Media Capture in a Democracy:
The Role of Wealth Concentration

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Abstract

Since objective news coverage is vital to democracy, captured media can seriously distort collective decisions. The current paper develops a voting model where citizens are uncertain about the welfare effects induced by alternative policy options and derive information about those effects from the mass media. The media might however secretly collude with interest groups in order to influence the public opinion. In the case of voting over the level of a productivity-enhancing public bad, it is shown that an increase in the concentration of firm ownership makes the occurrence of media bias more likely. Although media bias is not always welfare worsening, conditions for it to raise welfare are restrictive.

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1   Introduction

Messages communicated by the mass media to the citizenry can have a tremendous impact upon collective decision-making. On the one hand, to the extent that newspapers and television gather information and make it available to citizens, they can dramatically increase voters' ability to make intelligent choices. On the other hand, the media's role in strengthening democracy may be put in jeopardy by special interest groups that use the news providers to manipulate the public opinion.

Under which conditions can one expect journalism to be independent and news coverage to be objective? What are the welfare effects from manipulated media? The current paper aims at shedding light on these issues by developing a simple model of incompletely informed citizens who vote over policy, and mass media that have access to superior information, but can be captured by interest groups.

To illustrate the potential impact of captured media on democratic decision-making, I study the choice about the level of a productivity-enhancing public project that causes an uncertain social damage. Many real-world examples fit the model. One is governmental regulation of production techniques that might give rise to ecological disasters. Another example is a military attack to a foreign country, conducted in order to lower the price of an imported input. A further example is authorizing the merger of two companies that plan to form a monopoly; the monopoly price is formally equivalent to a public bad, and the sinergies due to the merger exemplify the productivity increase.[1]

Voters are assumed to obtain information on the risks associated with the public project from the media. I focus on the benchmark case where the media sector is a private monopoly. Although this is an extreme case, references to a "media monopoly" abound in media research, e. g. in the title of Bagdikian's (2000) influential monography. The preponderance of private ownership in contemporary media systems[2] along with the very

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[1]Roemer (1993) provides a political-economic analysis of the determination of the level of a productivity-enhancing public bad in the case of complete information.

[2]Djankov *et al.* (2003) analyze the ownership structure of top newspapers and television channels;

high level of industry concentration in the media sector[3] suggest that private monopoly is a model that deserves close scrutiny.

I assume that the media cannot be forced to objectively and accurately report their information. By presenting some facts and omitting others, by choice of emphasis, and by relience on slick press releases and "independent experts" handpicked by PR firms, the media are in a position to manipulate the beliefs of the electorate. Therefore, they can influence voting outcomes. This opportunity is recognized by interest groups, which may eventually bribe the media to get their preferred messages transmitted.

Bribes stand for various forms of transfers made by interest groups to people in the media sector in order to secure favorable reports. Examples range from highly remunerated speaking engagements of anchormen and journalists before associations and corporations, provision of cushy jobs with industry, and private invitations to breathe the special air of the upper upper-class. In some countries, industrial firms directly own televisions and newspapers. In this case, interest groups may bribe media personalities just by paying them a salary that is substantially above its market level.[4]

The model highlights the role played by firm ownership in determining media independence. It predicts that, *ceteris paribus*, a higher level of ownership concentration increases the probability of captured media. The largest shareholders disproportionately benefit from the profitability increase induced by the public project. Since their interests strongly conflict with those of the median voter, largest shareholders exhibit the strongest incentive to manipulate the electorate. A high level of wealth concentration is conducive

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these are defined as the five largest daily newspapers, as measured by share in total circulation, and the five largest television stations, as measured by share of viewing. In the U.S., all top media are privately owned. In France, Germany, Italy, Japan, and the U.K. private newspapers have a share between 83 and 100 %, while private television has a share between 39 and 61 %. Although the share of private television in Italy is only 39 %, the controlling shareholder is also the current prime minister.

[3]Six multinationals dominate the media sector worldwide. As they own stock in each other and cooperate in joint media ventures, they are referred to as a media monopoly by Bagdikian (2000). In the U.S., all major sources of TV news are divisions of only five, largely intertwined, conglomerates.

[4]Paul Krugman has recently drawn the attention to the conflicts of interest of the U.S. media: "The handful of organizations that supply most people with their news have major commercial interests that inevitably tempt them to slant their coverage" (New York Times, 11.29.02). For a highly documented picture of the corporate control of U.S. media, see McChesney (1999).

to captured media because it provides the media with a patron which has more to benefit from untruthful reporting and which is therefore willing to pay more for this.

The kind of media capture identified in this paper does not necessarily reduce social welfare. There is scope for dishonest media to be welfare improving because the political equilibrium with full information is distorted. While this distortion arises as soon as median and average wealth do not coincide, the conditions under which captured media raise social welfare are shown to be restrictive.

If the disproportionate influence of the wealthy on public opinion formation brings about a welfare loss, some form of public regulation of the media sector could be welcome. The model suggests that the case for regulation is stronger, the more concentrated the distribution of wealth is.

Anecdotical evidence about the U.S. suggests that wealth concentration might be an empirically significant determinant of media reliability, of course one among others. Over the past two decades, the U.S. society has experienced a tremendous growth of wealth inequality, along with a loss of trust of people in the media.[5]

A recent literature has identified various channels of media influence on politics. In Strömberg (2004), the media transmit politicians' campaign promises to the electorate. Due to economies of scale, the news media provide more space to issues of interest to large groups. Such a bias translates into a policy bias in favor of large groups. Chan and Suen (2004) study a Downsian framework with incompletely informed voters. In their model, the media has exogenous policy preferences and makes statements that maximize the probability of election of the party it prefers. In Baron (2004), it is the preferences of journalists for influence, or their career concern, that are at the root of media's influence upon politics.

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[5]A study of several yearly surveys undertaken by the Times Mirror Center for The People & The Press concludes that the news media's "negative rating" rose from 51.8 percent in 1985 to 60.3 percent in 1995 (Hess, 1996). In a survey report of 1999, lack of credibility is still mentioned as the single most important problem facing journalism. On the contemporary rise of wealth inequality in the U.S., see e. g. Wolff (2002).

Capture, as a source of media bias, is at the core of Besley and Prat (2004), which is the paper that is closest to the current one. Besley and Prat study how the structure of the media industry affects political accountability when voters cannot timely observe the performance of the incumbent government. The role of the media is to provide information about the government's ability, before voters may decide to reelect it. In their model, only verifiable information can be reported; however, a bad government may buy the media's silence. Besley and Prat show that the media sector is more likely to be corrupt if there are few outlets. Media plurality tends to ensure objective news coverage because it makes it harder for the government to bribe the whole media industry.

Besley and Prat's model and the current one explore two very different settings in which media can become corrupt. In their model, the media sector may be captured by the government, voters have common interests, and multiple media outlets are present. In the current model, there is a multiplicity of private agents that may capture the media, voters have conflicting interests, and there is a monopolistic media industry.

The model in the current paper posits rational voters that understand the potential incentives of the media to manipulate their reports.[6] Following the literature on strategic information transmission pioneered by Crawford and Sobel (1982), in the model of this paper there is a "sender" (the media monopoly) who observes a signal about the true state of the world and then transmits a message to "receivers" (the voters), who choose an action that determines payoffs. In spirit, the current model is related to the one developed by Benabou and Laroque (1992), who investigate the manipulation of an asset market through announcements by an insider that also trades the asset. While in their model the sender aims at manipulating a market process, in the current one the sender tries to manipulate a political process.

The rest of the paper is organized as follows. Section 2 describes the model. Equilibria are characterized in Section 3, where the role of wealth concentration is discussed. Section

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[6]Mullainhatan and Shleifer (2002) investigate the emergence and impact of media bias when users do not form Bayesian beliefs.

4 develops a welfare analysis. Section 5 concludes by reviewing some of the questions left open by this article. All proofs are gathered in the Appendix.

