Separating News from Entertainment: The Political Risks of Unbundled Media Consumption

Marta Korczak[1]

[1]Department of Economics, European University Institute

November 29, 2024

Abstract

This paper investigates the political implications of unbundling news and entertainment in the era of digital media. I use a two-period principal-agent model to analyze the effects of voters' time allocation between entertainment and news on political accountability. Increasing substitutability between news and entertainment reduces public scrutiny and enables politicians to engage in rent-seeking behavior if voters prefer entertainment. The model rationalizes the empirical decline of local journalism, highlighting the limits of conventional policy interventions like subsidizing news production. The findings emphasize the need for targeted strategies to reshape consumer preferences for news, which would enhance the media's role in democratic accountability. This research contributes to the political economy of media literature by reframing voter information acquisition as an opportunity cost problem influenced by evolving media markets.

JEL Codes: D82, H41, L82

1 Introduction

Voters no longer rely on daily TV news broadcasts or newspapers to learn about political matters. In 2023, the average American devoted merely 37% of daily media consumption time to traditional media channels, a significant decline from 68% in 2011 (Statista, 2024). This trend reflects a broader change in media markets: where traditional media once bundled news with entertainment—compelling viewers to consume both—digital technologies now enable more granular, independent consumption patterns. Consumers can now selectively subscribe to movie streaming services or specialized news platforms, rendering news and entertainment increasingly economic substitutes. In this paper I show how this decoupling of media consumption can affect political outcomes, focusing on the rent-seeking behavior of politicians. My results are especially relevant for relatively smaller constituencies (subnational: regional or municipal), where political journalism might be at larger risk of bankruptcy than at the national or international level.

Previously, consumers used to access news mostly through bundled media products (e.g., newspapers, satellite TV packages). The digital decoupling of entertainment and news might have contributed to the market failure: journalism, particularly in smaller markets, increasingly struggles to generate sufficient revenue. Empirical evidence is stark: between 2005 and 2020, approximately 25% of U.S. local publishers ceased operations, with half of over 3,000 counties becoming "news deserts" (Statista, 2022). Similar trends emerge in other countries as well: Swedish local newspaper advertising expenditure declined 56% between 2009 and 2021, Canadian local media saw a 51% revenue drop from 2015 to 2019, and German local press sales decreased by 27% between 2010 and 2021.

Furthermore, without robust local journalism, public scrutiny of political actors diminishes. With weaker incentives to perform well, politicians might extract rents or reduce their performance accountability with smaller risk of public exposure. With insufficient demand for political news, one of important mechanisms of political oversight becomes compromised.

I rationalize these phenomena through a two-period principal-agent model. Specifically, I focus on the impact of relative demand for news and entertainment on rent-seeking behavior of an incumbent. The key actors are voters (principals), an incumbent politician (agent), and media producers. The model centers on voters' media time allocation between news and entertainment, modeled as continuous goods using a CES utility function. This approach allows for versatile modeling of media demand substitutability. The incumbent determines budget allocation, choosing between public goods provision and rent extraction. Voters can only detect rent-seeking behavior by consuming news. The model assumes free entry for media producers, with consumers able to access external entertainment—a key assumption that reflects the global nature of entertainment markets versus the local specificity of political news.

By examining how variations in news demand affect political accountability, the model provides novel insights into the political implications of changing media consumption patterns, particularly in sub-national political contexts. I also discuss the limitations of some interventions. For instance, with relativelly weak demand for news, subsidizing journalism might not improve political accountability to an optimal level.

This research makes a contribution to the theoretical literature on the political economy

of media by reconceptualizing voter information acquisition as a time allocation problem with opportunity costs. While an extensive literature explores voter attention—examining its impact on policy reforms (Prato and Wolton 2016, Prato and Wolton 2018), political accountability (Grillo and Prato 2023), and electoral dynamics (Martinelli 2006) — most existing rational inattention models assume information acquisition has a direct cost to the utility function of a voter.

In contrast, this model introduces a theoretical innovation: information consumption is characterized by an opportunity cost of foregone entertainment, rather than an explicit cost. This subtle yet consequential distinction generates markedly different implications for welfare-improving interventions. In media environments dominated by entertainment preferences, traditional policy approaches — such as simplifying news content to reduce cognitive barriers or subsidizing journalism — may prove ineffective.

I conclude with a more nuanced policy approach: interventions that reshape voter preferences through awareness campaigns could be more impactful than structural changes to information delivery. I argue that nowadays the challenge of improving public scrutiny via media sector is fundamentally about preference formation rather than information accessibility.

The media market environment in my model serves to illustrate media markets and politics in local markets. There is less specialization of information in smaller communities. Hence, consistent with Perego and Yuksel (2022), the potential for polarization of voters is relatively small. Also, I do not assume ideological polarization. In a sub-national community, ideological media bias plays a smaller role than in a national context because usually polarizing policies cannot be changed locally (e.g. abortion law or LGBT rights).

The model combines elections, the rent-seeking behavior of an incumbent politician, and imperfect monitoring of the incumbent's behavior by voters. The main difference from the seminal model of elections by Ferejohn (1986) is that voters do not observe the incumbent's performance directly but only through the media sector, which produces news. Also, in contrast to the model exploring the link between media competition and capture by Besley and Prat (2006a), the content produced in equilibrium is determined by the voters' demand unless the fixed costs of producers are too high.

There are three types of agents in the model: voters heterogeneous with respect to their concerns for the provision of the public good of being informed (*principal*), politician/incumbent (*agent*), and media sector characterized by a number of firms producing news and entertainment. A politician can be of two types, *good* or *bad*, determined exogenously at the beginning of the game. A good politician gives voters all of the public budget, whereas a bad politician can extract rent, and its amount is private knowledge. The more rent is sought by an incumbent, the worse political accountability is. As voters do not directly observe corruption, a politician's decision is characterized by moral hazard. Voters can only learn about corruption by paying attention to the news which are produced solely by media producers. Similarly, as in other models on voter attention, there is a free-riding effect of *other* voters paying attention to the news (Prato and Wolton 2018). A news producer detects corruption with an endogenous probability, increasing with the extracted rent and demand for news. An incumbent discovered stealing public funds is punished by voters by not being re-elected for the next term in office. The price of media is zero; the only constraint voters face is time. A producer's only costs are fixed, as the marginal cost of producing news/entertainment for

each additional consumer is nearly zero.[1] Given this set-up of the media environment, more competition does not improve voters' welfare as there is no impact on prices.[2] There might be a situation in which fixed costs might be too high in relation to the advertising revenues and demand to offer any production of news by any producer. In that case, voters' demand for news might not be met (they consume more entertainment). On the other hand, if voters prefer mostly entertainment in equilibrium, there might be a relatively small production of news even if fixed costs allow for a larger scale. In these cases, a corrupt incumbent might not be detected by journalists and is re-elected. This is an illustration of adverse selection in the model. Also, news' political impact is bounded by voters' attention. Contrary to Prat (2018), the impact of political news in my model is positive (I do not introduce any bias in favor or against a politician).

In the model extension, I incorporate *word-of-mouth* private information, heterogenous with respect to the "ethical parameter" reflecting each voter's concerns for the provision of the public good of being informed. In this setting, the more a voter is engaged (the larger the "ethical parameter") and the fewer voters there are, the more precise expectation a voter has on rent-seeking behavior of an incumbent. I assume that with fewer voters, the more a single voter is informed as it is more probable that she "knows somebody who knows something".

In the next section, I present the model setting in detail. Section three presents a solution with parameters selected for the world when entertainent is preferred over news. Section four discusses the policy of subsidizing media, and section five incorporates the *word-of-mouth* private information to the model. Section six concludes. The definition of an equilibrium and its formal solution can be found in the Appendix, together with all the proofs.

2 Model setting

The game lasts two periods. There are N voters indexed by $J = 1, \ldots, N$. Voters are heterogenous with respect to "ethical voter" parameter λ_J drawn from a beta distribution: $\lambda_J \sim Beta(\alpha_1, \beta_1)\ \forall_{J \in N}$. Voters are the same in all other dimensions. Additionally, the model includes media producers and a ruler. The latter is determined exogenously and can be of two types: good or bad. If she is good, she gives all of the government budget to voters. Otherwise, she can extract rent. The ruler's decision on the extent of rent extraction is monitored imperfectly, with an endogenous probability of detection that rises with both the amount of extracted rent and the demand for news.

2.1 Timing

In the first period, a ruler is randomly selected. She can be either of a good type ($\theta = g$) with probability γ, or of a bad type ($\theta = b$). Only the ruler knows about her type. Each consumer/voter J draws her type λ_J and chooses the amount of entertainment $\hat{t}_{J,e}$ and news $\hat{t}_{J,n}$ to consume, with a time budget constraint: $\hat{t}_{J,n} + \hat{t}_{J,e} = 1$. The sum of voters' types $\sum_{J=1}^{N} \lambda_J$ is public knowledge. The aggregate demands for entertainment and news are given

[1] This is consistent with the actual media market environment (e.g., of radio stations Berry et al. 2016).

