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Media bias under direct and indirect government control: when is the bias smaller?

Abhra Roy
Kennesaw State University, aroy1@kennesaw.edu

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Abhra Roy
Kennesaw State University

Abstract

We present an analytical framework to compare media bias under direct and indirect government control. In this context, we show that direct control can lead to a smaller bias and higher welfare than indirect control. We further show that the size of the advertising market affects media bias only under direct control. Media bias, under indirect control, is not affected by the size of the advertising market.

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1 Introduction:

In this paper, we propose an analytical model to compare media bias and welfare across direct and indirect control of the media by the government.[1] It is generally accepted that direct ownership of the media results in a complete erosion of media freedom and hence leads to extreme bias in news reporting.[2] Besley and Pratt (2006), show that media capture leads to complete bias when the number of media firms isn't too large. In a similar vein Gelbach and Sonin (2014), show that direct and indirect control of a media firm results in the same level of bias in equilibrium. We underline conditions under which media bias under direct control is actually lower than under indirect control. In regards to the effect of advertising market on media bias, Besley and Pratt (2006) and Gelbach and Sonin (2014), show that media bias decreases when advertising markets are large. In a similar vein, Coyne and Leeson (2009), find that the government's influence on the media firms is highest when profit opportunities through the advertising market are greatly mitigated which tend to happen when the state of the economy is bad. In this context, we show that media bias falls with the size of the advertising market only under direct control. Under indirect control the size of the advertising market has no effect on media bias. Further, we compare citizens' welfare across direct and indirect control and show that citizens' welfare may be higher under direct than that under indirect control. The paper is organized as follows: We lay out the model in section 2. Media bias under direct and indirect ownership is presented in sections 3 and 4 respectively. Welfare comparisons are carried out in section 5. Conclusions follow in section 6.

2 Model:

We consider an economy with a continuum of citizens of size one, a government and a media firm which can be directly or indirectly controlled by the government. The media firm receives signals on the state of the economy which can be either good (G) or bad (B). We represent the state of the economy by the index $S \in \{G, B\}$. The government wants citizens to invest in a project, the return of which depends on the state of the economy. Only the government observes the true state of the economy. Citizens know the likelihood of the true state which is given by $\Pr[S = G] = \theta$ and $\Pr[S = B] = (1 - \theta)$. The investment yields a return of $X \sim U(0, 2m)$ in the good state and a return of 'zero' in the bad state. Citizens incur a cost of c to invest in the project which implies that in the bad state citizens lose c. We assume that the average return on the project in the good state is m with $m > c$.[3] The media firm is assumed to be of high quality which implies that it receives perfect signals about the state of the economy. Specifically, $\Pr[s = g|S = G] = 1 = \Pr[s = b|S = b]$. The firm reports $r = \{g, b\}$ where g denotes that the state of the economy is good while b denotes that the state of the economy is bad. We compare between two scenarios when the media firm is owned by the government, namely, direct control (Scenario 1) and when it is indirectly controlled (captured)

[1]Indirect control arises when a government bribes a privately owned media firm to promote its agenda without owning it. However, this is not the only possible form of indirect control. Other forms may include, licensing of journalists, licensing of the media firm(s), control of printing resources, defamation laws etc. We thank an anonymous referee for pointing this out. We are able to show that our analysis remains qualitatively unaltered in the context of licensing of the media firm(s) or when the government has control over printing resources. The analysis of licensing of journalists and defamation laws remain in our agenda for future research.

[2]See Pratt and Strömberg (2011) for an excellent survey of the literature on political economy of media bias.

[3]This assumption implies that if the good state were to become certain then more than half the population would invest in the project.

by the government, (Scenario 2). We represent the scenarios by $j \in \{1, 2\}$. Citizens update their beliefs about the true state after reading the report and decide whether or not to invest. The timeline of the game is as follows:

1. The state of the economy, $S \in \{G, B\}$, is realized.
2. The firm announces its editorial policy, $\Pr^j[r_j = g|s_j = b] = \sigma_j$ for $j \in \{1, 2\}$.
3. Citizens decide whether to subscribe to the news or not.
4. The firm receives a signal about the state of the economy, $s_j = \{g, b\}$ for $j \in \{1, 2\}$.
5. The firm makes a report, $r_j = \{g, b\}$ for $j \in \{1, 2\}$.
6. Citizens who subscribe receive the news, update their belief and decide whether to invest or not.
7. Payoffs are realized.