2 The model

The economy is populated by a continuum of agents, the mass of which is normalized to unity. Agents are denoted by $i \in [0,1] \equiv I$. Each agent inelastically supplies one unit of labor to the firm sector. To simplify the notation, there is just one firm in the economy, representing the entire, competitive, sector. The distribution of firm ownership is summarized by $\theta : I \rightarrow \mathbb{R}_+$, the fraction of the firm owned by agents. θ satisfies $\int_I \theta_i di = 1$, is continuous and increasing, and admits a unique maximum (at $i = 1$). The median of the ownership distribution is less than the average: $\theta_{.5} \equiv \theta_m \leq 1$.

Agents have common preferences summarized by the following von Neuman-Morgenstern utility function:

$$U_i = y_i - \omega D(x). \tag{1}$$

The variable y_i denotes agent i's consumption of the private good, while x is the amount of the public bad. The state of the world ω can take two values, 0 and 1; each state occurs with equal probability. The function $D : \mathbb{R}_+ \rightarrow \mathbb{R}_+$ represents the damage caused by the public bad, which only materializes if $\omega = 1$. The damage function is increasing and convex: $D' > 0$, $D'' \geq 0$.

An agent's level of private consumption is given by

$$y_i = w_i + \theta_i \Pi - (z_i - \omega)^2 \gamma. \tag{2}$$

The variable w_i denotes the wage income, while Π is the firm's profit. The third term on the r.h.s. of (2) captures possible private benefits from guessing the underlying state of the world. Each agent $i \in I$ takes an action $z_i \in \mathbb{R}$ and there is a consumption loss which is minimized if the action equals the state; the magnitude of the consumption loss depends on the parameter $\gamma \geq 0$.

The firm produces the private good according to the production function

$$Y = g(x)f(N), \tag{3}$$

where N is the employment level. The functions $f : I \to \mathbb{R}_+$ and $g : \mathbb{R}_+ \to \mathbb{R}_+$ are strictly increasing and concave: $f' > 0 > f''$, $g' > 0 > g''$. In order to ensure an interior solution, $g'(0) = \infty$ and $g'(\infty) = 0$ are assumed.

There is one agent in the population, denoted by $j \in (0,1)$, that runs a media enterprise. This activity entails two prerogatives: first, it gives agent j access to priviledged information about the state of the world; second, it enables agent j to communicate that information to the whole population. Agent j is referred to as the journalist. His superior information about the underlying state comes from a signal $s \in \{0,1\}$ that the journalist privately observes. With probability $p \in (1/2, 1)$, this signal is equal to the true state, while with probability $1 - p$ the journalist is misinformed about the state. The journalist reports a message $r \in \{0,1\}$ about the state of the world to the population. The latter utilizes the report to update its beliefs.

The journalist's utility function is the same as the one of everybody else in the economy, except that he might also care about the core principles of his profession, namely objectivity and accuracy. Formally, we assume

$$U_j = y_j - \omega D(x) - \kappa_j |r - s|,$$

where $\kappa_j \geq 0$ is the value to the journalist of making a truthful report.[7] This value is assumed to be private information. Specifically, a journalist's type may be either opportunistic or idealistic. The opportunistic type has $\kappa_j = 0$ and prior probability $1 - \lambda$; the idealistic type has $\kappa_j = \kappa > 0$ and occurs with probability $\lambda \in (0,1)$. The journalist's type and the signal are independently distributed.

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[7] Alternatively, the journalist faces a penalty if caught lying; κ_j captures the expected utility loss of lying, which depends on the level of the penalty and the probability of escaping discovery.

The sequence of events is as follows. At date $t = 0.5$ the journalist learns his type κ_j. At date $t = 1$, the journalist can choose one agent to match with. Matching causes some arbitrarily small costs $\epsilon > 0$ to the journalist. In case of agreement between the journalist and the contacted agent, these two are said to build a coalition; the journalist's partner, denoted by $a \in I$, is called the associate. By forming a coalition, agents j and a agree on two issues: the media's report and a side payment. Both report and payment can be made contingent on the signal observed by the journalist, i.e. j shares his information about the state of the world with a.[8] The outcome of bargaining between the two agents is given by the generalized Nash solution for bargaining games with incomplete information, due to Harsanyi and Selten (1972).[9]

At date $t = 1.5$ the journalist observes the signal about the state of the world; the journalist shares this information with his associate, if he has one. At date $t = 2$ the media report a message to the population in accordance with the agreement stipulated at $t = 1$. If no media coalition was formed at $t = 1$, the journalist unilaterally chooses the report. The voters only observe the report; they do not observe whether a media coalition was built or not. Upon having received the report, the voters revise their beliefs about the underlying state in accordance with Bayes' rule.

At date $t = 3$ agents choose their action z_i and vote on the level x of the public bad; the level of the public bad is determined according to the majority rule. At date $t = 4$ a general competitive economic equilibrium occurs.

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[8]Thus, truthful disclosure of the signal is assumed to be enforceable within the relationship between the journalist and the associate, whereas this is not possible in the relationship between the journalist and the media users. The idea behind this modeling is that media coalitions are strategic alliances involving a small number of parties. Hence, the corresponding transaction costs of verifying the signal transmitted by the informed party are relatively low.

[9]The assumptions of matching and cooperative bargaining are often used e. g. in models of the labor market. In the current setting, those assumptions keep the model tractable. If we allowed the journalist to simultaneously bargain with every other agent, we would run into a complex problem of common agency.

3   Determination of equilibrium

The model is analyzed by backward induction, i.e. agents hold rational expectations.

3.1   Markets

The purely economic part of the model is standard. The representative firm takes prices as given and demands labor so as to maximize its profit

$$\Pi = g(x)f(N) - wN,$$

where w is the competitive wage and the private good is used as the numéraire-good. Labor supply is fixed at 1 and in a competitive equilibrium everybody works. Routine computations show that in equilibrium the wage is given by

$$w^* = g(x)f'(1). \tag{4}$$

Equilibrium profits are given by

$$\Pi^* = g(x)\phi, \tag{5}$$

where $\phi \equiv f(1) - f'(1) > 0$ is proportional to the difference between average and marginal labor productivity. As g is an increasing function, both profit and wage increase with the level of the public bad.

3.2   Voting

The equilibrium level of the public bad is the one which beats all alternatives in pairwise comparisons based on majority voting. In order to characterize voters' preferences over the level of the public bad, notice that an agent's indirect expected utility is given by

$$EU_i = w^* + \theta_i \Pi^* - L_i - \mu D(x), \tag{6}$$

where L_i is the expected private loss induced by failing to guess the underlying state and $\mu = \Pr(\omega = 1|r)$ is the equilibrium posterior probability assigned to state 1 by all agents but a and j.[10]

Inserting (4) and (5) into (6) yields

$$EU_i = g(x)\left[f'(1) + \theta_i\phi\right] - \mu D(x) - L_i. \tag{7}$$

Since $g(x)$ and $-D(x)$ are concave, preferences for the public bad are single-peaked. Hence, there exists a Condorcet winner, namely the level of the public bad that is ideal for the median of the ownership distribution. The selected level of the public bad is implicitly determined by the f.o.c.

$$g'(x^*)\left[f'(1) + \theta_m\phi\right] = \mu D'(x^*). \tag{8}$$

This equation implicitly defines the equilibrium level of the public bad as a function of voters' beliefs μ; write this relationship as $x^*(\mu)$. Applying the theorem on the differentiation of implicit functions reveals that $dx^*/d\mu < 0$.