[2] The impact of competition on political outcomes is studied by, e.g., Besley and Prat (2006a), Trombetta and Rossignoli (2021).

by $T_e = \sum_{J=1}^{N} t_{J,e}$ and $T_n = \sum_{J=1}^{N} t_{J,n}$ respectively. Subsequently, M media producers decide to enter the market. Their number depends on the demand for media content and exogenously determined revenues from advertising and fixed costs for entertainment and news. Each media producer operates under the same profit function and concurrently determines the amount of entertainment and news to produce without the ability to target specific consumers (i.e., their offers are homogeneous).

Following these decisions, the markets clear. Consumers have access to alternative sources of entertainment, so each consumes $\tilde{t}_{J,e} = \hat{t}_{J,e}$, leading to a total consumption of $\tilde{T}_e = \hat{T}_e$. Producers collectively generate $T_e^s = min\{\hat{T}_e, T_e^s\}$. News is exclusively available through the media market.[3] Hence, both total production and consumption are equal to $\tilde{T}_n = T_n^s = min\{\hat{T}_n, T_n^s\}$.

Subsequently, if a ruler is of a bad type, she chooses the optimal amount of extracted rent from the public budget τ for both periods. The budget is the same for both periods ($\tau = \tau_1 = \tau_2$). The extracted share per period is $R = r\tau,\ r \in [0, 1]$. If $\theta = g$, i.e., a ruler is of a good type, she decides to give all the public budget to voters in both periods.

In the second period of the game, consumers/voters consume media content. If they include news, they might learn with an endogenous probability whether a ruler is corrupted (they receive signal $s = b$ or no signal $s = \emptyset$). If one voter learns about corruption, all voters are informed. The probability of learning is denoted as $\Psi(r, \tilde{t}_n)$ where r is a share of the stolen budget and $\tilde{t}_n = \frac{\tilde{T}_n}{N}$ is the average amount of consumed news in equilibrium.[4]

Finally, elections are held during which consumers decide whether to re-elect the incumbent. After the elections, they learn about the level of extracted rent. The term limit is two, so if there is a bad incumbent, they steal the entire public budget τ during their second term.

2.2 Voters/consumers

There are no prices for either entertainment or news. Each consumer $J = 1, \ldots, N$ decides how to allocate time between news and entertainment. Both entertainment and news are continuous goods, and each consumer has the same time budget equal to one and the same CES preferences characterized by the substitution parameter q and share parameter α. Producers supply the news and the entertainment, but only the latter can be accessed from outside the model in any quantity. Voters know the level of the government budget τ but learn about the extracted rent r at the end of the game after the elections. They assume that r follows a beta distribution $r \sim Beta(\alpha_2, \beta_2)$. Each consumer J gets an equal share of transfers. Voters are heterogenous with respect to λ_J. The parameter λ_J characterizes electoral responsibility ("by paying attention to the news, I am more informed to vote"), social norms ("it is well regarded to be well informed"), or other concerns. There is also a positive externality from other consumers paying attention to the news: $\sum_{I=1, I\neq J}^{N} \lambda_I t_{I,n}$.

[3] The idea behind this assumption is that political news, especially at the local level, has, on average, a much smaller outreach than entertainment. The latter is usually produced for national (or international) media markets.

[4] Putting the average amount of consumed news $\tilde{t}_n$ in the production function is arbitrary (this statistic is the most straightforward).

Each consumer/voter is maximizing the following utility function:

$$\begin{aligned}\hat{t}_{J,n}, \hat{t}_{J,e} = arg \max_{t_{J,n}, t_{J,e}} ((1-\alpha){t_{J,e}}^q + \alpha {t_{J,n}}^q)^{\frac{1}{q}} + \overbrace{\frac{2\tau\gamma}{N}}^{\theta = g} + \\ + \left(\sum_{I=1, I\neq J}^{N} \lambda_I t_{I,n} + \lambda_J t_{J,n} \right) \overbrace{(1-\gamma)}^{\theta = b} \Big(\underbrace{\Psi(E(r), \hat{t}_n)}_{\text{corruption discovered}} \left(\frac{\tau(1-E(r))}{N} + \frac{\gamma\tau}{N} \right) + \\ + \underbrace{\big(1 - \Psi(E(r), \hat{t}_n)\big)}_{\text{corruption not discovered}} \left(\frac{\tau(1-E(r))}{N} \right) \Big) \\ \text{s.t.} \\ q \in (-\infty, 0) \cup (0, 1] \\ 0 \leq t_{J,n} + t_{J,e} \leq 1 \\ \hat{t}_n = \frac{\hat{T}_n}{N} \\ \alpha \in (0,1), \;\; \gamma \in (0,1) \\ \lambda_J \sim Beta(\alpha_1, \beta_1), \;\; r \sim Beta(\alpha_2, \beta_2)\end{aligned} \tag{1}$$

If an incumbent is of a good type ($\theta = g$), each consumer receives $\frac{\tau}{N}$ in both periods. If she is of a bad type ($\theta = b$), voters estimate the probability of detection using the function $\Psi(E(r), \hat{t}_n)$ where $\hat{t}_n$ is the average demand for news. Note that the probability function of detecting a bad incumbent in a voter's problem, $\Psi(E(r), \hat{t}_n)$, has the average *demanded* content by voters ($\hat{t}_n$) which might not necessarily correspond to the equilibrium $\tilde{t}_n$ as the latter will be determined after firms solve their problem.

If any news producer detects corruption and voters pay attention to the news, they elect a new incumbent who is good with probability γ. If not, in expectation, they get only $\frac{\tau(1-E(r))}{N}$. Another decision of voters comes in the second period of the game: whether to re-elect an incumbent or not. The elections are held after voters consume media content. After receiving a signal about a politician in the news segment ($s = \emptyset$ or $s = b$), consumers/voters use Bayesian updating to calculate the probability of a politician being of a good type: $Pr(\theta = g|s)$.

2.3 Media producers

In the media market, there is free entry, but the level of fixed costs and revenues constrains the number of news producers in equilibrium. While fixed costs are the same for every producer, revenues decrease with each additional producer (consumers' attention per one firm decreases). Every producer faces only fixed costs (FC_n for news and FC_e for entertainment). Their revenues come from advertising (A_n for news and A_e for entertainment), which are proportional to the total viewership of both contents. Suppose the number of producers is larger than one. In that case, I assume that the total viewership of news is divided equally per each media outlet, so the advertising revenue is also divided equally between all news producers. The total number of firms is denoted as M. I assume that all producers do not discriminate between consumers and that the offered content is homogenous.

Each producer chooses a supply of news $\tilde{t}_n^s$ and entertainment $\tilde{t}_e^s$ maximizing his profits:

$$\tilde{t}_n^s, \tilde{t}_e^s = arg\max_{t_n^s, t_e^s} \frac{N\left(A_n \int_{\hat{t}_{n,min}}^{t_n^s} f(\hat{t}_n)d\hat{t}_n + A_e \int_{\hat{t}_{e,min}}^{t_e^s} f(\hat{t}_e)d\hat{t}_e\right)}{M} - FC_n - FC_e$$
$$\text{s.t.:} \tag{2}$$
$$t_n^s + t_e^s = 1, \;\; t_n^s \leq \hat{t}_{n,max}, \;\; t_e^s \leq \hat{t}_{e,max}, \quad \hat{t}_{n,max} = 1 - \hat{t}_{e,min}$$

As producers know consumers' demand, they take $\hat{t}_{n,J}, \; \forall J \in N$ as given, and choose amount of news t_n^s and entertainment t_e^s within supports: $[min(\hat{t}_n), max(\hat{t}_n)]$, $[min(\hat{t}_e), max(\hat{t}_e)]$. The profit-maximizing amount of news and entertainment produced depends on the distribution of demanded time by voters, the relation between advertisement revenues, and the fixed costs of both contents. There might be a situation in which $t_n^s < \min t_{n,J}$, when even the smallest demanded news content is larger than the break-even amount of produced news. In that case, the news is underprovided, and all consumers consume all available news t_n^s. Every news producer can learn about an incumbent's corruption with probability $\Psi(r, \tilde{t}_n)$. If one news producer learns about corruption, others are informed, and all send a signal $s = b$ (as in Besley and Prat 2006a). Otherwise, they send no signal, but news is produced.[5] Given the time constraint $t_n^s + t_e^s = 1$ (and $\hat{t}_{n,max} + \hat{t}_{n,min} = 1$), their problem could be rewritten as follows:

$$\tilde{t}_n^s = arg\max_{t_n^s} \frac{N\left(A_n \int_{\hat{t}_{n,min}}^{t_n^s} f(\hat{t}_n)d\hat{t}_n - A_e \int_{\hat{t}_{n,max}}^{t_n^s} f(1-\hat{t}_n)d\hat{t}_n\right)}{M} - FC_n - FC_e \tag{3}$$
$$\tilde{t}_e^s = 1 - \tilde{t}_n^s$$

After media producers announce their offer, a bad incumbent can choose how much rent to extract.