Next, we define the profit function of the media firm which is given by π as noted below:

$$\pi = \lambda \hat{I}^{\gamma} - \bar{C} - c_0 \hat{I}. \tag{1}$$

The first term on the right hand side of (1) gives the expected revenue of the firm with an expected subscription of $\hat{I}$ with $\lambda > 0$ and $\gamma \in (0, 1)$.[4,5] Following Corden (1953), we assume that advertising revenue increases with subscription but at a decreasing rate. Strömberg (1999), states that "In the newspaper industry, there are numerous examples of newspapers that have increased their sales only to see profits fall as a consequence of falling advertising revenue". He further quotes Otis Chandler, the late owner of the *LA Times "The target audience of the Times is....in the middle class and...upper class....We are not trying to get mass circulation, but quality circulation."* and Michael Mander, Deputy Chief Executive of the *Times, London* in the late 1960's explains *"From 1967 to 1969 the Times....sales shot up from 270,000 to 450,000—a remarkable achievement. But its higher sales made it no more attractive as an advertising medium....adding to the readership just watered down the essential target group and increased the cost of reaching it. A reversal of policy changed the situation with a consequent dramatic improvement in profitability."* These arguments provide further justification for assuming $\gamma \in (0, 1)$. The second and the third terms on the right hand side of (1) represent the fixed and variable costs of circulation. Following Rosse and Dertouzos (1978) and Strömberg (2004), we assume that marginal cost of circulation is constant. Given this setup we compare media biases and welfare across direct (scenario 1) and indirect control (scenario 2).

3 Scenario 1: Direct Control

In this subsection, we assume that the media firm is owned by the government. We first lay out the total pay-off function of the government which is the sum of the pay-off received from the expected number of people who invest in the project and the profit of the firm, given by:

$$V_1^{Gov} = \varphi \left\{ \Pr^1[r_1 = g] I_g^1 + \Pr^1[r_1 = b] I_b^1 \right\} + \pi \tag{2}$$

[4]λ represents the total advertising revenue received by the firm when all citizens subscribe to the news and hence represents the size of the advertising market and γ denotes the elasticity of expected advertising revenue to expected subscription.

[5]It is estimated that 60-80 percent of main source of revenue for newspapers come from advertising (see Dunnet (1988)).

The term $\Pr^1[r_1 = g]$ and $\Pr^1[r_1 = b]$ represent the probabilities of receiving a report $r_1 = g$ and $r_1 = b$ respectively. I_g^1 and I_b^1 denote the number of people expected to invest when the media firm reports $r_1 = g$ and $r_1 = b$, respectively and φ is the payoff received per investor. The profit of the media firm, π, is given by (1). The media firm, under government ownership, chooses a bias, σ_1, to maximize (2).

Next we proceed to analyze expected mobilization when the media firm reports, $r_1 = g$ and $r_1 = b$ respectively. Citizens upon hearing a report of $r_1 = g$ update the probability of the state $S = G$ according to Bayes' rule which is given by: [6]

$$\begin{aligned}\Pr^1[S = G|r_1 = g] &= \frac{\Pr^1[r_1 = g|S = G]\Pr^1[S = G]}{\Pr^1[r_1 = g]},\\ &= \frac{\theta}{\theta + (1-\theta)\sigma_1}.\end{aligned} \tag{3}$$

Following a report $r_1 = g$, only citizens with a return of at least $\bar{X}_g^1$ invest in the project, where $\bar{X}_g^1$ is given by:

$$\begin{aligned}\Pr^1[S = G|r_1 = g]\bar{X}_g^1 &= c,\\ \bar{X}_g^1 &= \frac{c}{\Pr^1[S = G|r_1 = g]},\\ \bar{X}_g^1 &= c\left[1 + \left(\frac{1-\theta}{\theta}\right)\sigma_1\right].\end{aligned} \tag{4}$$