The action z_i is taken by any agent $i \notin \{a, j\}$ so as to minimize the expected loss

$$L_i = \gamma[(1 - \mu)z_i^2 + \mu(z_i - 1)^2].$$

The optimal choice is

$$z_i^* = \mu.$$

Let $\beta = \Pr(\omega = 1|s)$ denote the probability assigned to state 1 by agents a and j. Straightforward computations establish that their optimal action is $z_a^* = z_j^* = \beta$. Notice, for later use, that in equilibrium $L_a = L_j = \gamma\beta(1 - \beta)$.

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[10]Since they have no mass, we may safely neglect the role of agents a and j on the voting outcome.

3.3 Mass communication

In the communication stage of the model, the journalist observes a signal $s \in \{0, 1\}$ and thereupon reports a message $r \in \{0, 1\}$ to the agents. Based on this message, agents' beliefs μ about the state are formed.

If a media coalition was formed at date $t = 1$, the report r is chosen so as to maximize the average of the journalist's and his associate's utility; hence it solves

$$\max g\left(x^*(\mu)\right)\left[f'(1) + \theta_c \phi\right] - \beta D\left(x^*(\mu)\right) - \frac{\kappa_j}{2}|r - s| - \gamma\beta(1 - \beta), \qquad (9)$$

where $\mu = \Pr(\omega = 1|r)$ is the probability assigned to state 1 by all other agents, θ_c equals $(\theta_a + \theta_j)/2$, and κ_j may be either 0 or κ. If no media coalition is in place, the journalist selects the report so as to solve

$$\max g\left(x^*(\mu)\right)\left[f'(1) + \theta_j \phi\right] - \beta D\left(x^*(\mu)\right) - \kappa_j|r - s| - \gamma\beta(1 - \beta). \qquad (10)$$

In either case, the media's optimal strategy depends on the journalist's type. If the intrinsic motivation of the idealistic type is sufficiently strong, the idealistic type only cares about being honest. This case is posited for the rest of the analysis.

Assumption 1 *For any $\theta \in [\theta_0, \theta_1]$ the solution to*

$$\max g\left(x^*(\Pr(\omega = 1|r))\right)\left[f'(1) + \theta\phi\right] - \beta D\left(x^*(\Pr(\omega = 1|r))\right) - \frac{\kappa}{2}|r - s|$$

always has $r = s$.

By making κ large enough, it can be guaranteed that the idealistic type will always truthfully report the signal. Assumption 1 considerably shortens the treatment without significant loss of insight.

If the journalist is of the opportunistic type, his report needs not coincide with the signal. Informally, the following two equilibrium requirements have to be met: first, the report delivered by the media maximizes their objective function, given the way in which

beliefs are formed; second, beliefs can be deduced from the media's optimal strategy using Bayes' rule.

I now begin characterizing the equilibria of the subgame starting at date $t = 2$. The player that chooses the report - which may be either the journalist or a coalition - will simply be called the media and denoted by $M \in \{j, c\}$.

Lemma 1 *There exists a scalar $\widetilde{\theta} > \theta_m$ such that the following holds: if $\theta_M \geq \widetilde{\theta}$, there exists an equilibrium of the subgame in which the opportunistic journalist always reports 0, independently of the signal; if $\theta_M < \widetilde{\theta}$, such an equilibrium does not exist.*

This result establishes that a systematic news bias can be an optimal strategy for the media if the ownership share of those who control the media is sufficiently large. The intuition is as follows. Letting the amount of the public bad increase boosts the firm's profit. If those in control of the media are entitled to a larger profit share than the one which goes to the median voter, the media prefer a larger amount of the public bad than the one preferred by the median voter. In this case, the opportunistic journalist will report that the public bad is not likely to be harmful ($r = 0$) even if the actual signal is that the public bad is likely to be harmful ($s = 1$).

Because of the conflict of interest, the public will be unsure whether the media are honest. Thus, an optimistic message ($r = 0$) will not be completely believed. Voters realize that with opportunistic journalist and economically interested media an optimistic report conveys no information, while with the idealistic journalist an optimistic report means that the good state ($\omega = 0$), has probability p. By Bayes' rule voters will then assign a probability q to the bad state ($\omega = 1$); as shown in the Appendix,

$$q = \frac{1 - p\lambda}{2 - \lambda}.$$

This probability is larger than $1-p$ because the media are not entirely credible. Therefore, rationality puts an upper bound to the extent of beliefs manipulation by means of media reports. The probability q assigned to state 1 is however strictly less than $1/2$, the prior probability of that state. Therefore, those in control of the media are indeed able to manipulate the voters' beliefs.

If the profit share of the media is close to the median voter's one, the interests of the media and those of the median voter will almost be aligned. In such a case it does not pay to mislead the electorate, since the ensuing level of the public bad would be too large even for the media; thus, a strategy of optimistic misreporting will not be played if those who control the media are "ordinary people".

Lemma 2 *There exists a scalar $\theta' < \theta_m$ such that the following holds: if $\theta_M \leq \theta'$, there exists an equilibrium of the subgame in which the opportunistic journalist always reports 1, independently of the signal; if $\theta_M > \theta'$ such an equilibrium does not exist.*

The interpretation of this result mirrors the previous one. Those who control the media might have interests that are in conflict with those of the median voter because the former are significantly poorer than the median voter. In this case, media bias entails a systematic reporting of pessimistic messages, so as to reduce the amount of the public bad desired by the electorate.

Lemma 3 *There exist scalars $\underline{\theta}$ and $\widehat{\theta}$, with $\widehat{\theta} > \theta_m > \underline{\theta}$ such that the following holds: if $\theta_M \in [\underline{\theta}, \widehat{\theta}]$, there exists an equilibrium of the subgame in which the opportunistic journalist correctly reports what he observes; if $\theta_M \notin [\underline{\theta}, \widehat{\theta}]$ such an equilibrium does not exist.*

This result establishes that the interests of those in control of the media have to be similar to those of the median voter in order for an honest equilibrium to exist. In this case, all information is transmitted to voters.

The optimistic misreporting equilibrium of Lemma 1, the pessimistic misreporting equilibrium of Lemma 2, and the honest equilibrium of Lemma 3 are the only types of

equilibria in pure strategies admitted by the subgame. The equilibrium correspondence can be characterized as follows:

Proposition 1 *There are five possible regimes:*

if $\theta_M < \underline{\theta}$, only a pessimistic misreporting equilibrium exists;

if $\underline{\theta} \le \theta_M \le \theta'$, both a honest and a pessimistic misreporting equilibrium exist;

if $\theta' < \theta_M < \widetilde{\theta}$, only a honest equilibrium exists;

if $\widetilde{\theta} \le \theta_M \le \widehat{\theta}$, both a honest and an optimistic misreporting equilibrium exist;

if $\theta_M > \widehat{\theta}$, only an optimistic misreporting equilibrium exists.

As a corollary, if the distribution of ownership is egalitarian, $\theta_M = \theta_m = 1$ and only the honest equilibrium exists.

3.4   Forming a media coalition

The decision of building a coalition must be optimal given the way in which the media's reports affect voters' beliefs about the damage; these beliefs have to be consistent with the journalist's optimal formation of a coalition. The incentive to collude heavily depends on the journalist's interests, as captured by his share θ_j. In order to simplify the exposition, I assume that the journalist's stake in the firm is not too different from the median:

Assumption 2 $\theta_j \in (\theta', \widetilde{\theta})$.

As implied by Proposition 1, this assumption guarantees that even the opportunistic journalist will make a truthful report if he does not collude with anybody.

Proposition 2 *(i) In an honest equilibrium, the journalist has no associate. (ii) In an optimistic misreporting equilibrium, the opportunistic journalist associates with the richest agent. (iii) In a pessimistic misreporting equilibrium, the opportunistic journalist associates with the poorest agent.*

In case of an honest equilibrium, there is no scope for colluding since the journalist has no credible threat to deviate from truthful reporting. In case of a misreporting equilibrium, he can credibly threaten his associate to switch to truthful reporting if no agreement is reached. This threat gives the journalist some bargaining power, that he can exploit by negotiating with an agent that benefits from media bias. In an optimistic misreporting equilibrium, the agents that have a keen interest in media bias are the wealthy ones. In order to maximize the side payment obtained when colluding, the journalist chooses as associate the agent with the largest stake in manipulating the electorate, which is the agent with the largest share in the firm. Conversely, in case of a pessimistic misreporting equilibrium, the journalist maximizes his income by associating with the agent with the lowest share in the firm.

