The Political Risks of Separating News from Entertainment

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Abstract

One aspect of the ongoing digital revolution is the increased separability of media content. I focus on news and entertainment: how can consumer preferences affect political accountability if these content types become easily substitutable? Using a two-period electoral accountability model, I analyze how voters' allocation of attention between these two options influences an incumbent politician's effort. The model demonstrates that when entertainment is favored over news, increased substitutability results in lower welfare for voters. However, a very high demand for news might motivate a bad incumbent to exert too much effort, boosting her re-election probabilities (*pandering politics*). This is not good for voters, as a re-elected bad incumbent never exerts any effort in the second term. I also show how the distribution of interest in the public good among voters matters for the demand for news: with interest in the public good widely dispersed throughout the population, public scrutiny is stronger. In the policy discussion, I describe the limited impact of subsidizing journalism and highlight the importance of public demand for scrutiny.[1]

JEL Codes: D82, H41, L82

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1 Introduction

The days when voters relied primarily on daily TV news broadcasts or newspapers for political information are long gone. In 2023, the average American devoted just 37% of their media consumption time to traditional media, a significant drop from 68% in 2011.[2] The trend is similar in Europe.[3] Traditional media once bundled news with entertainment — viewers could watch a movie following the evening news, or readers could enjoy crossword puzzles after reading the newspaper. Today, news and entertainment are easier to consume separately: one can subscribe to a movie streaming service or pay for news content independently. Consequently, news and entertainment have become more substitutable.

How effective is public scrutiny in the environment of separable media content? Broadly, I study how media consumption habits following the transition from traditional to digital media could impact political accountability, which I define in the model as the effort a politician puts into producing public goods. Before, even if consumers preferred entertainment over news, they usually had to buy a bundle of both (newspapers, TV), which allowed journalism to be sustained. However, the smaller the electoral district, the fewer people who might be potentially interested in local politics. As consumers can now access entertainment without engaging with news content, journalism might no longer be profitable. This phenomenon might have contributed to the decline of local journalism over the past two decades.[4][5] Without journalism, public scrutiny of politicians diminishes, giving them a greater incentive to reduce their efforts (or extract rents). Thus, political accountability might deteriorate if voters increasingly prefer entertainment over news, and substituting between these types of content becomes easier. I distinguish two motivations to consume news. Firstly, an intrinsic utility from consumption. Secondly, public scrutiny, meaning the more news is being consumed (on average), the larger the incentive for an incumbent to put effort into creating public goods. However, the public scrutiny motive is scaled by the "ethical" parameter: the larger it is, the more a consumer cares about the public good of being informed as a voter. I incorporate heterogeneity in the ethical parameter into the model to capture the free-riding effect of other voters caring about the public good.

I answer the research question with a two-period electoral accountability model with voters, an incumbent, and media producers. The model shows how the relative demand for news and entertainment affects a politician's effort in producing public goods. I focus on the attention voters pay to media: news and entertainment are continuous goods, and voters select how much "attentive time" they spend on either.[6] Their preferences for media are modeled with a CES function, so the model allows for rich demand characteristics. A ruler chooses how much effort to put in the first and second periods in office. The more effort a politician puts

[2]Digital includes time spent on online activities on any device; traditional includes linear TV, radio, print newspapers, magazines, printed catalogs, direct mail, cinema, and OOH. Source: Statista, 28 May 2024.

[3]The equivalent share for the UK was 55% in 2016 and 40% in 2023; and 30% in Spain (source: Statista, 28 May 2024), and 52% in France (source: eMarketer, 28 May 2024).

[4]Digital News Report 2021 — Reuters Institute for the Study of Journalism, access: 13 Jan 2023.

[5]Between 2005 and 2020, about a quarter of the U.S. local publishers were closed, and half of more than 3,000 counties were left with no local news outlet, making them so-called "news deserts". Local media also face difficulties similar to those in other developed countries. In Sweden, between 2009 and 2021, the advertising expenditure in local newspapers decreased by almost 56%, in Canada by 51% between 2015 and 2019, and in Germany, the sales of the local press decreased by more than 27% between 2010 and 2021. Source: www.statista.com, access: 22 May 2022.

[6]I define as entertainment all media content that does not inform about politics.

in, and the more attention voters pay to the news, the larger the probability of re-election. There is free entry for firms that can produce news and entertainment. Consumers can also access entertainment from outside the model in any quantity. This is an important assumption, as entertainment is less likely to be a "locally specialized" product, contrary to news.[7] The results illustrate the political consequences of a relatively weak demand for journalism when entertainment is easily accessible, a scenario particularly relevant to sub-national constituencies such as municipalities.

This study contributes to the theoretical literature on the political economy of media by examining how the substitutability between news and entertainment impacts political accountability. There is buoyant literature on the impact of voter attention (or "rational inattention") on the effectiveness and types of implemented reforms (Prato and Wolton 2018, Hu and Li 2019, Devdariani and Hirsch 2023, Blumenthal 2023, Blumenthal 2025), pandering (Trombetta 2020), polarization (Hu et al. 2023) or electoral outcomes (Martinelli 2006, Bruns and Himmler 2016).[8] Most rational inattention models assume that voters consume political information with a cost. In the model presented here, there is no costly acquisition of information but an "opportunity cost" of not devoting time to entertainment (if it is the preferred media content by voters). This has different implications for the hypothetical welfare-improving policies: in an environment with a strong preference towards entertainment, reducing the cost of consuming news (by, e.g., making news stories shorter and more accessible to voters) might not be effective. In this case, a potentially more suitable policy would be, e.g., a campaign raising awareness about the importance of being an informed voter (similar to campaigns encouraging people to vote), which could increase people's preferences for investigative journalism. While I am assuming an exogenous expectation toward incumbents' behavior in office (the probability of election of a "good" or "bad" politician), Grillo and Prato (2023) analyzes this expectation in relation to voters' *reference points*.

The media market environment in my model illustrates the interplay between media 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 voter monitoring of the incumbent's actions. The main differences from the seminal model of elections by Ferejohn (1986) are 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 (2006), the content produced in equilibrium is determined by the voters' demand.

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, the politician/incumbent, and the 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

[7] While entertainment can usually be consumed by a group of consumers speaking the same language (e.g., movies in the original language), the interest in local political news can be limited to a constituency, such as a municipality.

[8] For a review of the literature on rational inattention, please see Maćkowiak et al. (2023) or Balles et al. (2025).

the game. Voters learn about the size of the public good allocated to them at the end of the game. In putting effort into producing public goods, a good politician faces zero costs, whereas a bad politician faces a cost drawn from a uniform distribution, as in Aruoba et al. 2019. As voters do not directly observe the effort, a politician's decision is characterized by moral hazard. The more voters pay attention to the news, the larger the probability they learn about the effort. 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 reports on a politician's effort only in the news segment. If the news consumption and a politician's effort are large enough, an incumbent is re-elected. The price of media is zero; the only constraint voters face is attention span (normalized to one). A producer's only costs are fixed, as the marginal cost of producing news/entertainment for each additional consumer is nearly zero.[9] Given this set-up of the media environment, more competition does not improve voters' welfare as there is no impact on prices.[10] 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 lazy incumbent does not have enough motivation to exert effort. This is an illustration of adverse selection in the model. Also, the news's political impact is bound 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 of or against a politician).

In the next section, I present the model setting in detail. Section three summarizes the solution and relevant comparative statics. In section four, I analyze political accountability under different distributions of the ethical parameter. Section five analyzes the response of a bad incumbent under different scenarios, and section six describes voters' welfare. Section seven discusses the policy of subsidizing the production of news, and section eight concludes. All proofs and the definition of an equilibrium can be found in the Appendix.

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, her cost of putting in effort is zero. Otherwise, her cost is drawn from a uniform distribution: $c \sim U[0, 1]$. The ruler decides on the amount of effort to put in both periods, and the more effort she puts in, the more likely she is to be re-elected.

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

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

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 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 an "attention budget" constraint: $\hat{t}_{J,n} + \hat{t}_{J,e} = 1$. The aggregate demands for entertainment and news are given 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, as well as 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 market clears. 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 inside the model.[11] 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 at once the optimal amount of effort she puts in the first e_1 and second e_2 period, with $e_t \in [0, 1]$.[12] The public good in period t is proportional to the incumbent's effort: $e_t \tau_t$. The maximum amount of the public good is always larger in the second period ($\tau_1 < \tau_2$).[13]

Then, consumers consume media content. The more they pay attention to the news, the more the incumbent is motivated to exert an effort. The probability of re-election is given by $\rho(\tilde{t}_n, e_1) = \tilde{t}_n \sqrt{e_1}$ and $\tilde{t}_n = \frac{\tilde{T}_n}{N}$ is the average amount of consumed news in equilibrium.[14]

Finally, elections are held during which consumers decide whether to re-elect the incumbent. If they do, the second period of the game begins, in which the politician puts effort e_2 into producing the public good. At the end of the game, consumers learn about the realized level of the public good.

2.2 Consumers/voters

There are no prices for either entertainment or news. Each consumer, $J = 1, \ldots, N$, decides how to allocate their attention between news and entertainment. Both entertainment and news are continuous goods, and each consumer has the same "attention" 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 maximum level of public

[11] 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.

[12] There is no difference if the ruler chooses the effort consecutively, as after the second period there are no re-election incentives. A good incumbent will choose maximum effort in the second period, and a bad incumbent will choose zero effort, regardless of the timing of the decision.

[13] If it were the same, voters would have little motivation to re-elect an incumbent, as the expected public good from not re-electing would be higher than from re-electing.

[14] Putting the average amount of consumed news $\tilde{t}_n$ in the production function is arbitrary.

good in each period τ_t but learn about the politician's effort in both periods at the end of the game. Each consumer, J, gets an equal share of the transfers. Voters are heterogeneous with respect to λ_J, which 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: $\sum_{I=1,I\neq J}^{N} \lambda_I t_{n,I}$.