2.4 Incumbent

I assume that a ruler has risk-neutral preferences, knows how much news is consumed by voters, and correctly calculates the probability of being caught by news producers ($\Psi(r, \tilde{t}_n)$). If an elected politician is good, she distributes all the government budget τ to the consumers, and her payoff is zero. If she is of a bad type, she solves the following problem:

$$\hat{r} = arg\max_r \left\{(1 - \Psi(r, \tilde{t}_n))\,(r\tau + \tau) + \Psi(r, \tilde{t}_n)\,(r\tau + 0)\right\}$$
$$\text{s.t.} \tag{4}$$
$$r \in [0, 1]$$

I assume that the probability of catching a corrupt incumbent $\Psi(r, \tilde{t}_n)$ is increasing in $\tilde{t}_n$ and r, concave in $\tilde{t}_n$, and convex in r. Also, $\Psi(r, 0) = 0$, $\Psi(0, \tilde{t}_n) = 0$.

2.5 Equilibrium concept

I focus on pure strategies, and the characterized equilibrium is weak perfect Bayesian. A sequential equilibrium does not apply here as voters cannot use Bayes rules to calculate a posterior belief towards the level of extracted rent. Voters can use Bayesian updating only while deciding about an incumbent's re-election. On an equilibrium path, the ruler chooses

[5] In Besley and Prat 2006a, if there is no corruption, there are no revenues from producing news.

the level of rent that is consistent with voters' beliefs.
I show in the Appendix that the equilibrium can be defined only locally as the second-order condition does not hold for some parameter values.

3 Solution

If an incumbent is of a good type, realized welfare is the same for every consumer and is equal to $V^g = ((1-\alpha)\tilde{t}_e^q + \alpha\tilde{t}_n^q)^{\frac{1}{q}} + \frac{2\tau}{N}$. When an incumbent is of a bad type and is detected, realized welfare for each consumer is $V_J^{b,det} = ((1-\alpha)\tilde{t}_{J,e}^q + \alpha\tilde{t}_{J,n}^q)^{\frac{1}{q}} + \sum_{J=1}^{N} \lambda_J \tilde{t}_{J,n} \frac{\tau(1-r)+\gamma\tau}{N}$, $\forall_{J\in N}$; while when she is not detected, it is $V_J^{b,ndet} = ((1-\alpha)\tilde{t}_{J,e}^q + \alpha\tilde{t}_{J,n}^q)^{\frac{1}{q}} + \sum_{J=1}^{N} \lambda_J \tilde{t}_{J,n} \frac{\tau(1-r)}{N}$, $\forall_{J\in N}$. Note that in the last two cases, the second part of a welfare function is the same for every consumer as it depends on the sum $\sum_{J=1}^{N} \lambda_J \tilde{t}_J$. However, when solving their problem, each consumer considers only their own "ethical voter" parameter λ_J. Hence, the first part of welfare, characterized by a CES function, would vary between voters. Note that in this model, if everybody prefers entertainment over the news (i.e. when $\alpha < 0.5$) in the CES function, each consumer "free rides" on all consumers with a larger value of λ_J. It happens because if any consumer learns about corruption, all consumers learn as well. Also, the "public scrutiny" part of the welfare ($\sum_{J=1}^{N} \lambda_J \tilde{t}_J$) is increasing with the number of voters, but transfers per capita $\frac{\tau}{N}$ are decreasing. Therefore, if the decrease in per capita transfers is larger than the increase in public scrutiny when the number of voters increases, on average, the expected welfare from transfers might decrease for a voter.

After consumers choose, firms choose the amount of news and entertainment produced that maximizes their profits. Without the knowledge of the distribution of demanded content by consumers ($f(\hat{t}_n)$), we can only state that the equilibrium supplied content, identical for each media outlet, would satisfy the condition:

$$\frac{f(t_n^s)}{f(1-t_n^s)} = \frac{A_e}{A_n}. \tag{5}$$

A good incumbent gives all of the public budget in both periods to voters, and her welfare is zero. A bad incumbent solves her problem taking into account equilibrium consumption of news $\tilde{t}_n$, and her welfare is $\tilde{r}\tau + \tau$ when not detected and $\tilde{r}\tau$ when detected. Note that, as an incumbent takes demand for news as given while choosing the rent, the probability of detection as estimated by voters $\Psi(E(r), \hat{t}_n)$ has a *deterring* role: which would not be necessarily the case if voters decided about the demand for news at the same time or after obtaining some signal that corruption might be taking place. Then, the probability function would be expressed as $\Psi(r, \tilde{t}_n)$, and would have a *punishing* role.

The parameter of interest is q, which illustrates the substitutability between news and entertainment. How does consumption of news, rent, welfare, and other outcomes change if q increases? I answer this question with an example in which voters prefer entertainment over the news; most do not assign much value to the public good of being informed, and the probability of an incumbent being of a bad type is more than half.

3.1 Example

In this setup, voters prefer entertainment over the news ($\alpha = 0.35$), "ethical voter" parameter λ_J is drawn from the distribution $Beta(2, 5)$ for 100 voters, subjective expected rent is drawn from the distribution $U(0, 1)$, probability of an incumbent being good γ is 0.4, size of public budget τ is 100, probability of detecting a bad incumbent is characterized by the function $\Psi(r, t_n) = r^2(t_n)^{0.5}$, and the media market environment is characterized by $FC_n = 30$, $FC_e = 20$, $A_n = 2.4$, $A_e = 2.5$. Given the distribution of λ_J, most voters "do not care much" about the public good value of being informed, as the median for these parameters of the Beta distribution is only 0.26. In the following figures, I show how the outcomes change with the substitutability between news and entertainment: the dynamics of demand for news, voters' and incumbent's welfare, number and total profits of media companies, extracted rent by an incumbent, and probability of her detection.

In this setup, as entertainment is more profitable than news and is more in demand, firms always supply the minimum demanded amount of news. It also corresponds to realized consumption for each voter: everybody consumes the same amount of news as only the amount demanded by the least news-interested voter is provided. Figure 1 shows that with q increasing, the difference in maximum demand (demanded amount by the most "engaged" voter with the highest value of λ_J), and the least engaged (minimum demand) increases, meaning that the excess demand for news also increases. When news and entertainment are more complementary than substitute goods (for the lowest values of q), even the demand for news of the least "engaged" voter is bigger than the maximum demand for news when q is larger than zero. In the former case, news and entertainment have to be consumed more like a "bundle". In contrast, in the latter case, it is easier to substitute one with the other.

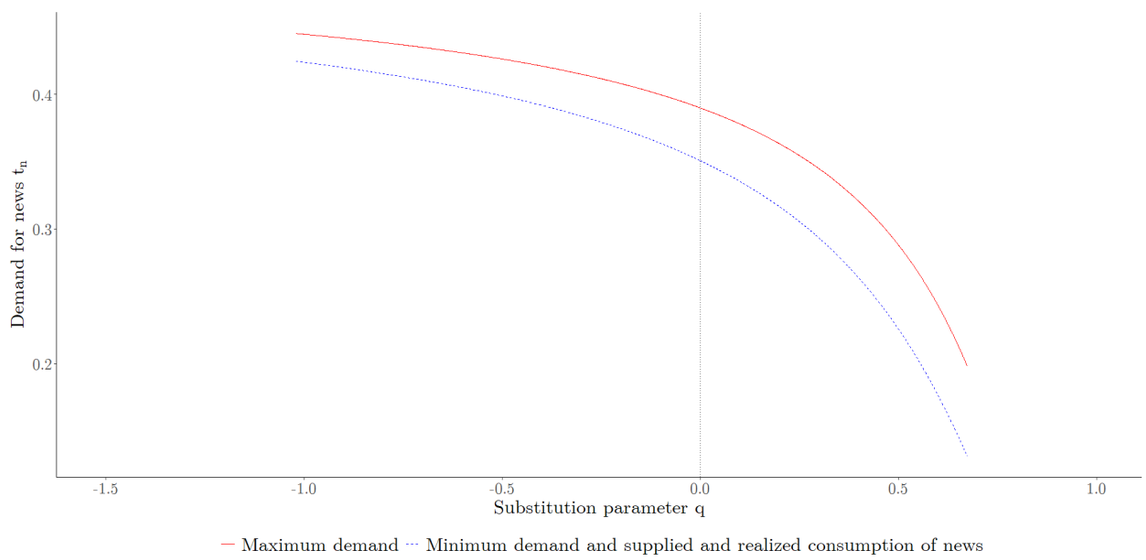

Figure 1: Realized, supplied, and maximum/minimum demand for news for each value of substitution parameter q

Figure 2 shows the realized total welfare of voters for all possible cases: when an incumbent is bad and detected/not detected and when she is good and the total ex-ante welfare (as estimated by voters). The difference between the green and orange/red lines is the welfare loss due to corruption. When an incumbent turns out to be good, the welfare increases with the substitution parameter q as it is easier for consumers to substitute news for entertainment

without any risk of rent extraction by a politician. Note that the dotted blue line (welfare ex-ante) is above the welfare of the bad incumbents. It means that voters underestimate the scale of corruption. If they were more skeptical towards the amount of extracted rent in expectation (e.g., if the distribution of beliefs was $Beta(5, 2)$ instead of $U(0, 1)$), the difference between ex-ante and ex-post should be narrower. In that case, voters would be more correct in their expectations and have a higher demand for news, and an incumbent would steal less because of the deterrence effect. There is an increase in voters' welfare if an incumbent is bad (dotted red and orange lines) and when the substitution parameter is high ($q > 0.5$). This is due to the characteristics of the function illustrating the demand for news (Figure 1): it is decreasing and concave with respect to q. Also, the news demand is so weak that an incumbent steals all of the public budget for these values of q (see Figure 4). Therefore, the welfare increases because voters find it easier to substitute a larger chunk of news for entertainment.