Since any citizen with a return of at least $\bar{X}_g^1$ always invests, the number of investors is given by:

$$\begin{aligned}I_g^1 &= \Pr^1[X > \bar{X}_g^1],\\ &= \left[1 - \frac{c}{2m}\left\{1 + \left(\frac{1-\theta}{\theta}\right)\sigma_1\right\}\right].\end{aligned} \tag{5}$$

Similarly, citizens upon hearing a report $r_1 = b$ calculate the true probability of state G as follows: [7]

$$\begin{aligned}\Pr^1[S = G|r_1 = b] =& \frac{\Pr^1[r_1 = b|S = G]\Pr^1[S = G]}{\Pr^1[r_1 = b]},\\ =& 0.\end{aligned} \tag{6}$$

Therefore, citizens infer that the economy is in a bad state with certainty upon hearing $r_1 = b$. As a result, no one invests when the economy is in a bad state which implies that $I_b^1 = 0$.

[6] The numerator on the right hand side of (3) gives us the likelihood of receiving a report $r_1 = g$ when the actual state is G. Since the firm does not lie about the good state, the probability of receiving $r_1 = g$ given state G is just the likelihood of state G (which is given by θ). The denominator gives the probability of receiving $r_1 = g$ which can happen because of two reasons: a) the state is G and b) the state is B (which happens with probability $(1-\theta)$ and the firm lies about its signal (which happens with probability σ_1).

[7] We can interpret (6) along the same lines as (3).

Note that from (3) we get:

$$\Pr^1[r_1 = g] = \theta + (1-\theta)\,\sigma_1. \tag{7}$$

Now, let us analyze the number of subscribers to the news. In the absence of the news media, citizens invest based on their priors. The minimum return needed to invest, based on the prior, is given by:

$$\begin{aligned} \Pr^1[S = G]\bar{X} =& c, \\ \bar{X} =& \frac{c}{\theta}. \end{aligned} \tag{8}$$

Therefore, citizens with a expected return below $\bar{X}$ do not invest, while citizens with a return above $\bar{X}$ always invest.

$$\begin{aligned} \bar{I} =& \Pr^1[X > \bar{X}], \\ =& 1 - \Pr^1[X \leq \bar{X}], \\ =& 1 - \frac{c}{2m\theta}. \end{aligned} \tag{9}$$

When the media firm reports $r_1 = g$, the good state becomes more likely and hence some people with a return below $\bar{X}$ may benefit from investing in the project.[8] Recall that following a report, $r_1 = g$, anyone with an expected return of at least $\bar{X}_g^1$ always invests. Therefore, the number of people mobilized by the news, when it reports $r_1 = g$, is given by $I_g^1 - \bar{I}$. Further, citizens who always invest in the project based on the prior ($\bar{I}$) benefit from the news when the firm reports $r_1 = b$. Therefore, the total number of subscribers, $\hat{I}$, is given by:

$$\begin{aligned} \hat{I} &= \left(I_g^1 - \bar{I}\right) + \bar{I}, \\ &= \left[1 - \frac{c}{2m}\left\{1 + \left(\frac{1-\theta}{\theta}\right)\sigma_1\right\}\right]. \end{aligned} \tag{10}$$

Note that $\hat{I} = I_g^1$. Plugging in (1) (5), (7), (10) and using the fact that $I_b^1 = 0$ in (2) and maximizing with respect to σ_1 gives the first order conditions for maximum which after simplification yields:

$$\varphi(1-\theta)\left[1 - \frac{c}{m}\left\{1 + \left(\frac{1-\theta}{\theta}\right)\sigma_1\right\}\right] = \left(\lambda\gamma\hat{I}^{\gamma-1} - c_0\right)\frac{c}{2m}\left(\frac{1-\theta}{\theta}\right). \tag{11}$$

We do not obtain a closed form solution for σ_1^* but (11) allows us to implicitly express, $\sigma_1^* = \sigma_1\left(\theta, m, \lambda, \gamma, c_0\right)$.[9]