Each consumer/voter J is maximizing the following utility function:

$$\begin{aligned}\hat{t}_{J,n}, \hat{t}_{J,e} = \arg\max_{t_{J,n}, t_{J,e}} & \underbrace{\left((1-\alpha)\, t_{J,e}^{q} + \alpha\, t_{J,n}^{q}\right)^{\frac{1}{q}}}_{\text{Intrinsic utility}} \\ & + \frac{1}{N}\left(\sum_{I=1,I\neq J}^{N} \lambda_I t_{n,I} + \lambda_J t_{n,J}\right) \\ & \times \Bigg[\underbrace{\gamma\left(\tau_1 + \rho(\hat{t}_n, 1)\,\tau_2\right)}_{\theta=g} \\ & \quad + \underbrace{(1-\gamma)}_{\theta=b}\left(\underbrace{\rho(\hat{t}_n, e_1)}_{\text{Bad re-elected}}\ \tau_1 e_1 + \underbrace{\left[1-\rho(\hat{t}_n, e_1)\right]}_{\text{Bad not re-elected}}(\tau_1 e_1 + \gamma\tau_1)\right)\Bigg]\end{aligned} \tag{1}$$

$$\begin{aligned}\text{s.t.}\quad & q \in (-\infty, 0) \cup (0, 1], \\ & 0 \leq t_{J,n} + t_{J,e} \leq 1, \\ & \hat{t}_n = \frac{\hat{T}_n}{N}, \quad \tau_1 < \tau_2, \\ & \alpha \in (0,1), \quad \gamma \in (0,1), \\ & \lambda_J \sim \text{Beta}(\alpha_1, \beta_1), \\ & \rho(\tilde{t}_n, e_1) = \tilde{t}_n\sqrt{e_1}.\end{aligned}$$

The intrinsic utility of consuming news $t_{J,n}$ and entertainment $t_{J,e}$ for consumer J takes the form of the CES function with substitution parameter q and preference for news parameter α (top part of the equation 1). The remaining part of the utility function is the expected utility from the public good in both periods, which is distributed equally among all voters N. It is scaled by the own ethical parameter $\lambda_J t_{n,J}$ and others': $\left(\sum_{\substack{I=1\\I\neq J}}^{N} \lambda_I t_{n,I}\right)$. Therefore, even if a voter does not care about the public good of being informed (when λ_J is relatively low), she can "free ride" on others' interest in news. Importantly, *consumers' attention also matters in case of* $\theta = g$, as even if a good incumbent exerts maximum effort, but if consumers are not interested in news, they might not re-elect her. If a bad incumbent is not re-elected, a new incumbent is determined exogenously with probability of being a good type γ.

The elections are held after voters consume media content. A voter J votes for re-election if the expected public good in the second term is larger than $\gamma\tau_1$, that is, the expected value of public good if an incumbent is not re-elected and the newly elected politician is of good type. Formally, a voter J votes for the re-election of an incumbent if:

$$\begin{aligned}\gamma\rho(\hat{t}_n, e_1)\tau_2 + (1-\gamma)\rho(\hat{t}_n, e_1) \times 0 > \gamma\tau_1 \\ \implies \hat{t}_n > \sqrt{\frac{\tau_1}{\tau_2} 2c}\end{aligned} \tag{2}$$

From (2), we can see that the voting decision is homogeneous. In case of equality, a voter tosses a coin. An incumbent wins the elections if $\rho(\tilde{t}_n, e_1) > 0.5$.

2.3 Media firms

Media firms are symmetric and supply a homogeneous bundle consisting of news and entertainment. A firm's content choice is summarized by the share of attention devoted to news, denoted $t_n^s \in [0,1]$, with the remaining share $1 - t_n^s$ allocated to entertainment. Firms earn advertising revenue proportional to the amount of time consumers spend watching each type of content.

Realized attention. Let $t_J \in [0,1]$ denote voter J's desired share of attention devoted to news. Given supplied news t_n^s, realized news consumption by voter J is

$$\tilde{t}_J = \min\{t_J, t_n^s\},$$

with realized entertainment consumption equal to $1 - \tilde{t}_J$. Thus, when supply is limited, voters may be rationed and unable to consume their desired amount of news.

Advertising revenue. Advertising revenue is directly proportional to the time spent consuming each type of media. Let $A_n > 0$ and $A_e > 0$ denote advertising rates per unit of attention for news and entertainment, respectively. If $M \in \mathbb{N}$ firms enter symmetrically, per-firm advertising revenue is

$$\frac{N}{M}\left[A_n \frac{1}{N}\sum_{J=1}^{N}\min\{t_J, t_n^s\} + A_e \frac{1}{N}\sum_{J=1}^{N}\min\{1 - t_J, 1 - t_n^s\}\right].$$

Each firm incurs fixed costs FC_n and FC_e associated with producing news and entertainment, respectively.

Profits and firm choice. Given the profile of voters' desired news shares $t = (t_J)_{J=1}^N$ and the number of active firms M, per-firm profits are given by

$$\Pi(t_n^s; t, M) = \frac{N}{M}\left[A_n \frac{1}{N}\sum_{J=1}^{N}\min\{t_J, t_n^s\} + A_e \frac{1}{N}\sum_{J=1}^{N}\min\{1 - t_J, 1 - t_n^s\}\right] - FC_n - FC_e. \quad (3)$$

Firms choose $t_n^s \in [0,1]$ to maximize profits. Because advertising revenue depends on realized attention and entry is discrete, the profit function need not be differentiable and optimal supply may be set-valued. Accordingly, firm behavior is characterized via best-response conditions rather than first-order conditions.

Entry. Entry is free. If $\max_{t_n^s \in [0,1]} \Pi(t_n^s; t, 1) \geq 0$, firms enter until profits are driven to zero. That is, in equilibrium there exists an integer $M \geq 1$ and a supply choice t_n^s satisfying

$$t_n^s \in \arg\max_{t \in [0,1]} \Pi(t; t, M) \quad \text{and} \quad \Pi(t_n^s; t, M) = 0.$$

If $\max_{t_n^s \in [0,1]} \Pi(t_n^s; t, 1) < 0$, no firm enters and $M = 0$.

The media market equilibrium is therefore characterized by profit maximization and free entry, allowing for corner solutions, non-differentiabilities, and rationing. Rationing refers to the situation in which supplied news content t_n^s is insufficient to meet some consumers' desired news consumption, so that realized consumption satisfies $\tilde{t}_J = \min\{t_J, t_n^s\}$.

This formulation accommodates high fixed costs and discrete entry and will be used throughout the paper.

2.4 Incumbent

I assume that a ruler has risk-neutral preferences and knows how much news is consumed by voters. In each period in office, she receives a remuneration of r.
If an elected politician is good, she faces no costs of exerting effort, $c = 0$. If she is of a bad type, her cost is drawn from a uniform distribution $c \sim U(0,1)$ (before solving the optimization problem). Each type chooses an amount of effort to put in both periods:

$$\begin{aligned} \hat{e}_1, \hat{e}_2 = arg \max_{e_1,e_2} \{(1 - c(\theta)e_1)r + (1 - c(\theta)e_2)r\rho(\hat{t}_n, e_1)\} \\ \text{s.t.} \\ e_1, e_2 \in [0,1]; \quad r > 0 \\ \rho(\hat{t}_n, e_1) = \hat{t}_n \sqrt{e_1} \\ c(\theta = g) = 0; \quad c(\theta = b) \sim U(0,1) \end{aligned} \tag{4}$$

2.5 Equilibrium concept

I focus on pure strategies, and the characterized equilibrium is weakly perfect Bayesian. On an equilibrium path, the ruler chooses the level of effort, taking the attention of consumers to news as given, and consumers divide their attention between news and entertainment, correctly foreseeing the effort of an incumbent, given $Pr(\theta)$ and expected cost of effort, $E(c)$. The appendix includes the definition of equilibrium (Appendix A), along with proofs of its existence (B) and uniqueness (C).

3 Solution

In equilibrium, three mechanisms determine political accountability, understood as the probability of re-electing a good incumbent and ousting a bad one:

(i) **Incumbent effort.** A good type exerts full effort in both periods, while a bad type exerts positive effort only in the first period, with intensity increasing in the average attention to news $\tilde{t}_n$ and decreasing in her cost of effort.

(ii) **Probability of re-election.** The probability that an incumbent is re–elected is increasing in both news attention and first–period effort, $\rho(\tilde{t}_n, e_1) = \tilde{t}_n \sqrt{e_1}$. Thus, higher news consumption strengthens accountability.

(iii) **Consumer demand and media supply.** Consumers divide their attention between news and entertainment depending on intrinsic preferences (α, q) and ethical concerns (λ_J). In equilibrium, media firms simply supply the aggregate amount of news that consumers demand.

While consumers' choices of attention directly discipline a bad incumbent, it is not optimal to confuse her with a good type. Political accountability is stronger when news is more attractive (high α), and when ethical concerns (λ_J) are more pronounced, but only in the case of a good incumbent or a bad incumbent exerting little effort. Therefore, “too much” interest in news might not be optimal if a bad incumbent chooses to exert large enough effort to be re-elected.

Equilibrium characterization. *In the two–period game described in Section 2, there exists a unique weakly perfect Bayesian equilibrium with the following properties:*

(i) *A good incumbent exerts full effort in the first period ($e_1 = 1$) and again in the second period, while a bad incumbent exerts*

$$e_1^*(c;\, \tilde{t}_n) = \min\left\{1,\ \left(\frac{\tilde{t}_n}{2c}\right)^2\right\}, \qquad e_2^* = 0,$$

where $c \sim U[0,1]$ and $\tilde{t}_n$ is the average share of attention devoted for news.