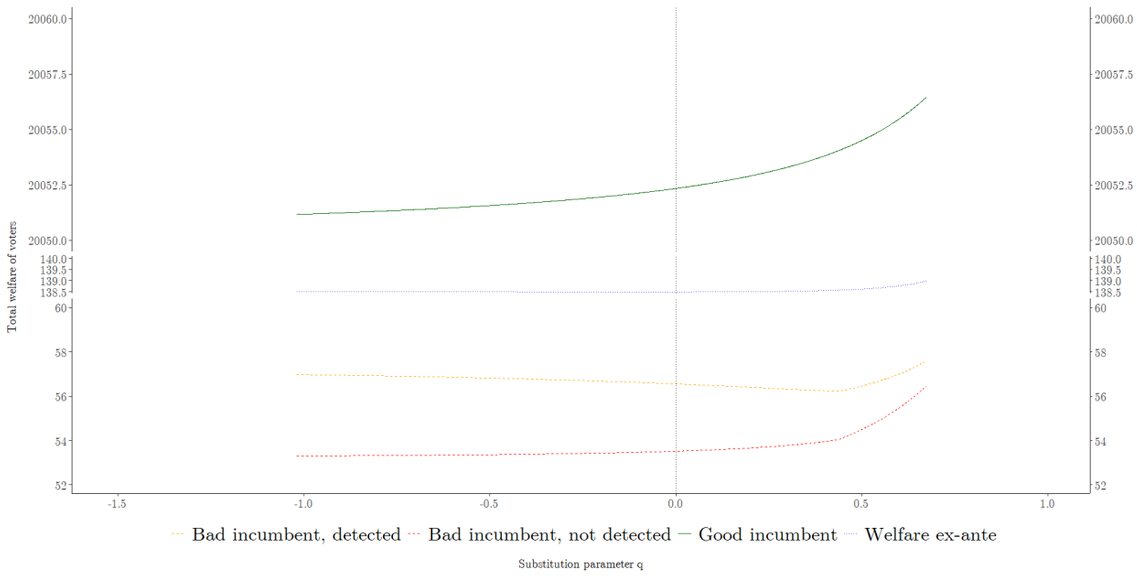

Figure 2: Total welfare of voters for each value of substitution parameter q

In this scenario, the number of producers is four at all values of the substitution parameter q for which a solution exists. Figure 3 shows the total profits for these four firms for each value of q. Because marginal revenue for producing entertainment is larger than for producing news ($A_e > A_n$), firms profit the most when the demand for news is the least.

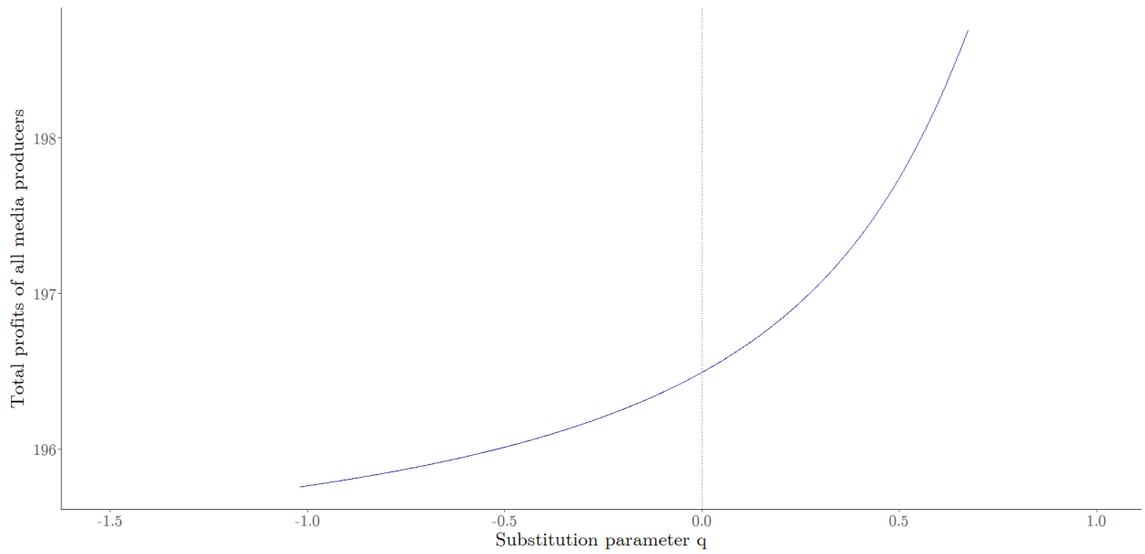

Figure 3: Total profits of media producers for each value of substitution parameter q

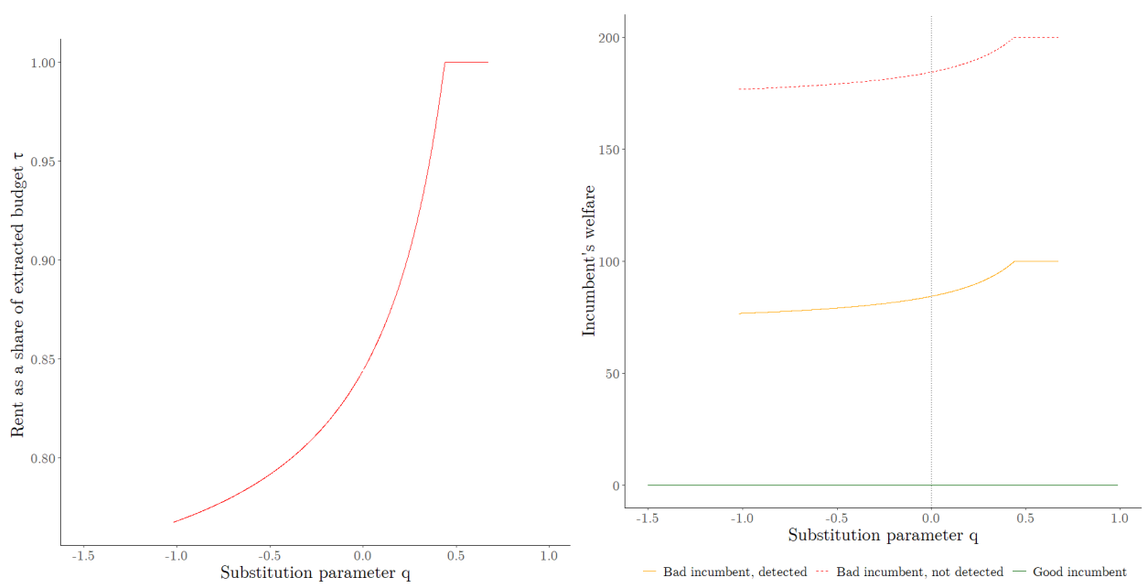

Figure 4: Extracted rent and welfare of both types of incumbent

Figure 4 shows the rent as the share of the extracted budget (r) and the welfare of a bad and a good incumbent. With the increasing substitution parameter q, the rent and incumbent's increases, as voters' demand for news is too weak to deter the incumbent from stealing public funds. Rent as a function of q is convex, and with growing substatibility, the decrease in demand for news precipitates. Therefore, in this case, increasing the substability between entertainment and news leads to an accelerating increase in corruption.

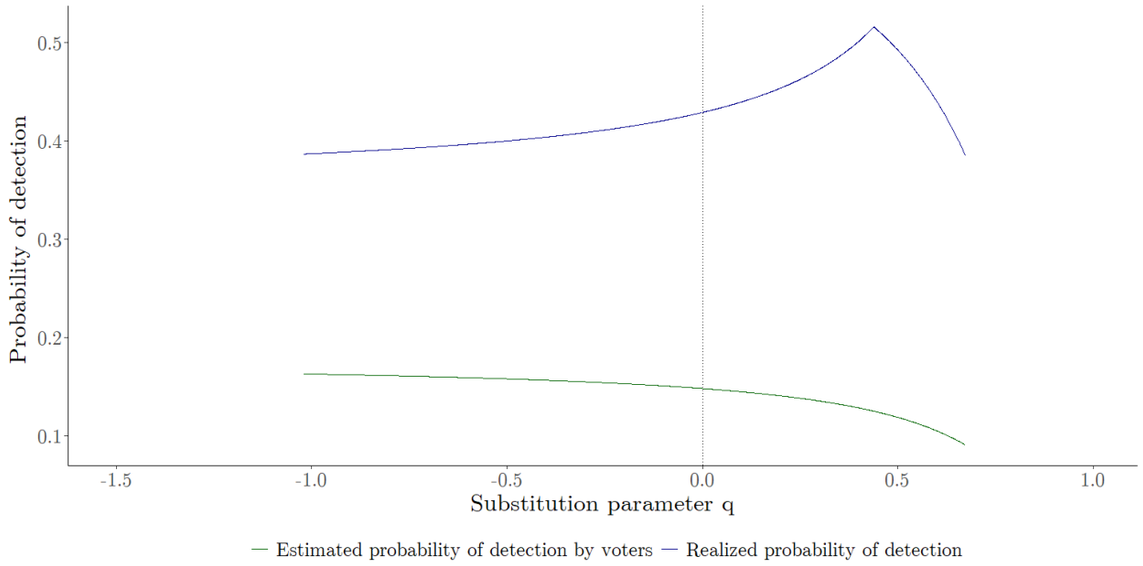

Figure 5: Probability of detection of a bad incumbent: realized $\Psi(\tilde{r}, \tilde{t}_n)$ and estimated by voters $\Psi(E(r), \hat{t}_n)$

Finally, Figure 5 shows the endogenous probability of detecting a bad incumbent. There is a gap between $\Psi(E(r), \tilde{t}_n)$ and $\Psi(\tilde{r}, \tilde{t}_n)$ as, in this setup, voters underestimate the scale of corruption. They cannot adjust their beliefs towards r (therefore, the equilibrium is weak Bayesian). As the "deterring" role of $\Psi(E(r), \tilde{t}_n)$ becomes weaker when the substitution parameter approaches one, the rent goes up, and with it, the realized probability of detection. When $q > 0.6$, the incumbent extracts all the public budget ($r = 1$), so there is no subsequent increase in the realized probability of detection. Instead, voters decrease their consumption of news, and it has an overall negative impact on the probability of detection of a bad incumbent.