The journalist may thus be viewed as taking two decisions: first, whether to build a coalition or not, and second, whether to collude with the richest or with the poorest agent in the economy. In equilibrium, the decision outcome depends upon the extrema and the median of the ownership distribution, as well as upon the journalist's ownership share θ_j. In the sequel, I establish conditions under which the opportunistic journalist chooses to be captured by the richest agent, rather than stay independent. In order to focus the analysis on that issue,

Assumption 3 $\theta' < 0$

is made. Since $\theta_M \geq 0$, Assumption 3 implies $\theta_M > \theta'$. By Proposition 1, no pessimistic misreporting equilibrium can exist under Assumption 3. Together with Proposition 2, this implies that if the journalist has an associate in equilibrium, then $a = 1$.

How restrictive is Assumption 3? Recall from Lemma 2 that $\theta' < \theta_m$. Hence, the condition in Assumption 3 is automatically met if the ownership share of the median voter is zero, which is often the case in reality. Intuitively, if the amount of wealth in possession of the median voter is small, her interests will almost be aligned with those of the poorest agent, and the latter will have no incentive to manipulate the electorate.

Proposition 3 *There exist scalars $\widetilde{\theta}_1 = 2\widetilde{\theta} - \theta_j$ and $\widehat{\theta}_1 = 2\widehat{\theta} - \theta_j$, with $\widehat{\theta}_1 > \widetilde{\theta}_1 > \theta_j$, such that the following holds:*

if $\theta_1 < \widetilde{\theta}_1$, the unique equilibrium has an independent journalist and truthful reports;

if $\theta_1 > \widehat{\theta}_1$, the unique equilibrium has a captured opportunistic journalist and optimistic reports;

if $\widetilde{\theta}_1 \leq \theta_1 \leq \widehat{\theta}_1$, both types of equilibrium exist.

Under Assumptions 1-3, the equilibrium can be described as follows. If the degree of wealth concentration is low, i.e. the wealthiest agent is not too much richer than the median voter, the journalist stays independent and makes truthful reports. If the degree of wealth concentration is sufficiently high, an opportunistic journalist colludes with the wealthiest agent in the economy and always reports optimistic messages, independently of the signal. In this case, the public opinion is manipulated with strictly positive probability. For intermediate levels of wealth concentration, both honesty and misreporting can be part of equilibrium behavior.

4 Welfare analysis

Since preferences are quasilinear, an efficient allocation of resources necessarily maximizes expected total surplus

$$g(x)f(1) - \beta D(x) - \gamma[(1 - \beta)z^2 + \beta(z - 1)^2]. \tag{11}$$

Hence, the unique efficient level of the public bad is implicitly given by

$$\frac{g'(x^S)}{D'(x^S)} = \frac{\beta}{f(1)}$$

and the efficient level of the private action is

$$z^S = \beta.$$

In order to conduct a welfare analysis of media capture, one has to evaluate the expected total surplus achieved in equilibrium from an ex ante point of view, i.e. at

date $t = 0$. This surplus is referred to as the (equilibrium) social welfare. Since we have excluded a pessimistic misreporting equilibrium by Assumption 3, in the sequel the expression "misreporting equilibrium" will always refer to an optimistic misreporting equilibrium.

Let us suppose that the degree of wealth concentration increases to such an extent that the equilibrium switches from honest to misreporting. How will social welfare be affected?

Proposition 4 *Social welfare is larger in an honest than in a misreporting equilibrium if γ is sufficiently large and / or θ_m is sufficiently close to 1.*

If there is a sufficiently strong private concern with objective information, captured media induce a welfare loss because the information not transmitted to the population is very valuable.

If median wealth coincides with average wealth ($\theta_m = 1$), media bias is welfare worsening even if there is no private concern with objective information ($\gamma = 0$). To grasp the intuition, notice that according to (11) and (7), expected total surplus coincides with the indirect expected utility of the agent with average wealth if $\beta = \mu$. If the median voter is endowed with average wealth and voters' beliefs are undistorted, majority voting yields the ex-ante efficient outcome - see Bergstrom (1979). If median and average wealth coincide but voters' beliefs are biased, majority voting misses the efficient level of the public bad. Therefore, an honest equilibrium delivers a larger social welfare than a misreporting equilibrium if the median and the average of the wealth distribution are sufficiently close.

Whereas captured media are detrimental to the choice about the private action, their effect upon the efficiency of the voting outcome depends upon the wealth of the median voter. In order to see how, consider first the case where the signal about the state of the world is 0. Although under both equilibria the media report 0, a misreporting equilibrium generates a lower expected total surplus than an honest equilibrium. Voters realize that

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in a misreporting equilibrium they receive the optimistic report with strictly positive probability even if the actual signal is 1. Hence, in a misreporting equilibrium the voters' assessment of the public project is less positive than in an honest equilibrium, and the electorate selects a lower level of the public bad. But the amount of the public bad in an honest equilibrium is less than the efficient one because the median voter profits less than average from the public bad. Hence, the distortion is heavier in a misreporting than in an honest equilibrium.

The welfare effect can instead go in either direction if signal 1 is observed, in which case the opportunistic journalist reports 0 in a misreporting and 1 in an honest equilibrium. If the median voter has a very small ownership share, her ideal level of the public bad can be much below the efficient one. By knowingly understating the risk of the project, captured media make the electorate choose a larger amount of the public bad. Although the selected amount will generally differ from the efficient one, it might lead to a larger total surplus than the one obtained under objective reporting.

The above arguments point out that the paradoxical result of an increase in social welfare due to media bias is the more likely, the smaller the private concern with information (γ low) and the smaller the ownership share of the median voter (θ_m low). As suggested by the following result, even if γ and θ_m are zero, captured media are unlikely to raise social welfare.

Proposition 5 *Suppose $\theta_m = \gamma = 0$, g quadratic, and D linear. Social welfare is larger in a misreporting than in a honest equilibrium, if and only if the share of aggregate income going to labor is less than $1/2$.*

In order to get the intuition for this result, it is useful to think of the median voter as a dictator that chooses the level of the public bad. If the median voter owns no shares, her income only depends on the wage level. When choosing the amount of the public bad, the median voter trades off the wage increase and the expected damage. Hence, she does not internalize the effect of the public bad on profits. The smaller the share of labor income

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in aggregate income, the larger the failure of the median voter to properly internalize all effects from a larger level of the public bad. This means that if the share of income going to labor is low, the median voter is a poor decision-maker for society as a whole. In this case, society might benefit from having an informationally distorted decision-maker, which is the case if the media are corrupt. Under the conditions of Proposition 5, society benefits from captured media only if wages make less than 50 % of national income, a condition which typically fails to be met in practice.

5   Concluding discussion

As objective news coverage is vital to democracy, captured media can seriously distort collective decisions. The model presented in this paper has shown that, other things being equal, an increase in the degree of wealth concentration can undermine objective news coverage. A high level of wealth concentration can raise the probability of corrupt media because it provides the media with a patron which has much to benefit from manipulating the electorate and is willing to pay much for this. Captured media induce an efficiency loss if the wealth of the median voter is close to average wealth or if the information transmitted by the media has a sufficiently large private value. While captured media do not necessarily diminish social welfare, conditions under which they increase it are restrictive.

The issue of media independence in a democracy is one with many facets. There are several respects in which the results presented in this paper could be extended and should be qualified. I thus conclude by reviewing a few key questions raised by the model.