(ii) *The re-election probability of an incumbent is:*

$$\rho(\tilde{t}_n, e_1) = \tilde{t}_n\sqrt{e_1},$$

(iii) *Consumers allocate attention between news and entertainment according to their CES preferences and their ethical parameter λ_J, with the optimal news share $t^*_{J,n}$ characterized by the first–order condition (6).*

(iv) *Media producers supply exactly the average demanded news share, $\tilde{t}_n = t^s_n$, subject to free entry and zero profits, unless fixed costs are too high relative to revenues.*

Moreover, the equilibrium demand for news is strictly positive and uniquely determined for $q < 1$ and $\alpha \in (0, 1)$.

A more formal definition of equilibrium, along with proofs, can be found in the Appendix. Here, I provide a step-by-step solution to the model. I solve the problem using backward induction, starting with an incumbent who takes an average news which will be supplied and consumed as given, $\tilde{t}_n$.

Incumbent’s turn. As a good incumbent has zero cost of exerting an effort, and she wants to be re-elected, she maximizes her effort in period one. In period two, she is indifferent between any value of effort (I assume she exerts again the largest possible effort, $e_2 = 1$). An optimal effort of a bad type in period two is zero (there is no incentive to exert any effort, as it is not possible to be re-elected after the second period). In period one, the optimal effort is given by:

$$\frac{\partial \rho(\tilde{t}_n, e_1)}{\partial e_1} = \frac{c}{1 - ce_2}$$

$$\text{If } e_2 = 0 \text{ and } \rho(\tilde{t}_n, e_1) = \tilde{t}_n\sqrt{e_1}, \text{ we have:} \tag{5}$$

$$e_1^* = \left(\frac{\tilde{t}_n}{2c}\right)^2$$

A bad incumbent’s effort thus increases with the average amount of news, but decreases faster with the cost of effort. Her welfare, if re-elected, is $(1 - ce_1^*)r + r$ if she is of a bad type, and $2r$ if she is good. If not re-elected, the bad type gets $(1 - ce_1^*)r$, and the good type gets r.

Firms' turn. For firms, profits may be non-differentiable, and entry is discrete, the analysis proceeds by examining the structure of profits rather than by solving first-order conditions.

Fix the profile of voters' desired news shares $t = (t_J)_{J=1}^N$ and the number of active firms M. The profit function (3) is continuous and piecewise linear in t_n^s, with kinks at values of t_n^s equal to $\{t_J\}_{J=1}^N$ and $\{1 - t_J\}_{J=1}^N$. These kinks reflect changes in the set of consumers who are constrained by available supply.

Consider increasing the supplied news t_n^s marginally. The resulting change in advertising revenue depends on the measure of voters whose desired news consumption exceeds t_n^s. When many voters are constrained, increasing t_n^s raises news viewership substantially; when few voters are constrained, the marginal gain from additional news is small. As a result, optimal supply balances the marginal gain from increasing news viewership against the corresponding reduction in entertainment viewership. Depending on parameters, the profit-maximizing supply may be interior, at a corner, or belong to a non-degenerate interval. An increase in the advertising rate for news, A_n, weakly raises the set of optimal news supplies, while an increase in the advertising rate for entertainment, A_e, weakly lowers it. Intuitively, higher news advertising revenue increases the marginal return to reallocating attention toward news, even when some consumers are already unconstrained. Similarly, higher fixed costs reduce entry and can lead firms to optimally supply less news, increasing the prevalence of rationing. These comparative statics do not rely on differentiability or interior solutions and therefore remain valid in the presence of kinks and the discrete entry. In equilibrium, supplied news must belong to the set of profit-maximizing supplies for the endogenously determined number of firms. The interaction between firms' supply choices and voters' consumption decisions is resolved through a fixed-point condition, formally analyzed in the Appendix.

Consumers' turn. As it is backward induction, consumers solve their problem first. Their solution follows the FOC:

$$\begin{aligned}
&\underbrace{\left[(1-\alpha)(1-t_{J,n})^q + \alpha\, t_{J,n}^q\right]^{\frac{1}{q}-1}\left[\alpha\, t_{J,n}^{q-1} - (1-\alpha)(1-t_{J,n})^{q-1}\right]}_{\text{Marginal intrinsic utility}} = \\
&\qquad \underbrace{-\frac{\lambda_J}{N}\Big\{\gamma\big(\tau_1 + \hat{t}_n\tau_2\big) + (1-\gamma)\,\tau_1\big(e_1 + \gamma - \hat{t}_n\,\gamma\sqrt{e_1}\big)\Big\}}_{\text{direct own-}\lambda_J t_{J,n}\text{ effect}} \\
&\underbrace{-\frac{1}{N^2}\Big(\sum_{I=1}^{N}\lambda_I t_{I,n}\Big)\,\gamma\Big(\tau_2 - (1-\gamma)\tau_1\sqrt{e_1}\Big)}_{\text{aggregate feedback via }\hat{t}_n}, \qquad \hat{t}_n = \frac{1}{N}\sum_{I=1}^{N} t_{I,n}.
\end{aligned} \tag{6}$$

The solution exists and it is unique for $q < 1$ and $\alpha \in (0,1)$ (please see Appendix). If $\alpha < 0.5$, the LHS of (6) could be negative, and thus the marginal utility from consuming more news (instead of preferred entertainment) should be equal to the marginal political payoff from more news (note that $\tau_2 > \tau_1$).

If an incumbent is of a good type and is re-elected, the welfare per consumer is equal to $V^g = ((1-\alpha)\tilde{t}_e^q + \alpha\tilde{t}_n^q)^{\frac{1}{q}} + \sum_{J=1}^N \lambda_J t_{n,J}\frac{\tau_1+\tau_2}{N}$. When an incumbent is of a bad type and is re-elected, realized welfare for each consumer is $V_J^{b,rel} = ((1-\alpha)\tilde{t}_{J,e}^q + \alpha\tilde{t}_{J,n}^q)^{\frac{1}{q}} + \sum_{J=1}^N \lambda_J t_{n,J}\frac{e_1^*\tau_1}{N}$, $\forall_{J\in N}$; and when she is not re-elected, it is $V_J^{b,nrel} = ((1-\alpha)\tilde{t}_{J,e}^q + \alpha\tilde{t}_{J,n}^q)^{\frac{1}{q}} + \sum_{J=1}^N \lambda_J t_{n,J}\frac{\tau_1 e_1^* + \gamma\tau_1}{N}$, $\forall_{J\in N}$. Note that the "public scrutiny" part of the welfare ($\sum_{J=1}^N \lambda_J t_{n,J}$) is increasing with the number of voters, but transfers per capita $\frac{\tau_t}{N}$ 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 consumer. How do consumers conjecture the level of effort in the first period chosen by an incumbent, e_1^*? They know the incumbent's FOC (5) and the distribution of costs $c \sim U(0,1)$. It follows that $E(e_1^*) = \tilde{t}_n^2$

While the solution exists for all $q < 1$, its closed form exists for some $q < 1$. I consider two cases: news and entertainment are complementary goods ($q = -1$), or substitutive goods ($q = \frac{1}{2}$).

- Complementary goods, $q = -1$:

$$\begin{aligned} K(\hat{t}_n) &= \gamma\big(\tau_1 + \hat{t}_n\,\tau_2\big) + (1-\gamma)\,\tau_1\big(e_1 + \gamma - \hat{t}_n\,\gamma\sqrt{e_1}\big), \\ K'(\hat{t}_n) &= \gamma\big(\tau_2 - (1-\gamma)\,\tau_1\sqrt{e_1}\big) \\ \hat{t}_n \;=\; \frac{1}{N}\sum_{J=1}^{N} t_{J,n}, &\qquad \bar{\Lambda} \;=\; \frac{1}{N}\sum_{J=1}^{N}\lambda_I\, t_{J,n} \\ C_J \;&=\; \frac{\lambda_J}{N}\,K(\hat{t}_n) \;+\; \frac{\bar{\Lambda}}{N}\,K'(\hat{t}_n) \\ y^* \;=\; \frac{-\,C_J\,\alpha(1-\alpha) \;+\; \sqrt{\alpha(1-\alpha)\,\big[\,1 + C_J(2\alpha-1)\,\big]}}{\alpha\,(1 + C_J\alpha)}&, \\ &\boxed{t^*_{J,n} \;=\; \frac{1}{1+y^*}}. \end{aligned} \tag{7}$$

  Note that $\frac{\lambda_J}{N}K(\hat{t}_n)$ is equal to the direct own-$\lambda_J t_{J,n}$ effect from (6) and $\frac{\bar{\Lambda}}{N}K'(\hat{t}_n)$ to the aggregate feedback via $\hat{t}_n$ from (6).

- Substitution goods, $q = \frac{1}{2}$:

$$\begin{aligned} X \;=\; 2\alpha - 1 + C_J, \qquad m \;=\; 2\alpha(1-\alpha), \qquad D \;=\; X^2 + m^2 \\ \boxed{t^*_{J,n} \;=\; \frac{(X+\sqrt{D})^2}{(X+\sqrt{D})^2 + m^2}} \end{aligned} \tag{8}$$

In these special cases, the closed-form best responses permit a direct comparison of the equilibrium news share $t_{J,n}$ under the same policy term C_J. The latter is proportional to the sum of the utility and the marginal utility from expected transfers (see 7).

Proposition 1. *Let $X := 2\alpha - 1 + C_J$. It follows from the respective closed forms that:*

$$\operatorname{sign}\Big(t_{J,n}^{(1/2)} - t_{J,n}^{(-1)}\Big) = \operatorname{sign}(X).$$

Proof in the Appendix D

Remark. *The case of substitution goods ($q = \frac{1}{2}$) yields a larger news share than the complementary case ($q = -1$) if and only if $\alpha > (1 - C_J)/2$, and the reverse holds when $\alpha < (1 - C_J)/2$.*

This comparison captures the intuitive idea that, holding the policy term fixed, preferences biased toward entertainment ($\alpha < 1/2$) will result in relatively more news consumption when goods are stronger complements, while preferences biased toward news ($\alpha > 1/2$) will yield a larger news share when goods are easier substitutes.