Political accountability in this example is weakened by several factors: voters'/consumers' strong preferences for entertainment, distribution of the "ethical parameter" λ_J, voters' incorrect beliefs about the level of extracted rent, and the media market which is characterized by larger revenues from entertainment than news, $A_n < A_e$. In this example, all voters consume the amount of news demanded by the "least engaged" voter. Therefore, if we subsidize income from news, their consumption might increase, and political accountability would improve.

4 Subsidizing production of news

In the problem of media producers (2), the distribution of demand for news and entertainment among voters is assumed to be continuous, as it is not likely that voters spend *exactly* the same amount of time for either content. In the Solution section, the optimality condition for every producer (5) states that $\frac{f(t_n^s)}{f(1-t_n^s)} = \frac{A_e}{A_n}$. Without distributional assumptions, it is not possible to further track the solution to this problem. However, we know that $t_n^s \in (0, 1)$, $t_e^s = 1 - t_n^s$. Therefore, I assume that $t_n^s \sim Beta(\alpha_3, \beta_3)$. We can deduce that $1 - t_n \sim Beta(\beta_3, \alpha_3)$. After transformations, we arrive at the following optimality condition

for each firm:

$$\left(\frac{t_n^s}{1-t_n^s}\right)^{\alpha_3-\beta_3} = \frac{A_e}{A_n} \tag{6}$$

In this case, because entertainment is preferred to news, the distribution of demand for the latter is first-order stochastically dominated by the distribution of demand for the former ($F(\hat{t}_n) > F(\hat{t}_e)$). Given the distributional assumption, this implies that $\alpha_3 < \beta_3$.

Suppose we dispose of a policy instrument that can subsidize news production, $A_{n,subs} = A_n + \Delta A_n$. If we subsidize the news to produce it at the maximum demanded amount, then every consumer would consume the amount they demand. From (6) we can get the formula for A_n:

$$A_n = \frac{A_e}{\left(\frac{1}{t_n^s}-1\right)^{\beta_3-\alpha_3}} \tag{7}$$

If $A_{n,max}$ corresponds to the revenue from news if the maximum demanded news is produced, we can find the level of subsidy as:

$$A_{n,max} - A_n = \Delta A_n = A_e \left(\frac{1}{\left(\frac{1}{t_{n,max}-1}\right)^{\beta_3-\alpha_3}} - \frac{1}{\left(\frac{1}{t_n^s-1}\right)^{\beta_3-\alpha_3}} \right) \tag{8}$$

If a subsidy is larger than ΔA_n, there will be no effect on news consumption unless consumers' preferences change (in favor of news).

4.1 Example continued

Coming back to the Example from Section 3.1, we can compare outcomes before and after imposing the subsidy. In this case, media outlets produce the maximum demanded content as long as $A_n > A_e$.

Before, as shown in Figure 1, realized consumption for every consumer at every level of q corresponded to the minimum demand. With supplied news at the level of $\hat{t}_{n,max}$, there is no excess demand for news and the average realized consumption of news increases (everybody consumes their demanded content, $\tilde{t}_{n,J} = \hat{t}_{n,J}\ \forall_{J \in N}$ (Figure 6).

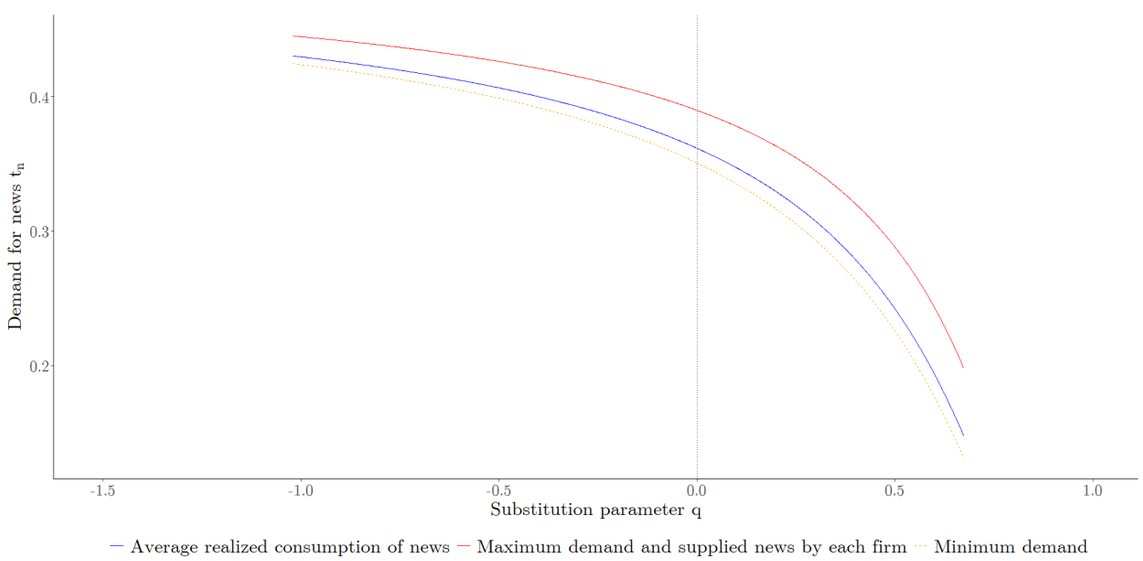

Figure 6: Realized, supplied, and maximum/minimum demand for news for each value of substitution parameter q if $A_n > A_e$

Subsequently, the increase in news revenues, through the channel of larger consumption of news, improves political accountability. Figure 7 shows the rent as a share of extracted budget τ before and after the increase in news revenues. The rent decreases after the subsidy for all values of q except when both rents reach 100% of the budget. Therefore, in this case, even with a news subsidy, if news and entertainment are easy to substitute, the entire budget is stolen by an incumbent.

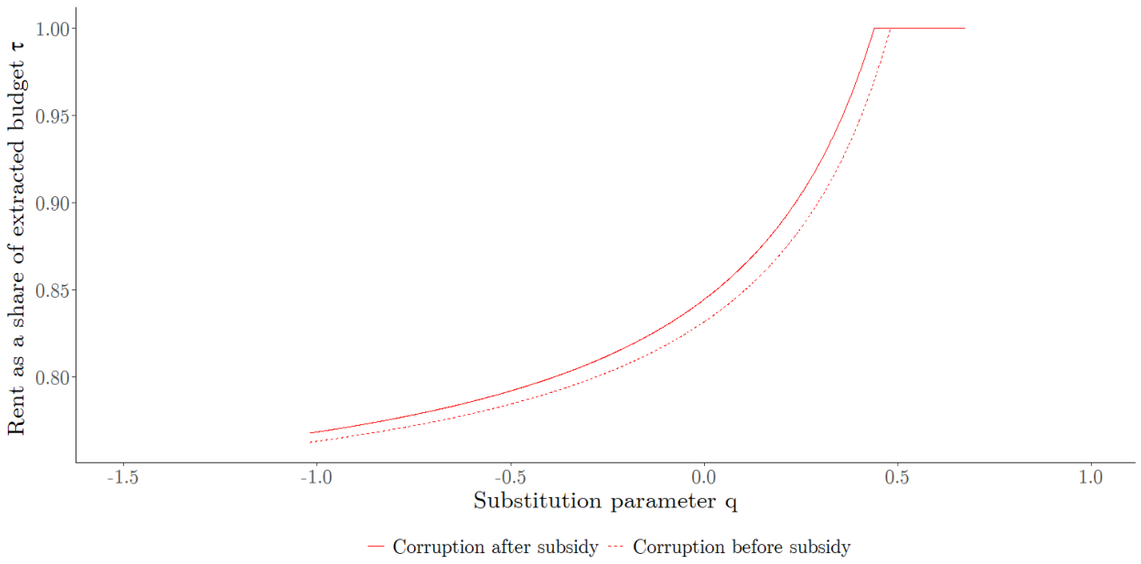

Figure 7: Extracted rent before and after subsidy for producing news

Figure 8 illustrates the improvement in political accountability: for higher values of substitution parameter q, the increase in the share of budget distributed to voters is around 0.03%. While it is an improvement, subsidies alone do not substantially change the politician's behavior in this landscape, as also Figure 7 illustrates.