5.1   Different policy areas and lobbies

The general insight to be derived from the model is that media bias is more likely to occur in a democracy if society is polarized. Groups with extreme preferences are those that are worst served by a well-informed democracy, because their preferences are the most distant

from those of the median voter. Thus, those groups have relatively strong incentives to bribe the media in order to influence the political process. The more polarized a society is, the stronger those incentives will be.

While a high level of wealth concentration can be seen as a determinant of media capture in some circumstances, different determinants of media capture may be at work in other settings. It seems implausible that wealthy capitalists are those who have the most to gain from untruthful reporting on all issues. By way of an example, workers in the trade sector might be those with the strongest incentive to bribe the media in order to gain political support for protectionism.

How can we identify the group that benefits most from media capture? Arguably, the underlying economic structure has to be explicitly modeled. Differences with respect to endowments, preferences, technologies, and market structure will generally lead to different political-economic equilibria under full information. Thus, those differences will lead to different forms of media capture under asymmetric information. By explicitly modeling the economic structure, one could try to identify the types of media capture that are associated with various economic settings.

5.2 Long-term effects and demand for news

The current model is a one-shot game in which the media's cost of being untruthful is nil. However, the interaction between voters, media and interest groups is a long-term one. Over time, media users learn something about the reliability of media outlets. Moreover, learning that a media outlet is unreliable may decrease demand, since individuals take private actions based on the reports delivered by the media.

Including a demand side along with learning into the current model would presumably diminish the frequency of media bias. By lying, an opportunistic journalist may decrease the probability assigned by media users that he is the honest type. This may reduce both future demand for the media outlet and its influence upon voters. As a consequence, a sufficiently patient journalist may have an incentive to build a reputation for being honest.

He would then reap the gains from that reputation in the final part of the relationship. To illustrate, the journalist may take a pro-poor stance on a number of relatively minor issues in order to build a reputation of being leftwing and therefore gain more influence when taking a pro-rich stance on a crucial issue.

A feature of demand that may affect the probability of media bias in an important way is the presence of confirmatory preferences. Media users may desire to read news that agrees with their prior views. If this taste is sufficiently strong, the media may display a conformist bias even if they are not captured.

I have discussed the incentives for media's news bias in a situation in which media users rationally recognize the possibility of capture and misreporting. Alternatively, the assumption of Bayesian rationality could be abandoned. Based on research in cognitive psychology, various judgement heuristics could be posited, and their implications for media's influence on voters could be investigated. Interestingly, the main result of this paper would carry over to a situation in which voters are naive and always believe the media. A more concentrated wealth distribution increases the bribe that the journalist could obtain by forming a coalition with the wealthy in order to influence voters. A way to state the contribution of this paper is therefore to point out that the danger of media capture by interest groups exists even if media users fully understand the potential incentives of the media to manipulate the news.

5.3   Competition and regulation

The model in this paper portrays the benchmark case of an unregulated media monopoly. In future work, it would be interesting to study to what extent oligopolistic competition in the media sector promotes objective news coverage. Clearly, the answer will depend on the degree of correlation across the oligopolists' privately observed signals. This suggests the importance of having a peek inside the black box of how the media collect information for their users.

The model could also be enriched to consider the role of public media. In some

countries, public media organizations are highly esteemed for their reliability. In others, especially less developed countries, state-owned media are just the mouthpiece of the ruling party. It is important to understand how the governance structure of public media should be designed to promote their objectivity and accuracy. The impact of independent media on the reporting policy of potentially captured ones is still another issue that needs more research and that may be attacked using the framework developed in this paper.

Acknowledgment

Appendix

Proof of Lemma 1.

A pure strategy for the opportunistic type ($\kappa_j = 0$) indicates which message is sent when a given signal is observed. There are four possible pure-strategy pairs: $(0,0)$, $(1,1)$, $(0,1)$, $(1,0)$. The first element of each vector indicates the media's report when the observed signal is 0 and the second element indicates the report when signal 1 is observed. Suppose that in the case of the opportunistic type, the strategy pair $(0,0)$ is played; what inferences will agents draw about the state of the world?

If voters receives a pessimistic report ($r = 1$), they will be sure that the journalist is idealistic and is truthfully reporting the signal. Hence,

$$\Pr(\omega = 1 | r = 1) = \Pr(\omega = 1 | s = 1).$$

By Bayes' rule, agents will then assign probability p to state 1. The voting outcome will thus be $x^*(p) < x^*(1/2)$, where the latter represents the selected level of the public bad when no information is conveyed by the media.

If voters receive an optimistic report ($r = 0$), they will be unsure whether the journalist is opportunistic (in which case the report conveys no information) or idealistic (in which case the state is 0 with probability p). By Bayes' rule voters will assign probability

$$\frac{\frac{1}{2}(\lambda p + 1 - \lambda)}{\frac{1}{2}(\lambda p + 1 - \lambda) + \frac{1}{2}[\lambda(1 - p) + 1 - \lambda]}$$

to state 0. The level of the public bad will be $x^*(q)$, where

$$q = \frac{1 - p\lambda}{2 - \lambda} \tag{12}$$

is the probability assigned to state 1. Notice that $q \in (1 - p, 1/2)$ and therefore $x^*(q) > x^*(1/2)$.

Given those inferences, what is the optimal strategy for the media in case $\kappa_j = 0$? Let

the media's payoff be denoted as

$$M_M(\mu; \beta) = V_M(\mu; \beta) - \gamma\beta(1 - \beta), \tag{13}$$

where

$$V_i(\mu; \beta) = g\left(x^*(\mu)\right)\left[f'(1) + \theta_i\phi\right] - \beta D\left(x^*(\mu)\right)$$

denotes agent i's payoff derived from the voting outcome if the public assigns probability μ to state 1 and its true probability is β.

First, suppose that $\theta_M \geq \theta_m$. It can be shown that strategy $(1,0)$ is then strongly dominated by $(0,0)$, while strategy $(1,1)$ is strongly dominated by $(0,1)$. In order to see it, consider the payoffs of the coalition if signal 0 is observed:

$$M_M(\mu; 1 - p) = V_M(\mu; 1 - p) - \gamma\beta(1 - \beta).$$

By examining how the report affects the voting outcome, it can now be shown that honesty dominates misreporting. If, upon observing 0, the media report 1, $\mu = p$ and the level of the public bad will be $x^*(p)$; if the media report 0, that level will be $x^*(q) > x^*(p)$. Suppose for the moment that $\theta_M = \theta_m$. Since the probability of state 1 is $1 - p$, the ideal level of the public bad for the media is in this case $x^*(1 - p) > x^*(q)$. Suppose now $\theta_M > \theta_m$; the media's preferred level of the public bad is implicitly given by the f.o.c.

$$\frac{g'(x)}{D'(x)} = \frac{\beta}{f'(1) + \theta_M\phi}, \tag{14}$$

where $\beta = 1 - p$ in the present case. Since the function on the l.h.s. of (14) is strictly decreasing in the level of the public bad, the preferred level is strictly increasing in θ_M; hence, it must be larger than $x^*(1-p)$. Since preferences are single-peaked, $V_M(q; 1-p) > V_M(p; 1 - p)$. Telling the truth is thus optimal if $s = 0$; hence, strategy $(0,0)$ dominates strategy $(1,0)$ and $(0,1)$ dominates $(1,1)$.