4 Scenario 2: Indirect control

In this section, we consider the case where the media firm is indirectly controlled by the government. The objective function of the government, in this case, is the payoff received from the

[8] $\Pr^1[S = G|r_1 = g] = \frac{\theta}{\theta + (1-\theta)\sigma_1} > \theta$

[9] It easy to check that the conditions for an interior maximum are satisfied for a sufficiently large φ and $\theta m < c$.

expected number of investors net of the cost of bribing, which is given by:[10]

$$V_2^{Gov} = \varphi \left\{ \Pr^2[r_2 = g] I_g^2 + \Pr^2[r_2 = b] I_b^2 \right\} - T. \tag{12}$$

As before, citizens, following a report $r_2 = g$, calculate the likelihood of the good state to be:

$$\Pr^2[S = G | r_2 = g] = \frac{\Pr^2[r_2 = g | S = G] \Pr^2[S = G]}{\Pr^2[r_2 = g]}. \tag{13}$$

We can interpret (13) along the same lines as (3). As in the previous section, let $\bar{X}_g^2$ denote the minimum return required for a citizen to invest in the project following a report of $r_2 = g$, which is given by:

$$\bar{X}_g^2 = c \left[1 + \left(\frac{1-\theta}{\theta} \right) \sigma_2 \right]. \tag{14}$$

Following the previous section, the number of people who invest in the news following a report of $r_2 = g$, is given by:

$$\begin{aligned} I_g^2 =& \Pr^2[X > \bar{X}_g^2], \\ =& 1 - \Pr^2[X \le \bar{X}_g^2], \\ =& \left[1 - \frac{c}{2m} \left\{ 1 + \left(\frac{1-\theta}{\theta} \right) \sigma_2 \right\} \right]. \end{aligned} \tag{15}$$

Similarly, after receiving a report of $r_2 = b$, citizens infer the probability of the good state, to be:

$$\begin{aligned} \Pr^2[S = G | r_2 = b] =& \frac{\Pr^2[r_2 = b | S = G] \Pr^2[S = G]}{\Pr^2[r_2 = b]}, \\ =& 0. \end{aligned} \tag{16}$$

As before, no one invests following a report $r_2 = b$. Also note that:

$$\Pr^2[r_2 = g] = \theta + (1-\theta)\sigma_2. \tag{17}$$

Noting that $I_b^2 = 0$ and plugging in (15), (17) in (12) and maximizing with respect to σ_2 yields: [11]

$$\sigma_2^* = \left(\frac{\theta}{1-\theta} \right) \left(\frac{m-c}{c} \right). \tag{18}$$

Result 1: *Media bias under direct control diminishes as the size of the advertising market becomes bigger.*

[10] The government only bribes the media firm if the difference in the government's payoff between bribing and not bribing is greater than the cost of bribing, T, otherwise it is better for the government to not capture the media firm. Note, that the cost of bribing is given by the loss in profit incurred by the independent media firm by promoting the government's objective (mobilization).The government therefore calculates its payoff with and without capture as the number of citizens investing in the project net of the bribe it pays out.

[11] It is easy to check that the second order conditions are satisfied yielding an interior solution if $\theta m < c$.

Proof: Recall (11) implicitly expresses σ_1^* as a function of λ. Differentiating (11) with respect to λ and using the implicit function rule gives us the result.
Remark: First, note from (10) that excessive bias reduces the expected number of subscribers. This happens because the news report becomes increasingly less useful as bias increases. Now consider (11). Note that as the size of the advertising market rises, the right hand side of (11) increases. As a result, the left hand side must also increase. This can only happen if bias goes down. As a result, equilibrium bias falls with the size of the advertising market. A similar result is obtained in Besley and Pratt (2006) and Gelbach and Sonin (2014).

Result 2: *Media bias is independent of the size of the advertising market under indirect control*
Proof: Obvious.
Remark: In this case, the government only compensates the firm for the loss of profit it incurs in promoting the government's agenda. Since the payment made by the government is lump sum, it does not directly alter the equilibrium choice of σ_2 as seen from (18).[12]

Next we compare between media biases across scenarios 1(direct control) and 2 (indirect control) and state the result in the following theorem.