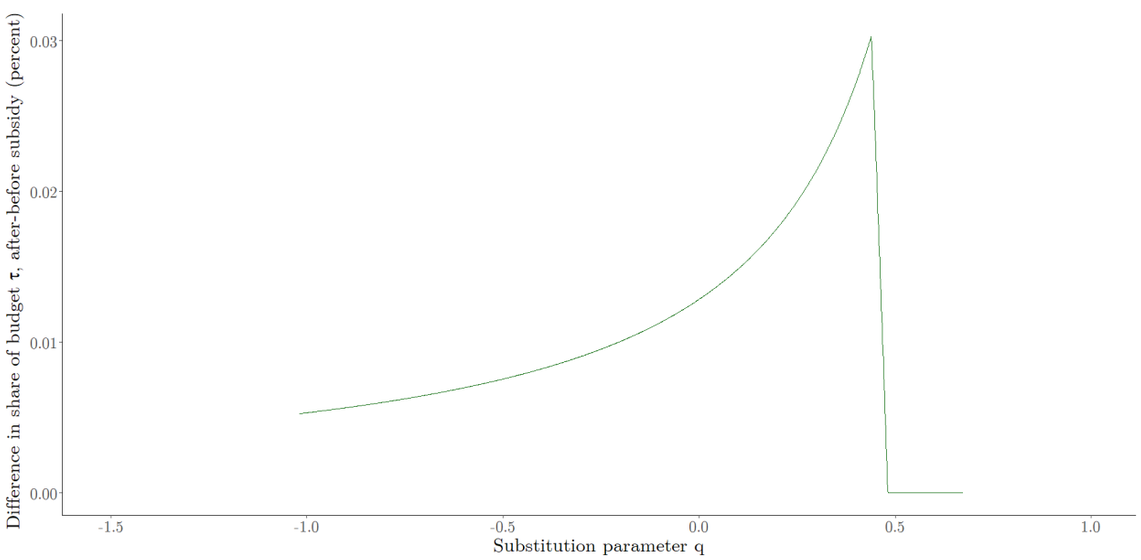

Figure 8: Increase in the share of busget distributed to voters after the subsidy, percent

Finally, Figure 9 shows the total welfare of voters for all scenarios as in Figure 2, now with and without the subsidy. The difference in welfare is the largest for the case when a bad incumbent is detected, but the increase is still relatively small.

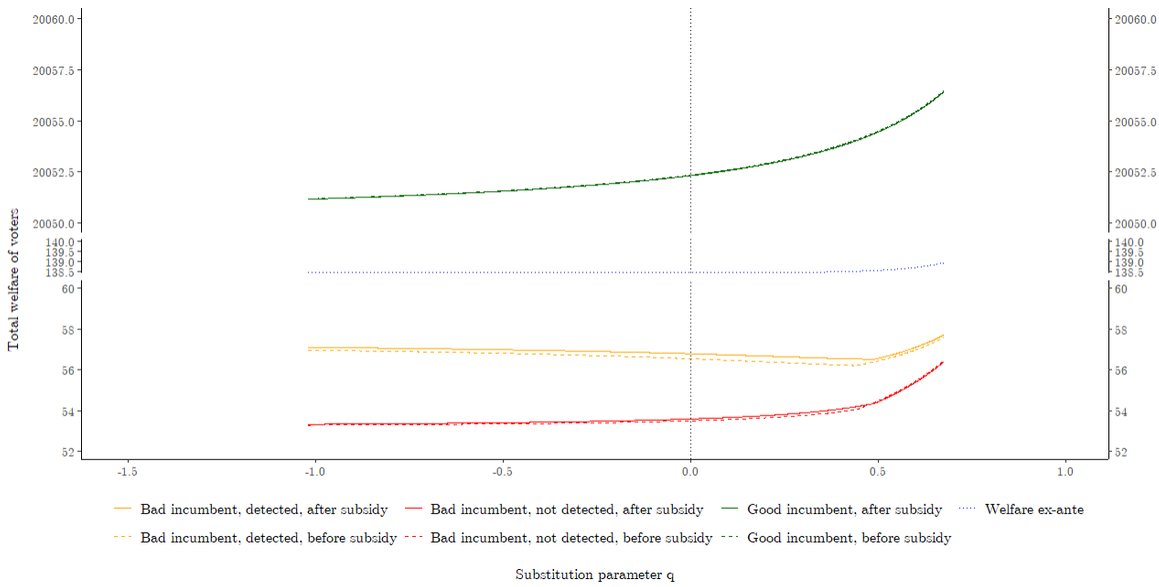

Figure 9: Total welfare of voters, before and after subsidy

Helping firms produce more news improves political accountability but to a limited extent. The more entertainment voters demand, the less impact the subsidy for firms has on corruption reduction.

So far, I have described the model where public monitoring is done by the media industry that sends signals about politicians to every voter interested in news. While every voter "free-rides" on the other voters' interest in news, the media firms are the only source of information about an incumbent. However, the smaller the market/constituency (also in geographical terms), the larger the probability of a bad incumbent being detected by a voter and the larger share of voters each voter knows. On the other hand, keeping the revenues A_n, A_e and fixed costs FC_n, FC_e constant, the smaller the market, the easier it is for an incumbent to capture media. With a decreasing number of consumers N, profits and the number of media outlets decrease in equilibrium. Henceforth, if the bribe offer becomes more attractive for firms than independent activity (the intuition behind incentives of media firms to accept the bribe are explained in a model developed by Besley and Prat (2006b)). This framework abstracts from media capture, which is already well described in the political economy literature. However, I can partially circumvent this problem by incorporating information that depends on the interest of a voter in politics (parameter λ_J) and the total number of voters N). I call this information *word-of-mouth*.[6]

5 *Word-of-mouth* information

Recall that the probability of obtaining a null signal from the news industry is: $Pr(s = \emptyset) = \gamma + (1-\gamma)(1-\Psi(E(r), \tilde{t}_n))$. The second part, $(1-\gamma)(1-\Psi(E(r), \tilde{t}_n))$, denotes a situation in which media send no signal, but because a bad incumbent has not been detected. Note that the more imprecise the expectations about corruption by voters $E(r)$, the more risk there is to re-elect a bad incumbent. Suppose now that a voter, while deciding about the re-election of an incumbent, can also get private information. Let's assume this information would

[6] I say "partially" as I do not take into account a situation in which a media producer is biased *against* an incumbent.

diminish the misinformation due to weak journalist scrutiny by $1+h(N,\lambda_J)$, which increases with the ethical parameter λ_J and decreases with the number of voters N. The integer 1 assures that $1+h(N,\lambda_J)>1$. The rationale behind this assumption is that the more a voter cares about being informed, the larger the probability she would get relevant information. Also, the smaller the number of voters, the larger the probability a voter "knows somebody who knows something". The function $h(N,\lambda_J)$ improves the voter's information about the incumbent as it reduces his bias towards the extracted rent. Denote the bias as $|E(r)-r|$. Then, we incorporate the private information reduce the bias in the following way:

$$\begin{aligned} bias &= \frac{|E(r)-r|}{1+h(N,\lambda_J)} \\ lim_{N\to 1,\,\lambda_J\to 1}&\frac{|E(r)-r|}{1+h(N,\lambda_J)} = 0 \\ &\text{If } E(r)-r>0\text{:} \\ E(r) &= bias(1+h(N,\lambda_J))+r \\ &\text{If } E(r)-r<0\text{:} \\ E(r) &= r-bias(1+h(N,\lambda_J)) \\ &\text{Example for } h(N,\lambda_J)=\frac{\lambda_J}{N}\text{:} \\ \frac{\partial}{\partial\lambda_J}&\frac{|E(r)-r|}{1+\frac{\lambda_J}{N}} < 0 \\ \frac{\partial}{\partial N}&\frac{|E(r)-r|}{1+\frac{\lambda_J}{N}} > 0 \end{aligned} \tag{9}$$

I assume that voters only know the expression $bias(1+h(N,\lambda_J)$, but cannot infer the value of bias and the private information separately. Also, when $E(r)-r>0$, voters are too "pessimistic" about the corruption, and they would be more likely not to re-elect a bad incumbent without private information than without it. A less desirable situation is when $E(r)<r$: when voters are too optimistic about the incumbent's performance. I assume the second case in the following analysis (when the *word-of-mouth* information might improve political accountability). Therefore, we can denote the new function for the probability of detection of a bad incumbent for each voter J as $\Psi_J(E(r)+bias(1+h(N,\lambda_J));\tilde{t}_n)$.