The optimal strategy is therefore either telling the truth or $(0,0)$. In order to see which is the optimal one, compute the payoffs of the media if the observed signal is 1. By (13), the net gain of misreporting is

$$M_M(q;p) - M_M(p;p) = V_M(q;p) - V_M(p;p).$$

Hence, $(0,0)$ is an equilibrium if and only if

$$V_M(q;p) - V_M(p;p) \geq 0,$$

where

$$V_M(q;p) - V_M(p;p) = [g(x^*(q)) - g(x^*(p))][f'(1) + \theta_M \phi] - p[D(x^*(q)) - D(x^*(p))]. \quad (15)$$

The net gain of misreporting is strictly increasing in θ_M because $g' > 0$ and $x^*(q) > x^*(p)$. Consider the case in which $\theta_M = \theta_m$. Then, $x^*(p)$ is the media's ideal level of the public bad, so that $V_M(q;p) < V_M(p;p)$. Consider now the case in which $M = 1$, $\theta_1 \to +\infty$ and thus $\theta_M \to +\infty$. Since, by equation (14), the media's ideal level of the public bad goes to $+\infty$ if θ_M does the same and since preferences are single-peaked, $x^*(q)$ delivers a larger payoff than $x^*(p)$: $V_M(q;p) > V_M(p;p)$. Hence, there exists a critical level $\widetilde{\theta} > \theta_m$ such that $V_M(q;p) - V_M(p;p) \geq 0$ if and only if $\theta_M \geq \widetilde{\theta}$.

It remains to be shown that $(0,0)$ cannot be an equilibrium if $\theta_M < \theta_m$. This follows from (15), which shows that $(0,0)$ is dominated by $(0,1)$ if $\theta_M < \theta_m$. Hence, an equilibrium with $(0,0)$ exists if and only if $\theta_M \geq \widetilde{\theta}$. Q.E.D.

Proof of Lemma 2.

The proof is symmetric to the previous one and will only be sketched. If $(1,1)$ is the media's strategy, then the public assigns probability $1 - p$ to the bad state if $r = 0$ is observed, and probability $t \in (1/2, p)$ if $r = 1$ is observed.

If $\theta_M \leq \theta_m$, the optimal strategy of the media, given the above inferences, is either $(0,1)$ or $(1,1)$. Hence, there is a pessimistic misreporting equilibrium if

$$V_M(t; 1 - p) - V_M(1 - p; 1 - p) \geq 0,$$

which can be written as

$$[g\,(x^*(1 - p)) - g\,(x^*(t))]\,[f'(1) + \theta_M \phi] \leq (1 - p)[D\,(x^*(1 - p)) - D\,(x^*(t))]. \qquad (16)$$

Since $x^*(1 - p) > x^*(t)$, the net gain of misreporting is a decreasing function of θ_M. If $\theta_M = \theta_m$, then, $x^*(1 - p)$ is the media's ideal level of the public bad, so that $V_M(t; 1 - p) < V_M(1 - p; 1 - p)$. If $\theta_M = -f'(1)/\phi$, then the term on the l.h.s. of (16) is zero, and thus $V_M(t; 1 - p) < V_M(1 - p; 1 - p)$. Hence, there exists $\theta' < \theta_m$ such that $(1, 1)$ is an equilibrium if and only if $\theta_M \leq \theta'$. Q.E.D.

Proof of Lemma 3

Suppose that the optimal strategy of both types is $(0, 1)$. By receiving message 0, voters will infer that state 1 has probability $1 - p$. Hence, the level $x^*(1 - p)$ of the public bad will result. By receiving message 1, voters will infer that state 1 has probability p. Hence, the level $x^*(p) < x^*(1 - p)$ of the public bad will result.

If $\theta_M \geq \theta_m$, for similar reasons as in the proof of Lemma 1, given the above inferences it never pays for the opportunistic type to use the strategies $(1, 0)$ or $(1, 1)$. Telling the truth is therefore better than misreporting if and only if $M_M(p; p) \geq M_M(1 - p; p)$ or

$$V_M(1 - p; p) - V_M(p; p) \leq 0. \qquad (17)$$

Using the same arguments as in the previous proofs shows that a critical level $\widehat{\theta} > \theta_m$ exists such that the optimal strategy of the media is $(0, 1)$ if and only if $\theta_M \leq \widehat{\theta}$.

If $\theta_M \leq \theta_m$, in order for $(0, 1)$ to be optimal, it is sufficient that it is better than $(1, 1)$. Hence, there is a honest equilibrium if and only if $M_M(1 - p; 1 - p) \geq M_M(p; 1 - p)$ or

$$V_M(p; 1 - p) - V_M(1 - p; 1 - p) \leq 0. \qquad (18)$$

Using the same arguments as before, there exists a critical level $\underline{\theta} < \theta_m$ such that the optimal strategy of the media is $(0, 1)$ if and only if $\theta_M \geq \underline{\theta}$. Q.E.D.

Proof of Proposition 1.

We have to show that $\widehat{\theta} > \widetilde{\theta}$ and that $\theta' > \underline{\theta}$.

The treshold value $\widetilde{\theta}$ can be determined by setting the r.h.s. of (15) equal to zero and substituting θ_M with $\widetilde{\theta}$, from which one obtains

$$\left[f'(1) + \widetilde{\theta}\phi\right] = p\frac{D\left(x^*(q)\right) - D\left(x^*(p)\right)}{g\left(x^*(q)\right) - g\left(x^*(p)\right)}. \tag{19}$$

A similar procedure for $\widehat{\theta}$, as deduced from (17), yields

$$\left[f'(1) + \widehat{\theta}\phi\right] = p\frac{D\left(x^*(1-p)\right) - D\left(x^*(p)\right)}{g\left(x^*(1-p)\right) - g\left(x^*(p)\right)}.$$

Therefore, $\widetilde{\theta} < \widehat{\theta}$ if and only if

$$\frac{D\left(x^*(q)\right) - D\left(x^*(p)\right)}{g\left(x^*(q)\right) - g\left(x^*(p)\right)} < \frac{D\left(x^*(1-p)\right) - D\left(x^*(p)\right)}{g\left(x^*(1-p)\right) - g\left(x^*(p)\right)}.$$

This inequality can be rewritten as

$$\frac{D'_{p,q}[x^*(q) - x^*(p)]}{g'_{p,q}[x^*(q) - x^*(p)]} < \frac{D'_{q,1-p}[x^*(1-p) - x^*(q)] + D'_{p,q}[x^*(q) - x^*(p)]}{g'_{q,1-p}[x^*(1-p) - x^*(q)] + g'_{p,q}[x^*(q) - x^*(p)]},$$

where $g'_{p,q} \in (g'(x^*(q)), g'(x^*(p)))$, $g'_{q,1-p} \in (g'(x^*(1-p)), g'(x^*(q)))$, $D'_{p,q} \in [D'(x^*(p)), D'(x^*(q))]$ and $D'_{q,1-p} \in [D'(x^*(q)), D'(x^*(1-p))]$ are appropriately chosen scalars. Simplifying the above inequality leads to

$$\frac{D'_{p,q}}{g'_{p,q}} < \frac{\alpha D'_{q,1-p} + D'_{p,q}}{\alpha g'_{q,1-p} + g'_{p,q}},$$

where $\alpha \equiv [x^*(1-p) - x^*(q)]/[x^*(q) - x^*(p)]$ is strictly positive. The last condition is met if and only if

$$g'_{p,q}D'_{q,1-p} > g'_{q,1-p}D'_{p,q},$$

which is true since $g'_{p,q} > g'_{q,1-p} > 0$ and $D'_{q,1-p} \geq D'_{p,q} > 0$. Hence, $\widetilde{\theta} < \widehat{\theta}$.

Let us now show by a similar method that $\theta' > \underline{\theta}$.