From now on, I distinguish "non-separable media" (when $q < 0$), and "separable media" (when $q > 0$).

3.1 Change in ethical parameter λ_J

I analyse the demand for news when a consumer increases their concerns over being informed as a voter (i.e., an λ_J increases). More specifically, is there a difference in demand for news between separable and non-separable environments after a change in λ_J?

Proposition 2. *A marginal increase in the ethical parameter λ_J leads to:*

- *larger positive response in demand for news when media are separable ($q > 0$), and voters prefer entertainment at least as much as news ($\alpha \leq 0.5$):*

$$\left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} > \left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0},$$

- *larger positive response in demand for news when media are non-separable ($q < 0$), and voters prefer news over entertainment ($\alpha > 0.5$):*

$$\left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} < \left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0},$$

Proof in the Appendix E

When intrinsic preferences do not strongly favor news ($\alpha \leq 1/2$), an increase in concern for being informed (λ_J) raises the optimal news share more strongly when news and entertainment are easily substitutable. In this case, reallocating attention away from entertainment is relatively easy, so policy incentives translate smoothly into higher news consumption. When intrinsic preferences favor entertainment ($\alpha < 1/2$) and news and entertainment are complementary, an increase in concern for being informed raises optimal news consumption only gradually. In this case, shifting attention toward news necessarily reduces entertainment consumption, which in turn lowers the marginal utility of news. As a result, complementarity dampens the response of news demand to changes in λ_J, and the optimal allocation remains interior.

When intrinsic preferences are news-loving ($\alpha > 1/2$), the mechanism is different. In the non-separable case, strong complementarity implies that the marginal utility of news falls rapidly once entertainment is crowded out. As a result, the optimal choice may lie close to the boundary between an interior and a corner solution. A small increase in λ_J can then shift the consumer to a near-corner allocation, generating a large increase in the optimal news share. For this reason, holding $\alpha > 1/2$ fixed, the non-separable case can exhibit a larger response of $t^*_{n,J}$ to changes in λ_J than the separable case.

If we remain in the interior regime of $t^*_{n,J}$ and focus on the case of preferred entertainment $\alpha < 0.5$, the reaction to the marginal increase in λ_J is stronger for the separable media case. It follows that a decrease in voters' interest in being informed ($\Delta\lambda_J < 0$) reduces optimal news consumption. Locally, this reduction is stronger in the separable media environment than in the non-separable one, reflecting the same substitution forces discussed above. In the next section, I switch attention from changes of λ_J given one distribution to changes in distribution given λ_J. In other words, I study aggregate news demand under different distributions of λ_J, using the uniform distribution $\lambda_J \sim U(0, 1)$ as a baseline.

4 The role of λ_J distribution

Assume there are 60 voters, they prefer entertainment over news ($\alpha = 0.4 < 0.5$), the probability of electing a good incumbent is 0.6, and the difference between the maximum public good in the second and first period is 5 ($\tau_2 - \tau_1 = 5$). I estimate the best responses of consumers and plot the histogram of individual optimal news shares $t^*_{J,n}$ in the non-separable ($q = -1$) and separable ($q = \frac{1}{2}$) media environment and four λ_J distributions: $U(0,1)$, $Beta(0.5, 0.5)$, $Beta(2,5)$, and $Beta(5,2)$.

Non-separable media. Histograms (1) show the demand for news according to the four distributions listed above. The demand is computed using the best response of the incumbent, and assuming no rationing from the media sector.

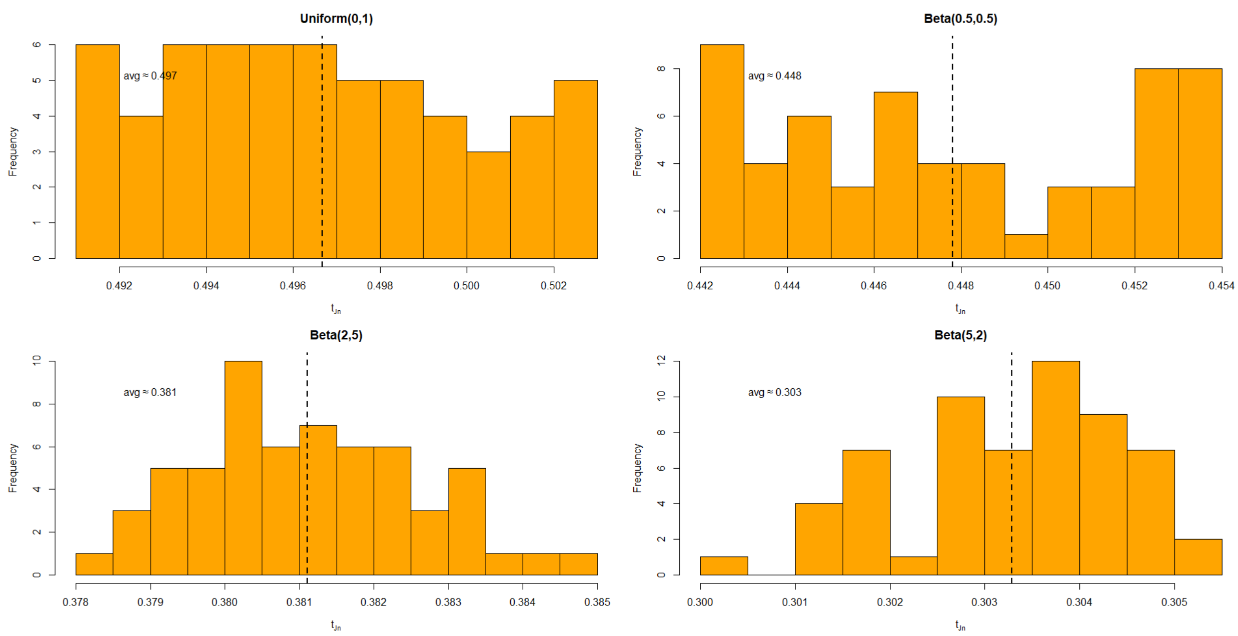

Figure 1: Distribution of the demand for news in the environment of non-separable media content (for $q = -1$).

The results show meaningful dispersion and shifts in the equilibrium cross-section. Interestingly, the average demand for news is the largest for the uniform distribution, even in comparison with $Beta(5,2)$, which is left-skewed. Because λ_J multiplies $t_{J,n}$ inside the aggregate, higher-λ agents adjust more, so the *shape* of the λ distribution (not just its mean) affects $\bar{t}_n$ and the full cross-sectional distribution of $t^*_{J,n}$.

Separable media content. Histograms (2) show the analogous distribution as in (1) but for $q = \frac{1}{2}$, which I interpret as separable media content. Again, the uniform distribution of λ_J results in the largest average demand for news, but it is smaller than in (1): $\hat{t}_{n,sep} = 0.486 < 0.497 = \hat{t}_{n,nsep}$. Also, the values are smaller for the remaining three cases, with the in-between differences steeper than in the non-separable media environment.

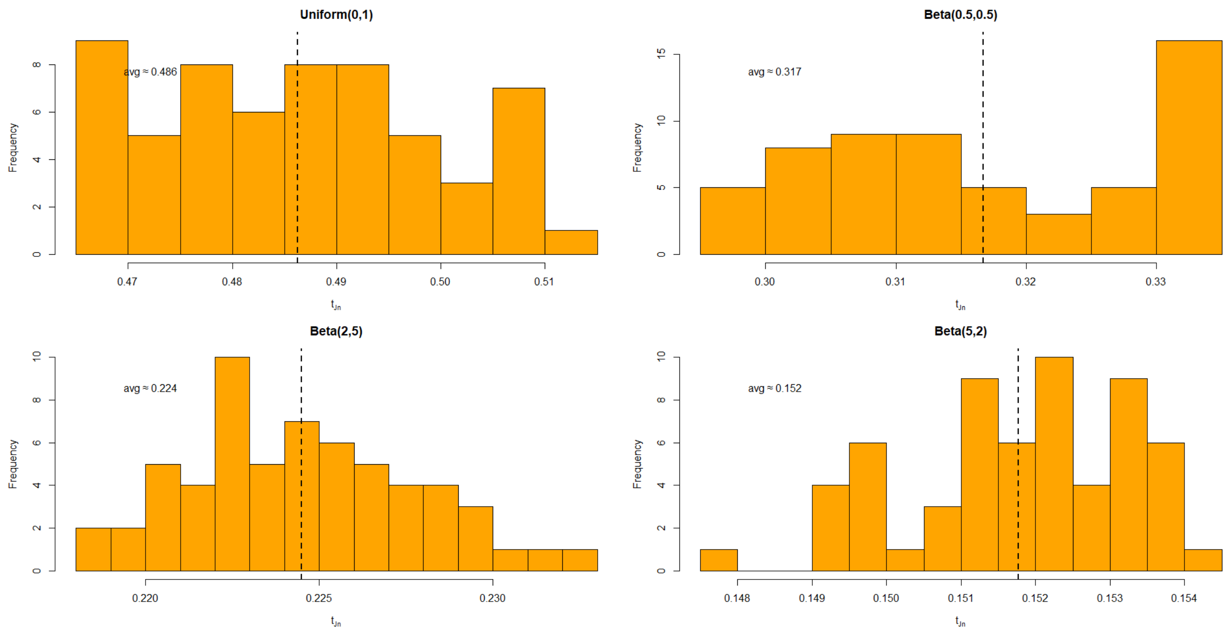

Figure 2: Distribution of the demand for news in the environment of separable media content ($q = \frac{1}{2}$)

Similarly to (1), the distribution with the second greatest average demand for news is $Beta(0.5, 0.5)$, with both tails thick. Interestingly, the lowest average demand for news is for the left-skewed distribution of λ_J, $Beta(5, 2)$.

In this configuration of parameter values, the shift from non-separable to separable media content brought a decrease in the average demand for news. It follows that in an environment where entertainment is preferred over news ($\alpha = 0.4$), easier substitutability between these content types decreases the average demand for news. In Proposition 3, I formulate the general case, showing how the Beta distribution of λ_J shapes the gap in news when media switch from $q < 0$ to $q > 0$.