As before, if the signal is bad ($s=b$), voters do not re-elect an incumbent (as the posterior probability that she is of a good type is zero). Therefore, we can summarize the possible scenarios and decision rules for voter J as:

$$\begin{aligned} Pr(\theta=g|s=b)=0 &\implies \text{no voter votes for re-election} \\ Pr(\theta=g|s=\emptyset)=\frac{\gamma}{\gamma+(1-\gamma)(1-\Psi(E(r)+bias(1+h(N,\lambda_J));\tilde{t}_n))} &> \gamma \implies \text{voter } J \text{ re-elects} \end{aligned} \tag{10}$$

Note that no matter the improvement in the precision of voters to estimate the rent extraction $(E(r)+bias(1+h(N,\lambda_J))$, the additional information of null signal from media producers gives the posterior probability $Pr(\theta=g|s=)>\gamma$, so for all cases every voter would re-elect the incumbent. It makes thus sense to separate information from the media industry and from the *word-of-mouth*. Suppose instead that the probability of detection as estimated by voters depends only on their subjective expectation of corruption: $\Psi(E(r)+bias(1+h(N,\lambda_J))$. In this case, it is possible that $\Psi(E(r)+bias(1+h(N,\lambda_J))>1$. Therefore for these cases, we

have the following voting rule:

$$\text{If } \Psi(E(r) + bias(1 + h(N, \lambda_J)) > 1:$$

$$Pr(\theta = g|s = \emptyset) = \frac{\gamma}{\gamma + (1-\gamma)(1 - \Psi(E(r) + bias(1 + h(N, \lambda_J))))} < \gamma \implies \text{voter } J \text{ does not re-elect} \tag{11}$$

If more than half of voters choose to re-elect, an incumbent stays in the office. If exactly $\frac{N}{2}$ choose to re-elect, a coin toss decides about re-election. If less than half of the voters are convinced that $\theta = g$, an incumbent is ousted from office. With the parametrization from the Example in section 3.1, let's see how the *word-of-mouth* can improve the selection of politicians into office.

5.1 Example continued

In the example from above, voters preferred entertainment to news ($\alpha < 0.5$), and the distribution of the "ethical parameter" λ_J reflected the average weak interest in politics as $\lambda_J \sim Beta(2, 5)$. Also, the media market is characterized by larger revenue from entertainment and news, which led media producers to produce only the minimum demanded amount of news in equilibrium $\tilde{t_n} = min(\hat{t}_J)$. As a result, the public scrutiny was relatively weak, and the incumbent stole, on average, 90% of the budget. Also, the private information function takes the form $h(N, \lambda_J) = \sqrt{\frac{\lambda_J}{N}}$.

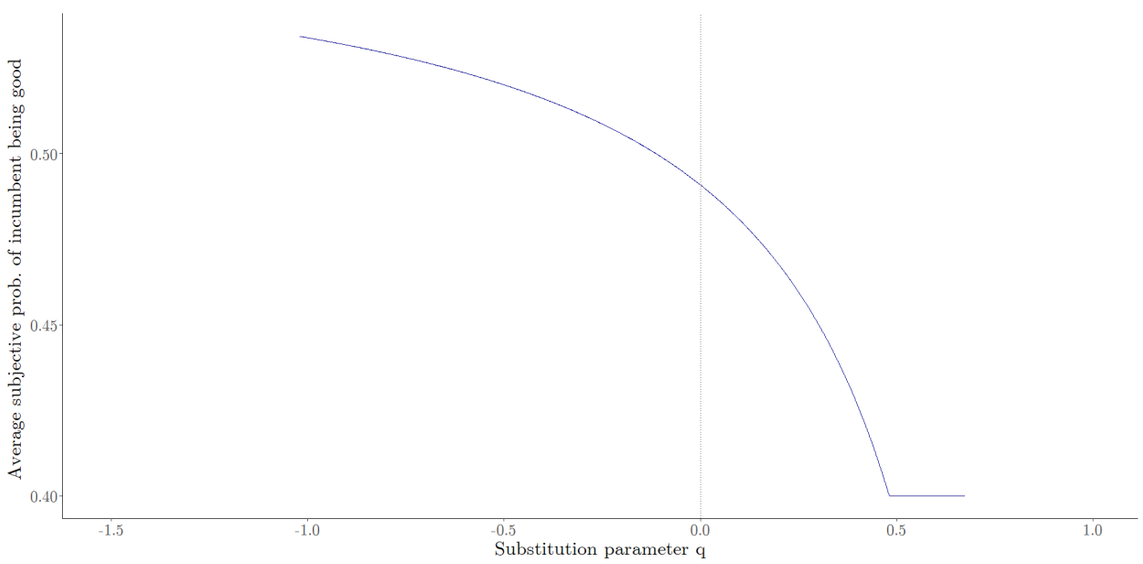

Figure 10: Average subjective probability of incumbent being of good type, $\theta = g$

As discussed above, in this example, with larger substitutability between news and entertainment, corruption increases. Therefore, on average, voters are getting more sceptical about an incumbent with the increase of a substitution parameter q, as Figure (10) shows. While the average subjective probability of an incumnbent being of a good type decreases with q, it never goes below 0.4, which is the exogenous probability of an incumbent being good. Therefore, in setting, an incumbent will always be re-elected, despite growing corruption.

6 Conclusion

According to the Reuters Institute Digital News Report from 2023, the share of people interested in news in the last eight years declined in every surveyed country except Finland.[7] Hence, not only it has become easier to substitute news for entertainment, but the preferences in favor of news decreased. This might have severe consequences for local journalism. As investigative journalism is more costly than other types of content (reprinted stories, job offers, crosswords, weather, etc.) and, with the Internet being a main source of most of the sought content, many places do or are at risk of losing the critical mass of demand enabling local journalism to thrive.[8]

Therefore, my findings are relevant to today's media landscape, especially locally. While policies that reduce media production costs might not lead to larger news consumption, targeted interventions to enhance voter demand for news could improve political accountability.

Future work could extend this model by endogenizing voters' decision to vote, which is complementary to being informed about politicians' performance. Additionally, empirical validation of the theoretical predictions would provide further insights into the practical implications of media consumption patterns on political accountability.

References

Berry, Steven, Alon Eizenberg, and Joel Waldfogel. 2016. "Optimal product variety in radio markets." *The RAND Journal of Economics* 47 463–497.

Besley, Timothy, and Andrea Prat. 2006a. "Handcuffs for the Grabbing Hand? Media Capture and Government Accountability." *American Economic Review* 96 720–736. 10.1257/AER.96.3.720.

Besley, Timothy, and Andrea Prat. 2006b. "Handcuffs for the Grabbing Hand? Media Capture and Government Accountability." *American Economic Review* 96 (3): 720–736. 10.1257/AER.96.3.720.

Ferejohn, John. 1986. "Incumbent performance and electoral control." *Public Choice* 50 5–25. 10.1007/BF00124924/METRICS.

Fudenberg, Drew, and Jean Tirole. 1994. "Fudenberg, Drew, and Jean Tirole. Game Theory. Cambridge, MA: MIT Press, 1991. ISBN: 9780262061414. Osborne, Martin, and Ariel Rubinstein. A Course in Game Theory. Cambridge, MA: MIT Press, 1994. ISBN: 9780262650403.."

Gavazza, Alessandro, Mattia Nardotto, and Tommaso M. Valletti. 2019. "Internet and politics: evidence from U.K. local elections and local government policies." *The Review of Economic Studies* 86 2092–2135.

Grillo, Edoardo, and Carlo Prato. 2023. "Reference Points and Democratic Backsliding." *American Journal of Political Science* 67 71–88. 10.1111/AJPS.12672.

Martinelli, Cesar. 2006. "Would rational voters acquire costly information." *Journal of Economic Theory*. 10.1016/j.jet.2005.02.005.

[7] Reuters Institute Digital News Report 2023, access: 30 May 2024

[8] On a related angle, using the data for the U.K, Gavazza et al. (2019) show that the Internet penetration contributed to the decrease of voter turnout in local elections, especially among less-educated and young adults. Many voters lost interest in politics because the Internet does not offer access to political information like newspapers and radio.

Perego, Jacopo, and Sevgi Yuksel. 2022. "Media Competition and Social Disagreement." *Econometrica* 90 223–265.

Prat, Andrea. 2018. "Media Power." *Journal of Political Economy* 126 1747–1783.

Prato, Carlo, and Stephane Wolton. 2016. "The Voters' Curses: Why We Need Goldilocks Voters." *American Journal of Political Science* 60 726–737. 10.1111/AJPS.12223.

Prato, Carlo, and Stephane Wolton. 2018. "Rational ignorance, populism, and reform." *European Journal of Political Economy* 55 119–135. 10.1016/J.EJPOLECO.2017.11.006.

Tian, Guoqiang. 2015. "On the existence of equilibria in games with arbitrary strategy spaces and preferences." *Journal of Mathematical Economics* 60 9–16. 10.1016/J.JMATECO.2015.06.001.

Trombetta, Federico, and Domenico Rossignoli. 2021. "The price of silence: Media competition, capture, and electoral accountability." *European Journal of Political Economy* 69 101939. 10.1016/J.EJPOLECO.2020.101939, Publisher: North-Holland.

