ. Econ. 97, 117–130.
Hamilton, J., 2004. All the News that's Fit to Sell: How the Market Transforms Information Into News. Princeton University Press, Princeton.
Herman, E.S., Chomsky, N., 1988. Manufacturing Consent. Pantheon.
Hillman, A.L., Samet, D., 1987. Dissipation of contestable rents by small numbers of contenders. Public Choice 54, 63–82.
Oreskes, N., 2004. The scientific consensus on climate change. Science 306, 1686.
Palfrey, T.R., Rosenthal, H., 1984. Participation and the provision of discrete public goods: a strategic analysis. J. Public Econ. 24, 171–193.
Petrova, M., 2011. Newspapers and parties: how advertising revenues created an independent press. Am. Polit. Sci. Rev. 105, 790–808.
Petrova, M., 2012. Mass media and special interest groups. J. Econ. Behav. Org. 84, 17–38.
Poitras, M., Sutter, D., 2009. Advertiser pressure and control of the news: the decline of muckraking revisited. J. Econ. Behav. Org. 72, 944–958.
Posner, R.A., 1969. The Federal Trade Commission. The University of Chicago Law Review 37 (1), 47–89.
Reuter, J., 2009. Does advertising bias product reviews? An analysis of wine ratings. J. Wine Econ. 4, 125–151.
Reuter, J., Zitzewitz, E., 2006. Do ads influence editors? Advertising and bias in the financial media. Q. J. Econ. 121, 197–227.
Rinallo, D., Basuroy, S., 2009. Does advertising spending influence media coverage of the advertiser? J. Market. 73, 33–46.