Proposition 3 (Distributional effects of changing media technology)**.** *Fix two media technologies $q^- < 0 < q^+ < 1$. For any scalar incentive index C, let $t_q^*(C)$ denote a voter's optimal share of news consumption under technology q, and define the technology gap (difference in news consumption for a voter between non-separable and separable media):*

$$h(C) \; := \; t_{q^-}^*(C) - t_{q^+}^*(C).$$

Let λ denote voters' concern for being informed, and suppose that $C = a\lambda + b$, where $a \neq 0$ and b are treated as fixed. For any distribution F of λ on $[0, 1]$, define the average technology gap

$$\Delta(F) \; := \; \mathbb{E}_{\lambda \sim F}[h(a\lambda + b)] \, .$$

The object $\Delta(F)$ measures the average difference in news consumption between the two media technologies; when $h(C) \geq 0$ on the relevant range, $\Delta(F)$ can be interpreted as the average drop in news demand induced by the change in technology.

Assume that for all λ in the support of F and for both technologies $q \in \{q^-, q^+\}$, the optimal news choice is interior, i.e. $t_q^*(a\lambda + b) \in (0, 1)$, and that h is three times continuously differentiable on $\mathcal{C}$, where $\mathcal{C}$ contains $\{a\lambda + b : \lambda \in \mathrm{supp}(F)\}$.

(i) ***Dispersion.*** *Let F_1 and F_2 be two distributions on $[0, 1]$ with the same mean and suppose that F_2 is a mean-preserving spread of F_1. The two distributions have the* *same mean, and $\mathbb{E}[\phi(\lambda)]$ is weakly larger under F_2 than under F_1 for every convex function ϕ. This notion captures increased dispersion without changing the mean.*

If h is convex on $\mathcal{C}$ (i.e. $h''(C) \geq 0$ for all $C \in \mathcal{C}$), then

$$\Delta(F_2) \;\geq\; \Delta(F_1).$$

If instead h is concave on $\mathcal{C}$ (i.e. $h''(C) \leq 0$), the inequality reverses.

Dispersion matters because media technology changes affect moderate voters the most, and dispersion determines the number of such voters.

(ii) ***Location (first-order stochastic dominance).*** *Let F_1 and F_2 be two distributions on $[0,1]$ such that F_2 first-order stochastically dominates F_1. If h is nondecreasing on $\mathcal{C}$ (i.e. $h'(C) \geq 0$ for all $C \in \mathcal{C}$), then*

$$\Delta(F_2) \;\geq\; \Delta(F_1).$$

If instead h is nonincreasing on $\mathcal{C}$ (i.e. $h'(C) \leq 0$), the inequality reverses.

Location matters because shifting the distribution of λ changes the weight placed on voters whose news consumption is most sensitive to media technology.

(iii) ***Skewness (local third-moment effect).*** *Fix a baseline distribution F_0 on $[0,1]$ with mean μ and consider a perturbation F_ε that preserves the mean and variance of λ and changes only its centered third moment by $\Delta m_3(\varepsilon)$, with $\Delta m_3(\varepsilon) \to 0$ as $\varepsilon \to 0$. Then, for ε sufficiently small,*

$$\Delta(F_\varepsilon) - \Delta(F_0) = \frac{a^3}{6}\, h^{(3)}(C_0)\, \Delta m_3(\varepsilon) \;+\; o(\Delta m_3(\varepsilon))\,,$$

where $C_0 := a\mu + b$ and $\frac{o(\Delta m_3(\varepsilon))}{\Delta m_3(\varepsilon)} \to 0$ as $\varepsilon \to 0$. In particular, the sign of the change in Δ induced by a small increase in skewness is given by $\operatorname{sign}\big(a^3 h^{(3)}(C_0)\big)$.

Skewness matters because a small group of extreme voters can have a disproportionate impact when individual responses are asymmetrically distributed around the mean. Individual responses are asymmetric around the mean when voters who care more about being informed react differently to technology changes than equally distant voters who care less.

Proof in the Appendix F.

Economic intuition. Proposition 3 shows that the aggregate difference in news consumption between the two media technologies is shaped not only by the mean of voters' "interest in being informed" λ, but also by how that interest is distributed across the population. The key object is the individual *technology gap* $h(C) = t^*_{q^-}(C) - t^*_{q^+}(C)$, which measures how much a voter with incentive index $C = a\lambda + b$ changes her news consumption when moving from the non-separable to the separable environment. Aggregating across voters amounts to averaging $h(C)$ over the cross-section, $\Delta(F) = \mathbb{E}[h(a\lambda + b)]$. Thus, distributional changes matter only insofar as different λ-types contribute different values of $h(\cdot)$.

A useful way to interpret the results is to distinguish voters who are *insensitive* to media technology from those who are *sensitive*. Insensitive voters are those who consume very little news under either technology (very low λ) or consume a lot of news under either technology (very high λ). Sensitive voters are those with intermediate λ, for whom the technology choice meaningfully changes the relative attractiveness of news and entertainment and therefore induces a larger gap $h(C)$. As the Proposition 3 relies on the notion of convexity/concavity of $h(C)$, I outline below the intuition behind these concepts.

When is the technology gap convex? The curvature of the technology gap

$$h(C) = t^*_{q-}(C) - t^*_{q+}(C)$$

is a local property that depends on the relative curvature of the best-response functions under the two media technologies. In particular, h is convex on a given range of C if the best response under the non-separable technology bends upward more strongly (or is less concave) than under the separable technology on that range.

A set of sufficient conditions under which convexity of h is likely to obtain on the relevant range are the following. First, optimal news consumption must be interior for both technologies, so that corner solutions do not flatten the response. Second, intrinsic preferences should not be strongly news-loving (e.g. $\alpha < 1/2$), so that voters are not already close to maximal news consumption. Third, complementarity in the non-separable case ($q_- < 0$) should be sufficiently strong relative to substitutability in the separable case ($q_+ > 0$), so that increases in the incentive index C lead to an accelerating adjustment of news demand under the non-separable technology.

Even when h is convex at low or moderate values of C, convexity need not hold globally. As C increases and voters approach high levels of news consumption under both technologies, best responses tend to flatten due to diminishing marginal utility and proximity to corner solutions. In this region, the separable technology may exhibit greater curvature than the non-separable one, causing the technology gap to become concave. Accordingly, the sign of $h''(C)$ should be understood as range-dependent, and distributional results based on convexity apply only on the subset of C induced by the relevant support of λ.

Now we have all the building blocks to understand conditions of minimizing the aggregate technology gap (difference in news consumption between non-separable and separable media environments):

1. **High dispersion around a fixed mean reduces the gap when h is convex on the relevant range.** If $h(C)$ is largest for intermediate C and small at the extremes, then concentrating probability mass toward very low and very high λ (i.e., increasing heterogeneity while holding the mean fixed) reduces $\Delta(F)$, because it shifts weight away from the types for whom technology matters most. Economically, when many voters are either almost indifferent to news or highly committed to it, a change in media technology has muted aggregate impact. Figure 3 shows the intuition for the convex $h(c)$ for two distinct cases: tight (less disperse) density of ($\lambda \sim Beta(10, 10)$ and wide (more disperse) density ($\lambda \sim Beta(0.6, 0.6)$), both having the same means. Dashed lines correspond to the densities, while solid lines depict the technology gap $h(\lambda)$. Intuitively, the gap is negative for low values of λ (indifferent voters): when news and entertainment become easy to substitute, these voters switch to entertainment. Shaded areas correspond to the contribution of $h(\lambda)$ to the average technology gap ΔF. On average, the decline in news consumption when media switches from non-

separable to separable occurs for tight density (lower dispersion) ($\Delta F_{tight} = -0.035$ vs $\Delta F_{wide} = -0.024$.)

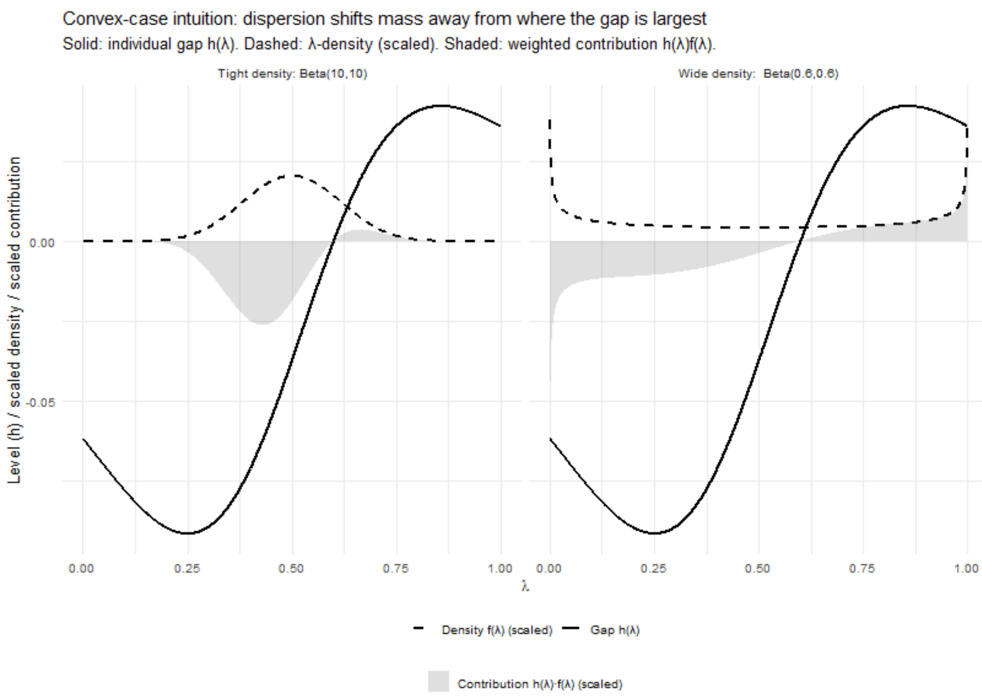

Figure 3

2. **Location (mean shifts).** An upward shift in the distribution of λ reduces the average technology gap whenever voters at higher λ are less sensitive to media technology than voters at lower or intermediate λ. The latter occurs when voters are entertainment-loving ($\alpha < 0.5$) and $h(c)$ is convex. In this case, increasing the mean of λ shifts the weight toward voters whose news consumption is relatively insensitive to the media environment, thereby dampening the aggregate effect of a technological change.