Appendix

I solve the model with the use of backward induction. Proposition 1 characterizes the equilibrium:

Proposition 1 *In a two-period game involving three types of players:*

1. *a ruler, chosen exogenously at the beginning of the game. She can be of two types: bad or good with* $Pr(\theta = good) = \gamma$
2. *voters indexed by* $J = 1, \ldots, N$ *who are heterogeneous with respect to the parameter* $\lambda_J \sim Beta(\alpha_1, \beta_1)\ \forall_{J \in N}$
3. *a number of news producers* M*,*

a weak Bayesian equilibrium is an assessment consisting of the subjective expectation of voters towards the level of extracted rent by a ruler $E(r)$*,* $r \sim Beta(\alpha_2, \beta_2)$*, the following strategy profile, which is consistent with* $E(r)$*:*

1. *if a ruler is good* $(\theta = g)$*, she chooses* $\tilde{r} = 0$*. If a ruler is bad* $(\theta = b)$*,* $\tilde{r}$ *is a solution to the maximization problem defined in (4).*
2. *each voter's demand for news* $\hat{t}_n^J$ *and entertainment* $\hat{t}_e^J$ *is a solution to maximization problem defined in (1).*
3. *production of news and entertainment by* M *number of producers. The amount of produced media content solves the maximization problem (2), which is the same for each producer.*
4. *decision rule of voters:*
   - *re-elect an incumbent if the news did not contain a bad signal about an incumbent, so* $s = \emptyset$*. If* $s = b$*, do not re-elect.*

– *if word-of-mouth information is available, an incumbent is re-elected if more than half of voters decide so (if $\frac{N}{2}$ decide to re-elect, a coin is tossed). An individual is informed by the word-of-mouth signal, which approaches the truth the larger the λ_J and the smaller the number of voters, N ($s \to \theta$ if $\lambda_J \to 1 \vee N \to 0$)*

and the market clearing condition, which determines the consumed news and entertainment for each voter in equilibrium $\tilde{t}_{n,J} = \min\{\hat{t}^s_{n,J}, \hat{t}_{n,J}\}, \tilde{t}_{e,J} = \hat{t}_{e,J}$. If $\hat{t}_{n,J} > \tilde{t}_{n,J}$, voters compensate for unmet demand for news with entertainment.

I start the proof of Proposition 1 with the last stage of the game, the elections. Then, I show an incumbent's solution for the optimal rent level $\hat{r}$. In the last two steps, I solve the problem of media producers and voters.

Elections

Proposition 3 *Voters re-elect an incumbent when $s = \emptyset$. Voters never re-elect an incumbent when $s = b$.*

Proof. After receiving a signal, voters use Bayesian updating to calculate the probability of an incumbent being of a good type. If the signal is null ($s = \emptyset$):

$$Pr(\theta = g|s = \emptyset) = \frac{\gamma}{\gamma + (1-\gamma)(1 - \Psi\left(E(r), \tilde{t}_n\right))} > \gamma \text{ if } \gamma < 1 \tag{12}$$

The posterior probability is larger than the a priori probability that an incumbent is of a good type. Hence, they re-elect her.
If the signal is bad ($s = b$):

$$Pr(\theta = g|s = b) = 0 \tag{13}$$

The posterior probability that an incumbent is of good type is zero. Hence, they do not re-elect her.

If the *word-of-mouth* signal is available, voters use the following voting rule:

$$Pr(\theta = g|s = \emptyset) = \frac{\gamma}{\gamma + (1-\gamma)(1 - \Psi(E(r) + bias(1 + h(N, \lambda_J))))} < \gamma \quad \begin{array}{r} \text{If } \Psi(E(r) + bias(1 + h(N, \lambda_J)) > 1: \\ \\ \implies \text{voter } J \text{ does not re-elect} \end{array} \tag{14}$$

□

Incumbent

An incumbent of type g always chooses $r = 0$, and all τ is transferred to voters at the end of the game. A bad incumbent solves the problem defined in (4) which yields the following FOC:

$$\frac{\partial \Psi(r, \tilde{t}_n)}{\partial r} = 1 \tag{15}$$

which determine the unique interior solution $\hat{r}(\tilde{t}_n)$ for any value of $\tilde{t}_n$ larger than zero.

Proposition 3 *The equilibrium level of rent $\hat{r}(\tilde{t}_n)$ decreases when the demand for news increases.*

Proof. From (15) and using the properties of $\Psi(r, \tilde{t}_n)$ we can study the effect of attention of voters towards news $\tilde{t}_n$ on the equilibrium rent, $\hat{r}(\tilde{t}_n)$:

$$\frac{d\hat{r}(\tilde{t}_n)}{d\tilde{t}_n} = \frac{-\frac{\partial\Psi(r,\tilde{t}_n)}{\partial r \partial \tilde{t}_n}}{\frac{\partial^2\Psi(r,\tilde{t}_n)}{\partial^2 r}} < 0 \tag{16}$$

The numerator is negative as $\Psi(r, \tilde{t}_n)$ increases with the increase of $\tilde{t}_n$ and r. The denominator is positive as the function $\Psi(r, \tilde{t}_n)$ is convex in r. As a result, the effect of a larger demand for news is smaller rent. □

Media producers

There is a free entry, and from (2) we can deduce the following:

Lemma 1 *The equilibrium number of media outlets M is equal to $M = \lfloor \frac{N(A_n F(\tilde{t}^s_n) - A_e F(\hat{t}_{n,max}) - A_e(\tilde{t}^s_n - \hat{t}_{n,max})}{FC_n + FC_e} \rfloor$ where $\tilde{t}^s_n$ is solution to the problem defined in (3).*

Proof. From (3) and given the free entry we know that an equilibrium number of news producers is equal to $M = \frac{N(A_n F(\tilde{t}^s_n) - A_e F(\hat{t}_{n,max}) - A_e(\tilde{t}^s_n - \hat{t}_{n,max})}{FC_n + FC_e}$. As M is an integer, the resulting number would be a floor function of the RHS. □

Note that with an additional producer, the revenues of existing producers diminish while costs stay the same. I assume the products media producers offer are homogenous, so they cannot establish a monopolistic competition. Then, unless fixed costs are relatively small, the model's outcome is fewer news producers than in markets with no fixed costs or an option for product differentiation. There can also be an equilibrium in which the fixed cost level is too large for any level of demand for news. In that case, if the losses from news production cannot be compensated with the revenues from entertainment, no news would be produced in an equilibrium.

Voters

Each voter J solves her problem as defined in (1), and the optimal demand for news and entertainment is the solution to the following FOC:

$$\begin{aligned} \left((1-\alpha)(1-t^q_{n,J} + \alpha t^q_{n,J}\right)^{\frac{1}{q}-1} \left((\alpha-1)(1-t^{q-1}_{n,J} + \alpha t^{q-1}_{n,J}\right) = \\ \lambda_J(1-\gamma)\left(\Psi(E(r),\hat{t}_n)\frac{\gamma\tau}{N} + \frac{\tau(1-E(r))}{N}\right) + \lambda_J t_{n,J}(1-\gamma)\frac{\partial\Psi(E(r),\hat{t}_n)}{\partial t_{n,J}} \end{aligned} \tag{17}$$

$$\hat{t}_{e,J} = 1 - \hat{t}_{n,J} \tag{18}$$

Existence of an equilibrium

The equilibrium concept is a weak Bayesian Nash equilibrium, and I consider only pure strategies.
The strategy space for all actors: each voter, media producer, and incumbent is a nonempty compact convex subset of an Euclidean space:

$$\begin{aligned} &\text{Voter } J\text{:} \\ t_{n,J} \in [0,1];\ t_{e,J} \in [0,1] \\ &\text{Media producer:} \\ t^s_n \in [0,1];\ t^s_e \in [0,1] \\ &\text{Incumbent:} \\ r \in [0,1] \end{aligned} \tag{19}$$

If the payoff functions for all actors are continuous and quasi-concave in each strategy space: $t_{n,J},\ t_{e,J},\ t^s_n,\ t^s_e,\ r$, and quasi-concave, there exists a pure-strategy Nash equilibrium (Fudenberg and Tirole 1994).
This does not hold for an incumbent's payoff, as:

$$\frac{\partial^2 \Psi(r, \tilde{t}_n}{\partial^2 r} > 0 \tag{20}$$

Therefore, I am using a result from Tian (2015), which characterizes conditions for the existence of a pure Nash equilibrium in a game with non-quasiconcave payoff functions.

TBA

A voter's utility function is quasi-concave in t_n if this condition is satisfied for each voter J:

$$\begin{aligned} (1-q)((1-\alpha)(1-\hat{t}_{n,J})^q)^{\frac{1}{q}-2}((\alpha-1)(1-\hat{t}_{n,J})^{q-1} + \alpha\hat{t}^{q-1}_{n,J})((\alpha-1)(1-\hat{t}_{n,J})^{q-1} + \alpha\hat{t}^{q-1}_{n,J}) \\ +((1-\alpha)(1-\hat{t}_{n,J})^q)^{\frac{1}{q}-1}((q-1)(1-\alpha)(1-\hat{t}_{n,J})^{q-2} + (q-1)\alpha\hat{t}^{q-2}_{n,J}) \\ -2\lambda_J(1-\gamma)\frac{\partial\Psi(\hat{t}_n, E(r))}{\partial t_{n,J}}\frac{\gamma\tau}{N^2} + \lambda_J\hat{t}_{n,J}(1-\gamma)\frac{\partial^2\Psi(\hat{t}_n, E(r))}{\partial^2\hat{t}_{n,J}}\frac{\gamma\tau}{N^2} < 0 \end{aligned} \tag{21}$$

Uniqueness of an equilibrium

Sketch of a proof:

- Construct Jacobian of SOCs
- Verify that the sign of a determinant is smaller than zero
- Perhaps need additional assumptions