Theorem 1: *Media bias under direct control can be smaller or greater than the media bias under indirect control according as* $\mu \lesseqgtr \frac{1}{2}$ *where* $\mu = \left(\frac{c_0}{\lambda\gamma}\right)^{\gamma-1}$.
Proof: See Appendix.
Remark: First note, that under direct control, the total pay-off to the government is given by the sum of the pay-off received from the expected number of investors and the profit of the firm. On the other hand, under indirect control, the government's total pay-off is the pay-off received from expected number of investors net of the bribe. Further, plugging in (18) in (15) we see that under indirect control, half the total number of citizens invest in the project. Now suppose that the government, under direct control, chooses the same level of bias as under indirect control. In that case, half of the total number of citizens would also invest under direct control. Now consider the profit of the media firm. Given (1), the media firm, in order to maximize profits, chooses a bias such that the number of subscribers is μ. Since, the expected number of subscribers always equal the expected number of investors, more than half the people also subscribe to the news.[13] If $\mu < \frac{1}{2}$, then the firm earns a negative profit by circulating news to too many subscribers when $\sigma_1 = \sigma_2$, which reduces the net payoff of the government under direct control. Hence, the government increases its payoff by reducing the bias at the margin. The exact opposite argument holds when $\mu > \frac{1}{2}$.

5 Citizens' Welfare:

In this section, we compare citizens' welfare across scenario 1(direct control) and scenario 2 (indirect control). Citizens' welfare under direct control, is given by:

[12]Let V_2^{Gov} and V_2^P be the pay-off received by the government when the media firm is under indirect control and when it is independent, respectively. Let π_2^{Gov} and π_2^P be the profit of the firm when it is under indirect control and when it is independent, respectively. Then, the government successfully captures the media firm if $V_2^{Gov} - V_2^P \geq \pi_2^{Gov} - \pi_2^P = T$. If the advertising market is too large, then this condition is not met and hence there is no media capture in equilibrium.

[13]It is easy to see that $I_g^1 = \hat{I}$ from (5) and (10).

$$W_1^{Gov} = \frac{\theta}{2m}\int_{\bar{X}_g^1}^{2m}(X-c)dx - \frac{(1-\theta)}{2m}c\sigma_1\int_{\bar{X}_g^1}^{2m}dx \tag{19}$$

The first term, in the above equation, is the gains that accrue to citizens when the state of the economy is G while the second term represents the expected loss to citizens who invest in the project after reading a report of $r_1 = g$ when the actual state of the economy is B. Note that no one invests in the project when the media reports $r_1 = b$. Recall from (4) that number of citizens who invest in the project after a reading a report $r_1 = g$ must have an expected return of at least X_g^1. Consequently, anyone with an expected return of at least X_g^1 invests in the project. However, the project earns a positive return only when the state of the economy is G while it yields no return when the state of the economy is B (in that case citizens lose c). Further, when the state of the economy is B (which happens with probability $(1-\theta)$) citizens invest in the project only if the media firm announces $r_1 = g$ which happens with probability σ_1.

Similarly, the citizens' welfare under indirect control is given by:

$$W_2^{Gov} = \frac{\theta}{2m}\int_{\bar{X}_g^2}^{2m}(X-c)dx - \frac{(1-\theta)}{2m}c\sigma_2\int_{\bar{X}_g^2}^{2m}dx \tag{20}$$

Citizens' welfare given by (20) can be interpreted along the same lines as (19). Next, we compare citizens' welfare across these two scenarios and state our result in theorem 2 as follows:

Theorem 2: *Welfare under direct control can be higher or lower than the welfare under indirect control depending on $\mu \lesseqgtr \frac{1}{2}$.*
Proof: See Appendix.
Remark: Consider the case where $\mu < \frac{1}{2}$. In this case, we have $\sigma_1 < \sigma_2$, by theorem 1. Since the firm has perfect signals, a greater bias under indirect control implies that the media firm distorts a greater number of bad signals ($s_2 = b$) into good reports ($r_2 = g$), in favor of government interests. Since the investor always loses c in the bad state, his expected payoff always goes down following a report of $r_2 = g$ when the actual state of the economy is B.[14] As a result, citizens' welfare under direct control is higher. The case for $\mu > \frac{1}{2}$ is the exact opposite.