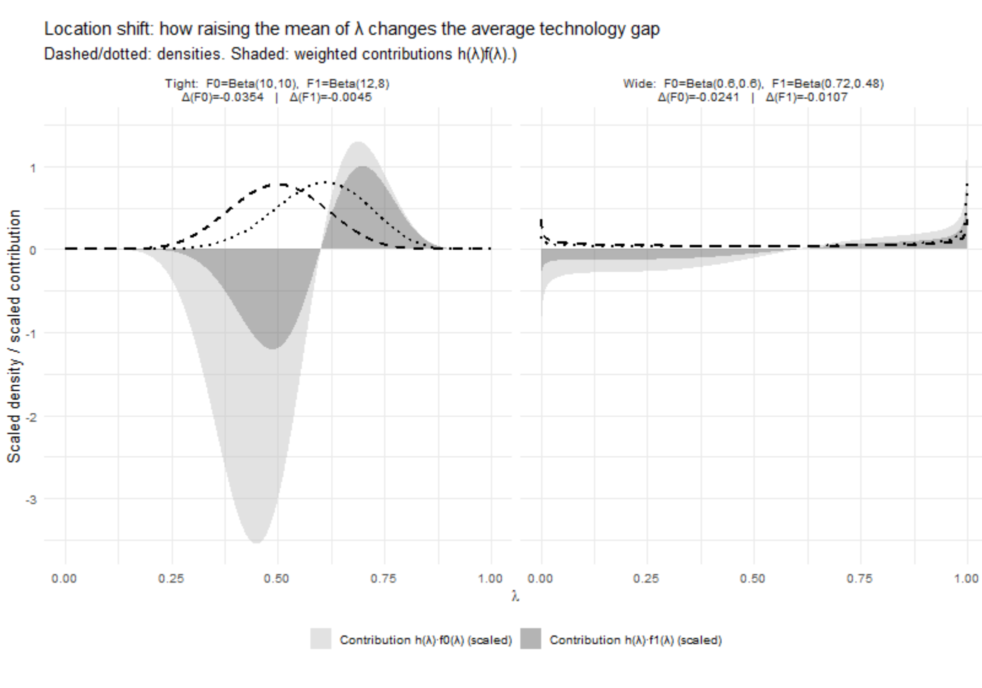

Figure 4

Figure 4 shows the same densities as Figure 3, but in both cases, there is an additional curve with the mean shifted upward (dotted line, contribution to average technology gap in darker gray). We can see that, especially for the case of tight distribution, the technology gap ΔF shrinks for distributions with larger mean ($\Delta(F0_{tight}) = -0.0354$ vs. $\Delta(F1_{tight} = -0.0045)$; and ($\Delta(F0_{wide}) = -0.0241$ vs. ($\Delta(F1_{tight} = -0.0107)$.

3. **Skewness matters only insofar as the gap differs between the high- and low-λ tails.** Holding mean and dispersion fixed, skewness shifts probability mass toward one tail. If the technology gap is larger among low-λ voters than among high-λ voters, then shifting mass toward the right tail (positive skewness) lowers $\Delta(F)$; if the opposite is true, it raises $\Delta(F)$. Location determines how responsive the average voter is, while skewness determines whether extreme voters matter more on one side of the distribution than the other. In the numerical illustrations depicted on Figures 3 and 4, the distributions of λ are symmetric around their mean, so skewness plays no role. This allows us to isolate the effects of dispersion and location without confounding them with asymmetry in the distribution.

In sum, the aggregate technology gap is smallest when the distribution of λ places relatively little mass on the voters for whom media technology matters most. In the empirically relevant case in which the individual gap is largest for intermediate λ and attenuated at the extremes, this occurs when (i) λ is highly dispersed (many voters near 0 or 1 rather than in the middle) and/or (ii) the population is shifted toward high λ so that many voters consume news under either technology.

In our calibration, numerical inspection of $t_q^*(C_0)$ (via the closed forms for $q \in \{-1, 1/2\}$) shows that on the relevant C–range we have the sign pattern:

$$h'(C_0) \; < \; 0, \qquad h''(C_0) \; > \; 0, \qquad h'''(C_0) \; > \; 0. \tag{9}$$

Since $h'(C_0) < 0$, a higher mean μ *reduces* Δ. Hence, holding dispersion fixed,

$$\mu(\text{Beta}(2,5)) < \mu(\text{Uniform}) < \mu(\text{Beta}(5,2)) \tag{10}$$

This explains why $\Delta(\text{Beta}(2,5)) > \Delta(\text{Beta}(5,2))$ despite identical variances.
Since $h''(C_0) > 0$, larger variance *increases* Δ. Thus, at the same mean 0.5,

$$Var\big(\text{Beta}(0.5,0.5)\big) > Var\big(\text{Uniform}\big) \quad \Rightarrow \quad \Delta\big(\text{Beta}(0.5,0.5)\big) > \Delta\big(\text{Uniform}\big), \tag{11}$$

matching the finding that the uniform distribution yields the smallest drop.
Since $h'''(C_0) > 0$, right-skew ($\kappa_3 > 0$) *raises* Δ while left-skew lowers it. Therefore, relative to the mean–0.5 cases,

$$\kappa_3\big(\text{Beta}(5,2)\big) > 0 \;\; \text{boosts} \;\; \Delta, \qquad \kappa_3\big(\text{Beta}(2,5)\big) < 0 \;\; \text{drags} \;\; \Delta \text{ down}. \tag{12}$$

In our calibration, the (negative) mean effect dominates the skew drag for Beta$(2,5)$, keeping it on top; for Beta$(5,2)$, the positive skew offsets its higher mean (which would otherwise reduce Δ) and pushes it above Beta$(0.5,0.5)$.

Putting the three forces together yields exactly the observed ranking:

$$\boxed{\Delta(\text{Beta}(2,5)) \; > \; \Delta(\text{Beta}(5,2)) \; > \; \Delta(\text{Beta}(0.5,0.5)) \; > \; \Delta(\text{Uniform})}. \tag{13}$$

The ordering of drops across λ–distributions can be understood from the shape of the gap $h(C)$, which measures the additional demand for news under non-separable relative to separable media. In our calibration ($\alpha = 0.4$, $N = 60$, $\gamma = 0.6$, $\tau_2 - \tau_1 = 5$), numerical inspection shows that $h'(C) < 0,\;\; h''(C) > 0$. Among our four priors for λ_J, only Beta$(0.5,0.5)$

is U–shaped and therefore concentrates mass at the extremes; the skewed distributions Beta$(2, 5)$ and Beta$(5, 2)$ are unimodal and place most mass away from the boundaries (near 0.29 and 0.71). The empirical ordering in (13) is thus explained by two forces evaluated at our calibration: (i) a *mean effect* with $h'(C) < 0$, which makes a lower mean $E[\lambda]$ increase the drop (hence Beta$(2, 5) >$ Beta$(5, 2)$), and (ii) a *variance effect* with $h''(C) > 0$, which makes higher dispersion at a fixed mean increase the drop (hence Beta$(0.5, 0.5) >$ Uniform). The skewness terms are second order here and do not overturn that ranking.

This mechanism is illustrated in the difference in distributions between Figures (1) and (2). Distributions that concentrate mass away from the boundaries of λ_J exhibit a visibly larger downward shift in average news consumption when the media becomes more substitutable, while the uniform distribution displays the smallest change.

Now I turn to the analysis of the best response of a bad incumbent, showing that incentivizing effort might not always be optimal from the voters' perspective.

5 Bad incumbent's response

Given the linear cost of effort for an incumbent, ce_1, and $\rho(\hat{t}, \sqrt{e_1})$, the bad incumbent's optimal effort, and its expectation over c, is monotonically increasing in $\hat{t}_n$, meaning that there is no cost high enough which would disincentivize the incumbent to exert an effort. Figure (5) shows the best response of a bad incumbent (in exerting effort) to the average demand for news by voters.