The treshold value θ' is implicitly determined by letting (16) hold as an equality, which yields

$$[f'(1) + \theta'\phi] = (1-p)\frac{D(x^*(1-p)) - D(x^*(t))}{g(x^*(1-p)) - g(x^*(t))}. \tag{20}$$

The threshold value $\underline{\theta}$ is obtained from (18) as

$$[f'(1) + \underline{\theta}\phi] = (1-p)\frac{D(x^*(1-p)) - D(x^*(p))}{g(x^*(1-p)) - g(x^*(p))}.$$

Therefore, $\theta' > \underline{\theta}$ if and only if

$$\frac{D(x^*(1-p)) - D(x^*(t))}{g(x^*(1-p)) - g(x^*(t))} > \frac{D(x^*(1-p)) - D(x^*(p))}{g(x^*(1-p)) - g(x^*(p))}.$$

This inequality can be rewritten as

$$\frac{D'_{t,1-p}[x^*(1-p) - x^*(t)]}{g'_{t,1-p}[x^*(1-p) - x^*(t)]} > \frac{D'_{t,1-p}[x^*(1-p) - x^*(t)] + D'_{p,t}[x^*(t) - x^*(p)]}{g'_{t,1-p}[x^*(1-p) - x^*(t)] + g'_{p,t}[x^*(t) - x^*(p)]},$$

where $g'_{p,t} \in (g'(x^*(t)), g'(x^*(p))), g'_{t,1-p} \in (g'(x^*(1-p)), g'(x^*(t)))$, $D'_{p,t} \in [D'(x^*(p)), D'(x^*(t))]$ and $D'_{t,1-p} \in [D'(x^*(t)), D'(x^*(1-p))]$ are appropriately chosen scalars. Simplifying the above inequality leads to

$$\frac{D'_{t,1-p}}{g'_{t,1-p}} > \frac{D'_{t,1-p} + \xi D'_{p,t}}{g'_{t,1-p} + \xi g'_{p,t}},$$

where $\xi \equiv [x^*(t) - x^*(p)]/[x^*(1-p) - x^*(t)]$ is strictly positive. The condition above is met if and only if

$$g'_{p,t}D'_{t,1-p} > g'_{t,1-p}D'_{p,t},$$

which is true since $g'_{p,t} > g'_{t,1-p} > 0$ and $D'_{t,1-p} \geq D'_{p,t} > 0$. Hence, $\underline{\theta} < \theta'$. Q.E.D.

Proof of Proposition 2.

(i) First, consider the case in which the journalist's reporting strategy in equilibrium is $(0, 1)$. Since the journalist's optimal reporting strategy is $(0, 1)$ if no coalition is in

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place, building a coalition does not change the level of the public bad. Furthermore, the true signal is revealed to all media users. Hence, no surplus is generated by forming a coalition. Arbitrarily small costs of building a coalition entail that no coalition is formed.

(ii) Second, suppose that the strategy played by the media in the continuation game is $(0,0)$ if the journalist is opportunistic, which entails public beliefs $\Pr(\omega = 1|r = 0) = q$ and $\Pr(\omega = 1|r = 1) = p$. Suppose that the journalist has started negotiations with agent n. An agreement between j and n specifies four pairs $(r_s^{\kappa_j}, b_s^{\kappa_j})$, namely the report to the public and the side payment to the journalist, conditional on the journalist' anouncement of his type $\kappa_j \in \{0, \kappa\}$ and the jointly observed signal $s \in \{0, 1\}$. According to the generalized Nash solution, the bargining parties agree that at each realization of the random variables the obtained surplus is split in equal parts if this agreement is incentive compatible [Harsanyi and Selten (1972)]. Hence, assuming for the moment incentive compatibility, the payoff to the journalist equals his fallback payoff plus half of the surplus obtained by the coalition.

In order to determine the fallback payoffs of the bargainers, recall that in case of disagreement the journalist unilaterally sets the report. Since $\theta_j \in (\theta', \widetilde{\theta})$, the journalist's optimal strategy in case of disagreement is also $(0, 1)$ if he is the opportunistic type. Therefore, agent n learns the true signal with certainty even if the negotiations with j break down. Furthermore, the report in case of disagreement is the same as in case of an agreement if $\kappa_j = \kappa$ or if $\kappa_j = 0$ and $s = 0$. This implies that the only case in which there may possibly exist a strictly positive surplus is $\kappa_j = 0$ and $s = 1$.

If the journalist is opportunistic, he maximizes his payoff by being in a coalition with the agent that obtains the largest benefit from switching from $r = 1$ to $r = 0$ if the signal is $s = 1$. This benefit is given by

$$V_n(q; p) - V_n(p; p) = [g(x^*(q)) - g(x^*(p))][f'(1) + \theta_n \phi] - p[D(x^*(q)) - D(x^*(p))].$$

Since this expression strictly increases with θ_n, then $n = 1$. Thus, if a coalition is built,

then $a = 1$ and the transfer payment received by the journalist from his associate amounts to

$$b_1^0 = \frac{[g\left(x^*(q)\right) - g\left(x^*(p)\right)]\left[f'(1) + (\theta_1 + \theta_j/2)\phi\right] - p[D\left(x^*(q)\right) - D\left(x^*(p)\right)]}{2}. \quad (21)$$

From the above reasoning it follows that in an optimistic misreporting equilibrium, if the journalist has an associate, $a = 1$ and the proposed agreement is $(r_0^\kappa, b_0^\kappa) = (0, 0)$, $(r_1^\kappa, b_1^\kappa) = (1, 0)$, $(r_0^0, b_0^0) = (0, 0)$, $(r_1^0, b_1^0) = (0, b_1^0)$, where b_1^0 is given by (21). Since the equilibrium is supposed to be $(0, 0)$ the surplus generated by this coalition is indeed positive, and the coalition is built.

It remains to be checked whether the above agreement is incentive compatible. Since the two types pool if $s = 0$, only the case $s = 1$ is of interest. If the opportunistic type truthfully reveals his type to the associate, his expected utility is $V_j(q; p) - \gamma p(1 - p) + b_1^0$, which is larger than $V_j(p; p) - \gamma p(1 - p)$, the expected utility derived by claiming to be the idealistic type, because the latter utility is the one corresponding to the journalist's fallback payoff.

The IC-condition for the idealistic type is

$$V_j(p; p) - \gamma p(1 - p) \geq V_j(q; p) - \gamma p(1 - p) - \kappa + b_1^0.$$

Inserting (21), this can be rewritten as

$$[V_j(p; p) - V_j(q; p)] + \frac{1}{2}V_c(p; p) \geq \frac{1}{2}V_c(q; p) - \kappa.$$

Assumption 2 implies that the term in the square bracket is positive. Hence the IC-condition is met if

$$\frac{1}{2}V_c(p; p) \geq \frac{1}{2}V_c(q; p) - \kappa.$$

This is actually the case, since from Assumption 1 it follows that

$$\frac{1}{2}V_c(p;p) \geq \frac{1}{2}V_c(q;p) - \frac{\kappa}{4} > \frac{1}{2}V_c(q;p) - \kappa.$$

(iii) Suppose now that the strategy played by the media in the continuation game is $(1,1)$ if the journalist is opportunistic. The proof that $a = 0$ in this case is analogous to the one of the previous case. Notice that the journalist seeks the associate with the maximum gain from switching from $r = 0$ to $r = 1$ when $s = 0$. This gain equals $V_i(t; 1 - p) - V_i(1 - p; 1 - p)$ and is therefore strictly decreasing with θ_i. Q.E.D.

Proof of Proposition 3.

By Assumption 3, $\theta_M > \theta'$. By Proposition 1 it then follows that only an honest and an optimistic misreporting equilibrium can exist.

