Additional Material for
Handcuffs for the Grabbing Hand?
Media Capture and Government Accountability

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1 A Model with Market Segmentation

The baseline model assumed that all voters are informed if there is at least one informative outlet. This may be unrealistic because it presupposes that people are willing to switch to a different outlet if their usual outlet does not have interesting news. The goal of the present section is to consider a more general model where some viewers are flexible (they are willing to switch to a different media source) and some are not. We also generalize the model to allow for heterogeneity among outlets in the strength of the commercial motive (we replace a with a_i) and in the transaction costs (we replace τ with τ_i). Finally, we now allow the possibility that the government censors the media as well as buying silence through "voluntary" capture.

1.1 Model

The setting is as in the baseline case, except for the following changes:

Politicians: As before, politicians may offer bribes $\{t_i\}_{i=1}^n$ to outlets. However, now there is an outlet-specific transaction cost τ_i – out of a bribe of t_i, the outlet receives t_i/τ_i. We take this transactions cost to be an exogenous feature of the institutional environment embedded in legal, ownership or regulatory structures. A higher τ_i corresponds to it being harder to bribe the media. With probability $1 - \lambda$, the politician finds a way of silencing the media without offering a bribe (e.g. direct censorship).

The incumbent still cares about holding office: she gets r if she is re-elected and zero otherwise. However, now this benefit r is a random variable with support $[0, \infty)$ and cumulative distribution function F.

Voters There is a continuum of voters $V = [0, 1]$ with homogeneous preferences (but possibly heterogeneous information). They choose whether to re-elect the incumbent or a random challenger who is good with probability γ.

We divide voters in into two classes: a proportion $1-\varphi$ has a preferred outlet and buys it if and only if it carries informative news (*inflexible viewers*), while a proportion φ will buy any outlet as long as it carries informative news (*flexible viewers*). As we shall see below, the proportion of flexible viewers is an important determinant of media capture.[1]

[1] One might further complicate the problem by assuming that some voters do not read newspapers or that some voters always read the same newspapers whether or not it carries informative news. The presence of these groups would make it easier for the incumbent to keep the electorate uninformed (but it would not add much to the analysis because their behavior is somewhat similar to inflexible viewers).

Media As in the baseline case, there is an exogenous probability q that all outlets become informed if the incumbent is bad.

Each outlet i is characterized by a natural market share σ_i (with $\sum_i \sigma_i = 1$). The idea of a natural market share is a simple way of bringing in issues of concentration. It can be interpreted as reflecting some underlying characteristic of a outlet which is attractive to some viewers and is fixed for the purposes of this analysis. We take it as fixed for the purpose of our analysis. However, clearly it is variable over the longer term, with entry and exit of outlets.

As in the baseline model, the payoff of a media outlet depends on the number of viewers it attracts multiplied by a factor which we call the "commercial motive". However, now this fact is outlet-specific, and it is denoted by a_i for outlet i.

Putting this together, we can compute the expected payoff to outlet i when there is a set J of informative outlets. This is:

$$\pi_i = \begin{cases} a_i \left((1-\varphi)\,\sigma_i + \varphi \frac{\sigma_i}{\sum_{j \notin J} \sigma_j} \right) & \text{if } i \in J \\ 0 & \text{if } i \notin J \end{cases} \tag{1}$$

If outlet i carries informative news, then it attracts all of its own inflexible viewers and a share of the flexible voters depending on how many other outlets are carrying news. For example, if it is the only outlet with news, then it gets all of the flexible voters.

Timing

1. The incumbent is in power and her type is θ. If $\theta = b$, with probability q all outlets acquire a verifiable signal $y_i = b$. Otherwise, they all observe non-verifiable signal $y_i = \emptyset$. With probability $1 - \lambda$, all outlets are censored.

2. The random variable r, distributed on $[0, \infty)$ according to CDF F, is realized and observed. The incumbent observes the vector of signals $\{y_i\}_{i=1,\dots,n}$ and can propose bribes $\{t_i\}_{i=1,\dots,n}$.

3. outlet i knows what signals the other outlets have observed and it accepts or rejects the bribe t_i. If it accepts the bribe, it reports $\tilde{y}_i = \emptyset$, if it rejects the bribe it reports $\tilde{y}_i = b$.

4. Voter v chooses which outlet to select according to his type (flexible, inflexible) and his market segment. A voter who chooses outlet i observes $\tilde{y}_i$. Voter v casts his vote for the incumbent or the challenger. The candidate who wins the election is in power for the second term.