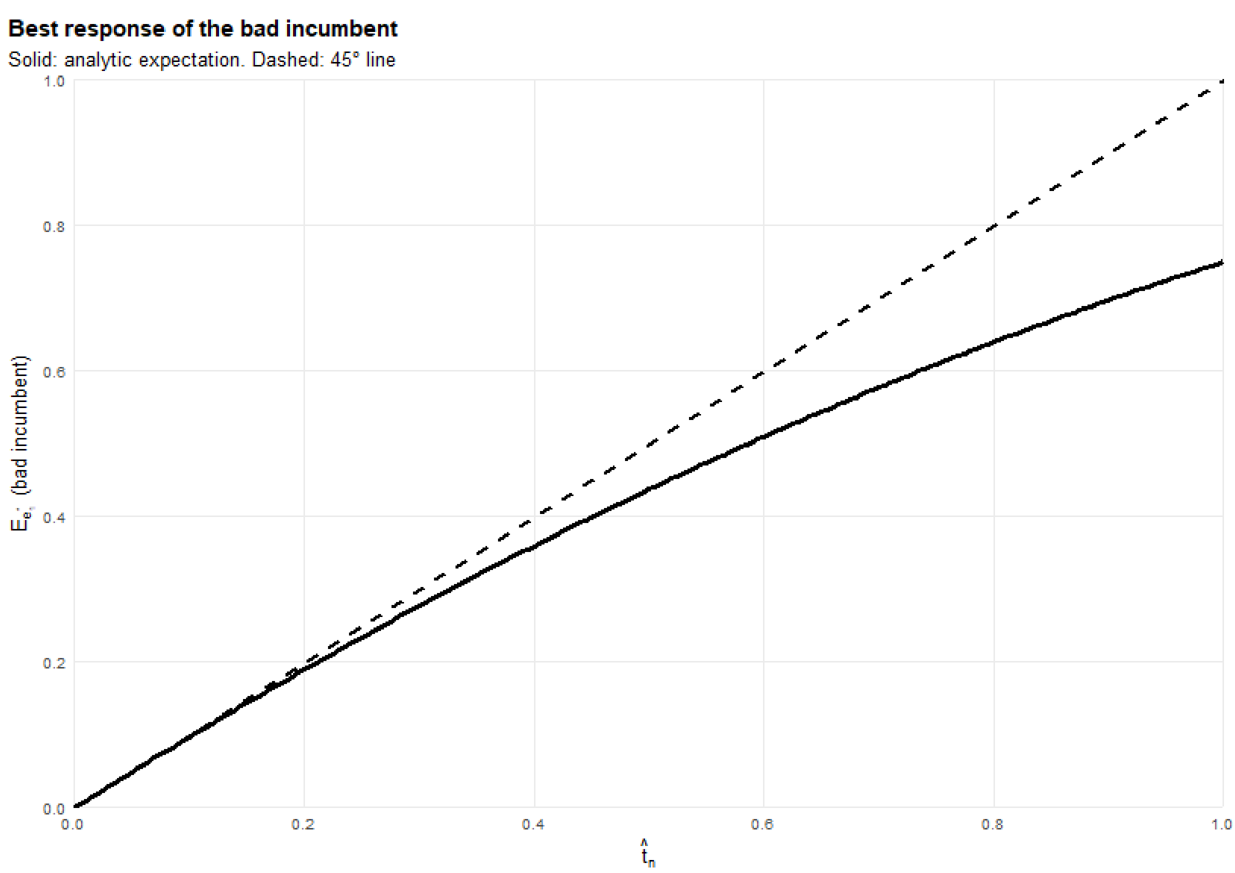

Figure 5

This is not necessarily beneficial for voters: hypothetically, if the incumbent is ineffective, they might be better off consuming less news, as a bad incumbent would likely put less effort into their campaign, making them less likely to be re-elected. On the other hand, the less news consumers demand, and the incumbent is good, the lower the probability of electing her. Figure 6 shows re-election probability as a function of average news share when $\theta = g$ and $\theta = b$.

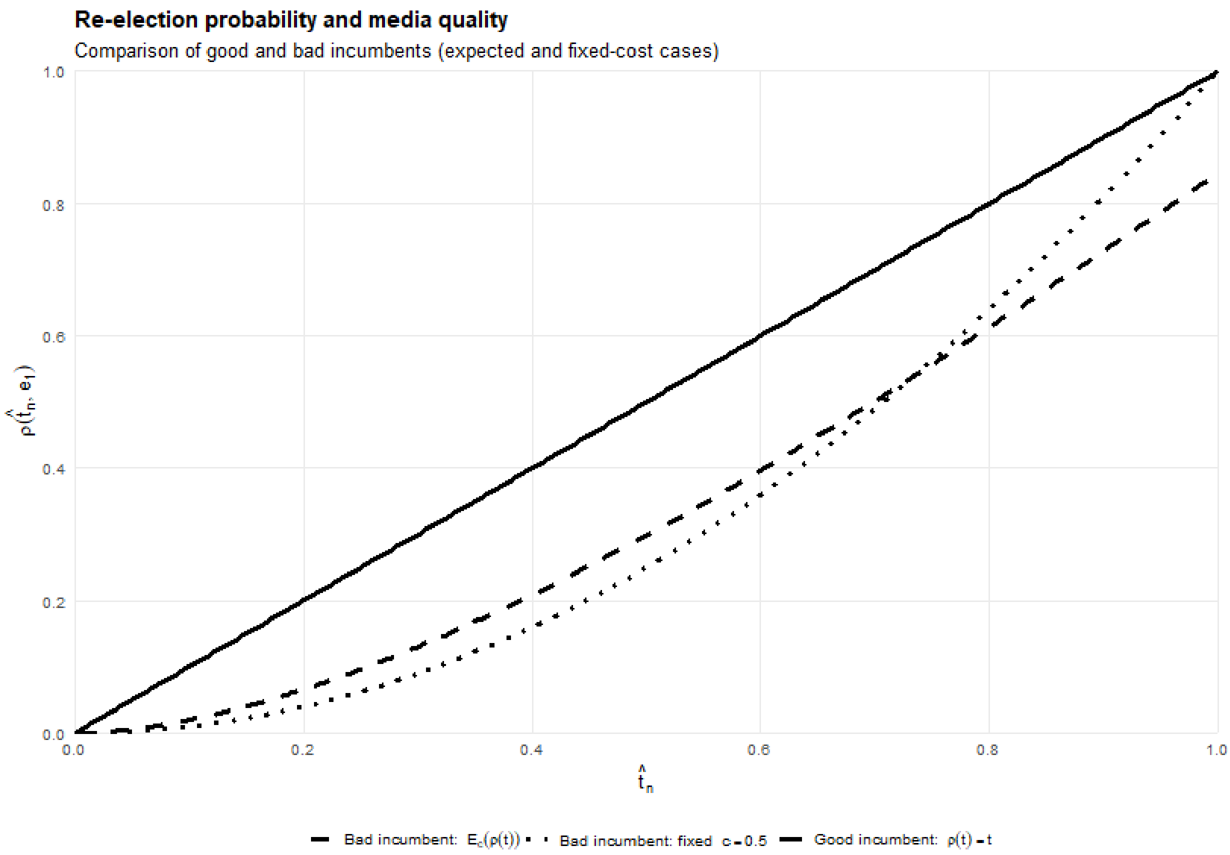

Figure 6

An incumbent takes the average level of news consumption, $\hat{t}_n \in [0, 1]$, as given. A *good incumbent* ($\theta = g$) faces zero cost of effort, $c(\theta = g) = 0$, and maximizes the probability of re-election. Hence, she exerts full effort in the first period ($e_1 = 1$), which yields a re-election probability $\rho_g(\hat{t}_n) = \hat{t}_n\sqrt{e_1} = \hat{t}_n$. A *bad incumbent* ($\theta = b$) draws her cost of effort $c \sim U(0, 1)$. Her optimal first-period effort is $e_1^*(c; \hat{t}_n) = \min\left\{1, \left(\frac{\hat{t}_n}{2c}\right)^2\right\}$, which follows from backward induction, since in the second period she has no incentive to exert effort. The associated re-election probability is $\rho_b(\hat{t}_n; c) = \hat{t}_n\sqrt{e_1^*(c; \hat{t}_n)}$. We focus on the expected probability under the cost distribution, $E_c[\rho_b(\hat{t}_n)] = \frac{\hat{t}_n^2}{2}\left(1 - \ln\frac{\hat{t}_n}{2}\right)$.

From Figure (6), we can see that the gap in re-election probabilities is largest for the average share of news at around half, while it narrows near the corners. For the very high demand for news, $\hat{t}_n \approx 1$, the probability of re-electing an incumbent is approaching one regardless of her type. This result is consistent with the model of Prato and Wolton (2016), in which a too high interest in politics by voters might motivate "bad" politicians to pander. Therefore, as Prato and Wolton (2016) conclude, we need "goldilock" voters.

6 Voters' welfare

With voters becoming more interested in entertainment, and with heterogeneous ethical parameters λ_J, the shift from non-separable to separable media may worsen public scrutiny, defined as the average demand for news (Proposition 2). Also, according to Proposition 3, the "technology gap" - drop in consumption of news after this transition - depends on the shape of λ_J distribution.

Assume the calibration from an example in Section 4, with $\lambda_J \sim Beta(2,5)$ (producing the largest drop in the average demand for news, $h(C)$). Conditional on the interest in news ($\alpha \in (0,1)$), how does the realized welfare of a consumer change if the media environment changes from non-separable to separable?