First, consider the honest equilibrium. By Proposition 2, the journalist has no associate in such an equilibrium, hence $M = j$ and, by Lemma 3, $\theta_j \in [\underline{\theta}, \widehat{\theta}]$, which is the case by Assumption 2. In order to prove that no profitable deviations exist, consider the payoff to the journalist in case of collusion. The journalist gets a side payment only if he deviates from honest reporting for some value of the signal. Only two cases need to be discussed: $(0,0)$ and $(1,1)$. Suppose a coalition is formed that agrees on $(0,0)$. Since the surplus generated by the coalition is split into equal parts between the journalist and the associate, the journalist gains from the coalition if and only if the surplus is positive. The surplus to the coalition generated through misreporting is

$$V_M(1 - p; p) - V_M(p; p).$$

By Lemma 3, this gain of misreporting is increasing in θ_M and a critical level $\widehat{\theta} > \theta_m$ exists such that $V_M(1 - p; p) - V_M(p; p) \leq 0$ if and only if $\theta_M \leq \widehat{\theta}$. Hence, a profitable deviation exists if $\theta_1 > 2\widehat{\theta} - \theta_j$. Consider now deviations that entail a coalition that agrees on $(1,1)$. The gain to the coalition from misreporting is

$$V_M(p; 1 - p) - V_M(1 - p; 1 - p).$$

Because of Lemma 3, the gain of misreporting is decreasing in θ_M and there exists a critical level $\underline{\theta} < \theta_m$ such that $V_M(p; 1-p) - V_M(1-p; 1-p) \leq 0$ if and only if $\theta_M \geq \underline{\theta}$. Since $\theta_M \geq 0 \geq \theta' > \underline{\theta}$, this condition is always met, which implies that no profitable deviation to $(1,1)$ exists. Hence, an honest equilibrium exists if and only if $\theta_1 \leq 2\widehat{\theta} - \theta_j$.

Second, consider the optimistic misreporting equilibrium. By Proposition 2, $a = 1$. Consider a deviation to $(0,1)$, in which case the journalist has no associate. This deviation is profitable to the journalist if and only if the surplus for the coalition in case of misreporting,

$$V_M(q; p) - V_M(p; p),$$

is strictly negative. By Lemma 1, there exists a critical level $\widetilde{\theta} > \theta_m$ such that $V_M(q; p) - V_M(p; p) \geq 0$ if and only if θ_M is larger than $\widetilde{\theta}$. Hence, a profitable deviation exists if $\theta_1 < 2\widetilde{\theta} - \theta_j$. Consider now whether a deviation to $(1,1)$ can be profitable. A necessary condition for this to be the case is that there exists a coalition that generates a positive surplus if $r = 1$ is reported when $s = 0$; this necessary condition is thus

$$V_M(p; 1-p) - V_M(q; 1-p) < 0.$$

It can be shown that this condition is met if and only if θ_M is smaller than a critical value. By the same method as in the proof of Proposition 1, it can be shown that this critical value is strictly smaller than $\underline{\theta}$. Since $0 \geq \theta' > \underline{\theta}$, also that critical value is strictly negative, which implies that a deviation to $(1,1)$ cannot be profitable. Hence, an optimistic misreporting equilibrium exists if and only if $\theta_1 \geq 2\widetilde{\theta} - \theta_j$. Q.E.D.

Proof of Proposition 4.

Denote by $S(x; \beta)$ the interim total surplus derived from the collective action when an amount x of the public bad is selected and the probability of the bad state is β. Denote by $L(\mu; \beta)$ the aggregate consumption loss when action μ is taken and the probability of the bad state is β. Social welfare in an honest equilibrium amounts to

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$$\frac{1}{2}[S(x^*(1-p); 1-p) - L(1-p; 1-p)] + \frac{1}{2}[S(x^*(p); p) - L(p; p)].$$

In a misreporting equilibrium, the level reached by social welfare is

$$\frac{1}{2}\{S(x^*(q); 1-p) - L(q; 1-p) + \lambda[S(x^*(p); p) - L(p; p)] + (1-\lambda)[S(x^*(q); p) - L(q; p)]\}.$$

The change in social welfare induced by media bias can thus be written as

$$\Delta = \Delta_0 + \Delta_1 + \Delta_L,$$

where

$$\Delta_0 = \frac{1}{2}[S(x^*(q); 1-p) - S(x^*(1-p); 1-p)]$$

is the expected change in S when signal 0 occurs,

$$\Delta_1 = \frac{1}{2}(1-\lambda)[S(x^*(q); p) - S(x^*(p); p)]$$

is the expected change in S under signal 1, and

$$\Delta_L = \frac{1}{2}\{L(1-p; 1-p) - L(q; 1-p) + (1-\lambda)[L(p; p) - L(q; p)]\}$$

is the expected change with respect to the consumption loss.

In order to show the first part of the proposition, notice that γ only affects Δ_L. Since

$$L(\mu; \beta) - L(\beta; \beta) = \gamma(\mu - \beta)^2,$$

one gets

$$\Delta_L = -\frac{\gamma}{2}\left[(q-1+p)^2 + (1-\lambda)(p-q)^2\right] \leq 0.$$

Since Δ_L goes to $-\infty$ if γ goes to $+\infty$, a sufficiently large γ implies $\Delta < 0$.

In order to prove the second part of the proposition, we first show that $S(x^*(q); 1-p) < S(x^*(1-p); 1-p)$ and hence $\Delta_0 < 0$. Let $x^S(\beta) = \arg\max S(x; \beta)$. Notice that the efficient level of the public bad is the one preferred by the agent with average wealth, i.e. $\theta = 1$. Since the ideal level for the median voter increases with θ_m and the latter is smaller than 1, we have $x^S(\beta) > x^*(\beta)$. Therefore we have

$$x^S(1-p) > x^*(1-p) > x^*(q).$$

From the strict concavity of $S(x; 1-p)$, it then follows that $S(x^*(1-p); 1-p) > S(x^*(q); 1-p)$.

In the last step we show that $\Delta_1 \leq 0$ if θ_m is close enough to 1. If $\theta_m = 1$, then $x^*(p) = x^S(p)$. Therefore, $S(x^*(p); p) > S(x^*(q); p)$, which implies that $\Delta_1 < 0$. By a continuity argument, it follows that $S(x^*(p); p) \geq S(x^*(q); p)$ if θ_m is close enough to 1, which implies $\Delta_1 \leq 0$. Q.E.D.

Proof of Proposition 5.

If $\gamma = 0$, then $\Delta_L = 0$ and $\Delta > 0$ if and only if

$$\Delta_1 > -\Delta_0,$$

which may be rewritten as

$$(1 - \lambda)[S(x^*(q); p) - S(x^*(p); p)] > S(x^*(1-p); 1-p) - S(x^*(q); 1-p). \quad (22)$$

In case of $g(x) = a + bx - cx^2$, $D(x) = d + ex$ and $\theta_m = 0$, one obtains

$$x^*(\mu) = \frac{b}{2c} - \frac{e}{2cf'(1)}\mu \quad (23)$$

and

$$S(x^*; \mu) = af(1) - d\beta + (bf(1) - e\beta)x^* - cf(1)x^{*2}.$$

From this expression it follows that

$$S(x_1^*; \mu) - S(x_2^*; \mu) = (x_2^* - x_1^*)\left[e\beta - bf(1) + cf(1)(x_1^* + x_2^*)\right] \quad (24)$$

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for any x_1^*, x_2^*. Inserting (23) into (24) yields

$$S(x^*(q); p) - S(x^*(p); p) = \frac{e^2}{2cf'(1)}(p - q)\left[\frac{f(1)}{2f'(1)}(p + q) - p\right]$$

and

$$S(x^*(1-p); 1-p) - S(x^*(q); 1-p) = \frac{e^2}{2cf'(1)}(q - 1 + p)\left[\frac{f(1)}{2f'(1)}(1 - p + q) - 1 + p\right].$$

Substituting the last two equations into (22) shows that $\Delta > 0$ if and only if

$$(1 - \lambda)(p - q)\left[\frac{f(1)}{2f'(1)}(p + q) - p\right] > (q - 1 + p)\left[\frac{f(1)}{2f'(1)}(1 - p + q) - 1 + p\right].$$

Tedious but straightforward manipulations, that make use of (12), allow one to rewrite this condition as

$$\frac{1}{2} > \frac{f'(1)}{f(1)}.$$

By (4) and (5), $f'(1)/f(1)$ is indeed equal to the share of income going to labor. Q.E.D.

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