As there is a continuum of voters, we should expect multiple perfect Bayesian equilibria. For analytic simplicity, we choose to focus on *sincere voting*: each voter computes the posterior probability that the incumbent is good, $\hat{\gamma}$. If $\hat{\gamma} > \gamma$, he votes for the incumbent. If $\hat{\gamma} < \gamma$, he votes for the challenger.[2]

1.2 Capture

To bribe a media outlet, the incumbent must offer to compensate it for any profits that it forgoes by remaining silent. The minimized cost for a bad politician of buying sufficient media silence to gain re-election is given in:[3]

Proposition 1 *There is a sincere equilibrium where the minimum cost for a bad incumbent to be re-elected is:*

$$C^* = \min_J \left((1-\varphi) \sum_{i \in J} a_i \tau_i \sigma_i + \varphi \sum_{i \in J} \frac{a_i \tau_i \sigma_i}{\sum_{j \notin J} \sigma_j + \sigma_i} \right) \tag{2}$$

subject to

$$\sum_{i \in J} \sigma_i \geq \min \left(1, \frac{1}{2(1-\varphi)} \right) \equiv s^*. \tag{3}$$

[2]This is not an innocuous assumption: we should expect better political accountability with pivotal voting, because uninformed voters have an incentive to abstain (or cast their ballot at random). For a discussion of the difference between sincere voting and pivotal voting in political economy models of the media, see Prat and Stromberg (2004).

[3]As in the rest of the paper, we focus on pure-strategy equilibria.

Proof. Begin with Stage 4. Given sincere voting, each voter uses the information he has to construct a posterior $\hat{\gamma}$ of the probability that the candidate's type is g and votes for the incumbent if and only if $\hat{\gamma} \geq \gamma$. Conjecture that viewers observe each of the two possible signal realizations with positive probability (we will check later that this belief is correct in equilibrium). Then it must be that $\hat{\gamma}(\tilde{y}_i = b) < \gamma < \hat{\gamma}(\tilde{y}_i = \emptyset)$. This means that if $y = \emptyset$ the incumbent is always re-elected and if $y = b$ the incumbent is re-elected if and only if at least half of the viewers observe $\tilde{y} = \emptyset$.

At stage 3, suppose that outlet i has been offered t_i and it conjectures that a subset J of outlets (including himself) will suppress their signal. His payoff is

$$\pi_i = \begin{cases} a_i \left((1-\varphi)\sigma_i + \varphi \frac{\sigma_i}{\sum_{j \notin J} \sigma_j + \sigma_i} \right) & \text{if he rejects} \\ \frac{t_i}{\tau_i} & \text{if he accepts} \end{cases}$$

Thus he accepts if and only if

$$t_i \geq a_i \tau_i \left((1-\varphi)\sigma_i + \varphi \frac{\sigma_i}{\sum_{j \notin J} \sigma_j + \sigma_i} \right)$$

The total cost of suppressing the signal for subset J is thus

$$(1-\varphi) \sum_{i \in J} a_i \tau_i \sigma_i + \varphi \sum_{i \in J} \frac{a_i \tau_i \sigma_i}{\sum_{j \notin J} \sigma_j + \sigma_i}$$

At stage 2, the incumbent chooses between leaving the media free or making sure that half of the voters are silenced. If he silences a subset J the proportion of viewers who observe $\emptyset$ is

$$\begin{cases} (1-\varphi) \sum_{j \in J} \sigma_j & \text{if } J \subset N \\ 1 & \text{if } J = N \end{cases}$$

In order to suppress information for at least half of the voters, the incumbent must choose J such that either

$$\sum_{j \in J} \sigma_j \geq \frac{1}{2(1-\varphi)}$$

or $J = N$. In concise form, we can write

$$\sum_{j \in J} \sigma_j \geq \min\left(1, \frac{1}{2(1-\varphi)}\right) \tag{4}$$

Thus, the cost minimization problem of an incumbent who wants to suppress the signal is as in the statement of the Proposition. ■

To understand Proposition 1, note that the equilibrium cost of silencing outlet i is equal to the additional profit that the outlet would receive if it were to carry informative news instead:

$$(1-\varphi) a_i \sigma_i + \varphi a_i \frac{\sigma_i}{\sum_{j \notin J} \sigma_j + \sigma_i}.$$

The first additional term is the forgone revenue from inflexible viewers. The second additional term, is the forgone revenue from (potential) flexible viewers: if the outlet deviates and rejects the incumbent's offer, it gets a share of flexible viewers equal to its initial share σ_i boosted by a factor $\frac{1}{\sum_{j \notin J} \sigma_j + \sigma_i}$ that depends on the total share of outlets that are not silenced. The cost of capture is simply the summation over all outlets that are silenced in equilibrium.

The constraint represents the requirement that at least 50% of viewers stay uninformed. If $\varphi \geq 1/2$, the incumbent needs to buy out the whole media industry. If instead $\varphi < 1/2$, then she only needs to buy out a set of outlets that covers a share of (initial) viewership greater or equal than $\frac{1}{2(1-\varphi)}$. If all viewers are inflexible, then buying a share $s^* = \frac{1}{2}$ is sufficient.