6 Conclusion:

Conventional wisdom on media bias suggests that media bias under direct control of the government is generally higher than under indirect control. Gelbach and Sonin (2014) show that media bias under direct and indirect control result in the same amount of bias. We underline situations when the media bias under direct control is actually smaller than under indirect control. Further Besley and Pratt (2006) and Gelbach and Sonin (2014) show that a larger advertising market leads to smaller bias under direct or indirect media control. We show that the size of the advertising market affects bias only under direct control and has no impact on bias under indirect control. We find that welfare under direct control can be higher or lower than that under indirect control depending on the volume of subscription.

[14] Recall that the media firm distorts only $s_j = b$ signals.

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Appendix:

Theorem 1:*Media bias under direct control can be smaller or greater than the media bias under indirect control depending on* $\mu \lesseqgtr \frac{1}{2}$.
Proof: Plugging (10) in (11) and using (18) and some algerbra, yields:

$$\left.\frac{dV_1^{Gov}}{d\sigma^1}\right|_{\sigma^1=\sigma^2} = -\left\{\lambda\gamma\left(\frac{1}{2}\right)^{\gamma-1} - c_0\right\}\frac{c}{2m}\left(\frac{1-\theta}{\theta}\right) \tag{21}$$

Therefore, $\left.\frac{dV_1^{Gov}}{d\sigma^1}\right|_{\sigma^1=\sigma^2} \lesseqgtr 0$ according as $\left\{c_0 - \lambda\gamma\left(\frac{1}{2}\right)^{\gamma-1}\right\} \lesseqgtr 0$

Note that $\left\{c_0 - \lambda\gamma\left(\frac{1}{2}\right)^{\gamma-1}\right\} \lesseqgtr 0$ simplifies to $\mu \lesseqgtr \frac{1}{2}$ where $\mu = \left(\frac{c_0}{\lambda\gamma}\right)^{\gamma-1}$.

Since V_j^{Gov} is strictly concave with respect to σ_j, $\mu \lesseqgtr \frac{1}{2}$ implies that $\sigma_1 \lesseqgtr \sigma_2$ ■

Theorem 2: *Welfare under direct control can be higher or lower than the welfare under indirect control depending on* $\mu \lesseqgtr \frac{1}{2}$.
Proof: Subtracting (20) from (19) and using (4). (14), (18) and some algebra yileds:

$$\begin{aligned} W_1^{Gov} - W_2^{Gov} &= \frac{\theta}{4m}\left\{(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1\right\}^2 - \frac{\theta m}{4} \\ &= \frac{\theta}{4m}\left[\left\{(2m-c) - c\left(\frac{1-\theta}{\theta}\right)\sigma_1\right\}^2 - m^2\right] \\ &= \frac{\theta}{4m}\left[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 + m\right]\left[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 - m\right] \end{aligned} \tag{22}$$

Note that $[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 + m] > 0$ since $m > 0$ and $\bar{X}_1^g < 2m$. Therefore,
$W_1^{Gov} - W_2^{Gov} \lesseqgtr 0$ according as $[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 - m] \lesseqgtr 0$

Consider $[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 - m] \lesseqgtr 0$. Re-arranging terms and using (18) we note that
$[(2m-c) - c(\frac{1-\theta}{\theta})\sigma_1 - m] \lesseqgtr 0 \implies \sigma_2 - \sigma_1 \lesseqgtr 0$.
Using theorem 1, we note that:
$\mu \lesseqgtr \frac{1}{2}$ implies that $\sigma_1 \lesseqgtr \sigma_2$. Hence,
$W_1^{Gov} - W_2^{Gov} \lesseqgtr 0$ according as $\mu \lesseqgtr \frac{1}{2}$ ■