It is clear from (2) what factors go into making it more costly to capture the media. First, it is more costly to capture the media when there is more commercialization as represented by higher a_i and higher levels of commercialization as represented by τ_i. More voter flexibility also makes it more expensive to buy off the media – it means that a greater market share needs to be bought. Also an increase in φ results in a greater cost of capture. We summarize these results in:

Proposition 2 *The cost of capture C^* is an increasing function of the proportion of flexible viewers φ, and a non-decreasing function of the transaction cost τ_i and the commercial motive a_i of each outlet i.*

The comparative static on concentration is now more complicated. Let us restrict attention to settings where the transaction cost and the commercial motive is the same for all outlets: $a_i = a$ and $\tau_i = \tau$ for all i. We distinguish two cases, according to whether $\varphi \geq 0.5$.

If the proportion of flexible viewers is at least 50%, the analysis is simple. A bad incumbent must buy out all outlets in order to guarantee re-election ($s^* = 1$). The cost of capture in expression (2) boils down to

$$C^* = a\tau \left(1 - \varphi + \varphi n\right),$$

which is a linear function of the number of outlets. Hence, the situation is very similar to the baseline result. Indeed, if $\varphi = 1$, the cost of capture is exactly the same as in Proposition 1 in the main text, namely $a\tau n$.

If the proportion of flexible viewers is below 50%, the relationship between media concentration and cost of capture is more complex. To make the problem tractable, we make a further simplification: initial shares are identical across outlet, $\sigma_i = \frac{1}{n}$. Then, a decrease in concentration is just an increase in n. The cost of capture becomes

$$C^* = a\tau \left(\left(1 - \varphi\right) \frac{m}{n} + \varphi \frac{m}{n - m + 1} \right),$$

where $m \geq s^* n$.

However, if $\varphi < 0.5$, a decrease in concentration may lead to a *decrease* in the cost of capture because of integer constraints. For instance, suppose that all viewers are flexible and there is only one outlet. The cost of capture is simply $a\tau$. However, if the outlet splits into two equal size outlets, the cost is reduced to $\frac{1}{2}a\tau$. This effect is due solely to an indivisibility problem. With only one outlet, the incumbent is forced to buy out the whole outlet.[4]

Indeed, we can show that the effect disappears if integer constraints are not present. To see this, assume that we start from a situation where the constrain $m \geq s^* n$ is binding (this is approximately true when n is sufficiently large). The cost of capture is

$$C^* = a\tau \left((1-\varphi) s^* + \varphi \frac{s^* n}{(1-s^*) n + 1} \right).$$

Now the cost of capture is strictly increasing in n unless $\varphi = 0$.

To summarize our results on concentration:

Proposition 3 *Suppose $a_i = a$ and $\tau_i = \tau$ for all i:*

1. *If $\varphi \in \left[\frac{1}{2}, 1\right]$, the cost of capture is strictly increasing in the number of independent outlets n;*

2. *Suppose $\varphi \in \left(0, \frac{1}{2}\right)$, $\sigma_i = \frac{1}{n}$ for all i, and the constraint (3) is binding. Then, the cost of capture is non-decreasing in the number of independent outlets n.*

The higher is the proportion of flexible viewers, the closer we are to the baseline model. Only in the case where all viewers are inflexible ($\varphi = 0$) does a decrease in concentration not increase the cost of capture.

1.3 Political Outcome

To determine whether the media is captured, the incumbent (if she is bad) compares the cost of silencing the media with the stochastic rent r from holding office in period two. The media is captured when the rent is high. Thus, we have:

[4]This is probably just an artifact of the model. In practice, the incumbent and the newspaper could reach a mutually beneficial agreement whereby the paper finds a way of reducing its readership to less than 50%.

Proposition 4 *Suppose that voting is sincere. Then*

(i) The probability that a bad incumbent is revealed to voters is

$$E = q\lambda F\left(C^{*}\right)$$

(ii) Expected turnover is

$$T = (1-\gamma)\, q\, (1-\lambda)\, F\left(C^{*}\right)$$

and

(iii) Expected voter welfare is

$$U = \left(2 + (1-\gamma)\left(q\,(1-\lambda)\, F\left(C^{*}\right)\right)\right)\gamma$$

The last result shows that the results described in Proposition **??** for the baseline case extend to this more complex set-up. Voter information, political turnover, and voter welfare are all increasing functions of the cost of capture, and hence, by Propositions 2 and 3, of transaction cost, commercial motive, and (with the proviso discussed above) concentration.

Moreover, political outcomes also depend, in an unsurprising way, on the monitoring technology (q) and on direct censorship (λ).

References

[1] Prat, Andrea and David Strömberg [2004], "The Political Economy of State Television." Working paper.