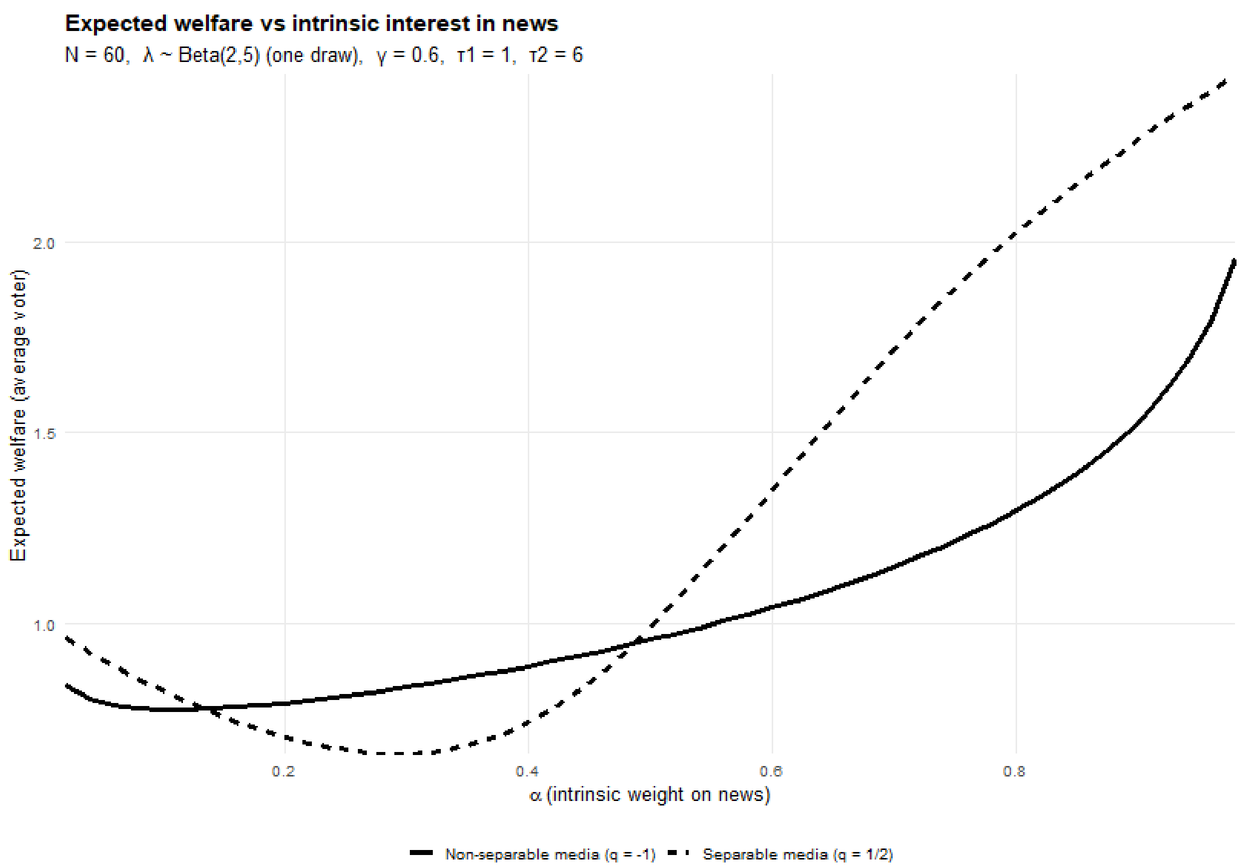

Figure 7

In the calibration from Figure 7, all parameters are as in Section 4, with varying α. The expected welfare is calculated according to (1), taking into account a voter's optimal $t^*_{n,J}$ from (6). It follows that if voters are moderately interested in news $\alpha \approx 0.3$, and the distribution of the ethical parameter is right-skewed ($Beta(2,5)$), a change from a non-separable to a separable media environment produces a drop in welfare. This is intuitive: when news and entertainment are complements, non-interested voters have to consume more or less the same amount of both content, which leads to higher public scrutiny than in an environment of easy substitution.

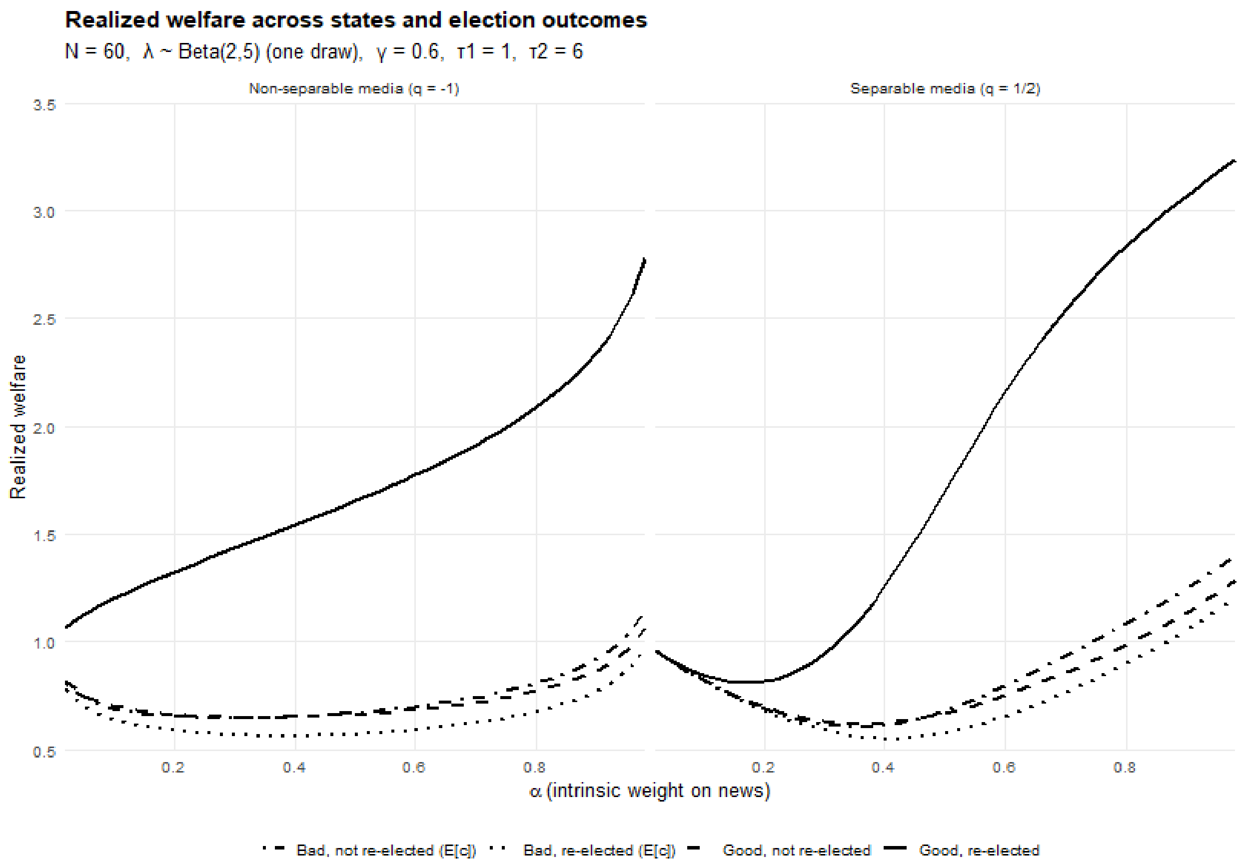

Figure 8

In Figure (8), when the parameter α is very small, consumers place almost no intrinsic value on news, and therefore choose $t_{J,n} \approx 0$. In this region, the "public scrutiny" component of welfare, $\frac{1}{N}\sum_{J=1}^{N} \lambda_J t_{J,n} \cdot K(\hat{t}_n)$, collapses toward zero, so differences in the transfers $K(\hat{t}_n)$ between good and bad incumbents become irrelevant. As a consequence, realized welfare in the case of a re-elected good type,

$$V^{g,\text{rel}} = \left((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\right)^{1/q} + \frac{1}{N}\sum_{J=1}^{N} \lambda_J t_{J,n} \cdot (\tau_1 + \tau_2), \tag{14}$$

and in the case of a re-elected bad type,

$$V^{b,\text{rel}} = \left((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\right)^{1/q} + \frac{1}{N}\sum_{J=1}^{N} \lambda_J t_{J,n} \cdot (\tau_1 e_1^*), \tag{15}$$

both converge to the intrinsic utility of entertainment alone,

$$\left((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\right)^{1/q} \approx (1-\alpha)^{1/q} \approx 1. \tag{16}$$

This explains why, in the separable case ($q = 1/2$), where goods are close substitutes and $t_{J,n}$ declines sharply as $\alpha \to 0$, the welfare lines for good and bad incumbents overlap at low α. By contrast, in the non-separable case ($q = -1$), complementarities sustain a small positive level of news consumption even for low α, so the difference between good and bad types, while diminished, remains visible.

7 Subsidizing the production of news

So far, media producers have not been strategic players in the political sense: they take voters' demand as given and supply news subject to advertising revenues and fixed costs. In equilibrium, whenever firms enter, they supply a homogeneous amount of news that equals the average demanded news share, $\hat{t}_n$, unless fixed costs are too high relative to advertising revenues. In this case, supplied news satisfies $t_n^s = \hat{t}_n$, and voters whose individual demand exceeds the average are rationed. Rationing implies that a subset of voters consumes less news than they would optimally choose absent supply constraints. Because voters' utility from news includes a public scrutiny component that depends on aggregate consumption, this raises the question of whether public policy can improve accountability by subsidizing news production.

Policy experiment. Consider a subsidy that increases the effective advertising revenue from news, raising A_n to $A_n + \Delta A_n$. The policy objective is to induce media producers to supply a higher level of news, potentially up to the maximum demanded amount

$$t_{n,\max} := \max_J t^*_{n,J}.$$

If $t_n^s \geq t_{n,\max}$, rationing disappears and every voter consumes her desired amount of news.

Firms' response under discrete profits. Under the media market described in Section 2.3, firms' profit functions are continuous but generally non-differentiable in t_n^s, with kinks at voters' desired news shares. Optimal supply is therefore characterized by a set of profit-maximizing news levels rather than by first-order conditions. An increase in A_n weakly raises the marginal profitability of reallocating attention from entertainment to news for any voter who is currently constrained. As a result, subsidizing news weakly expands the set of optimal supply choices t_n^s. However, because profits are piecewise linear, small subsidies may have no effect on equilibrium supply, while larger subsidies may induce discrete jumps in t_n^s. Once t_n^s reaches $t_{n,\max}$, further subsidization has no effect on news consumption.

Implications for public scrutiny and welfare. If the subsidy succeeds in eliminating rationing, aggregate news consumption increases from $\hat{t}_n$ to

$$\tilde{t}_n = \frac{1}{N} \sum_{J=1}^{N} t^*_{n,J},$$

which weakly raises public scrutiny and the incentives of an incumbent to exert effort. Holding voters' preferences fixed, producing more news cannot reduce welfare, since voters are no longer constrained in their media consumption choices.

However, the quantitative impact of such a policy is limited. In particular, when the distribution of voters' interest in being informed places substantial mass on low-λ types, the difference between average and maximal demanded news is small. In this case, even eliminating rationing has little effect on equilibrium effort or welfare. This is consistent with the numerical results shown in Figure 9, where welfare differences between supplying average and maximal news are negligible across media environments.

Limits of subsidies. Subsidies are most relevant when fixed costs are high enough that, absent intervention, no firm enters or supplied news is severely constrained. In such cases, subsidies may be necessary to sustain any news production at all. By contrast, when firms

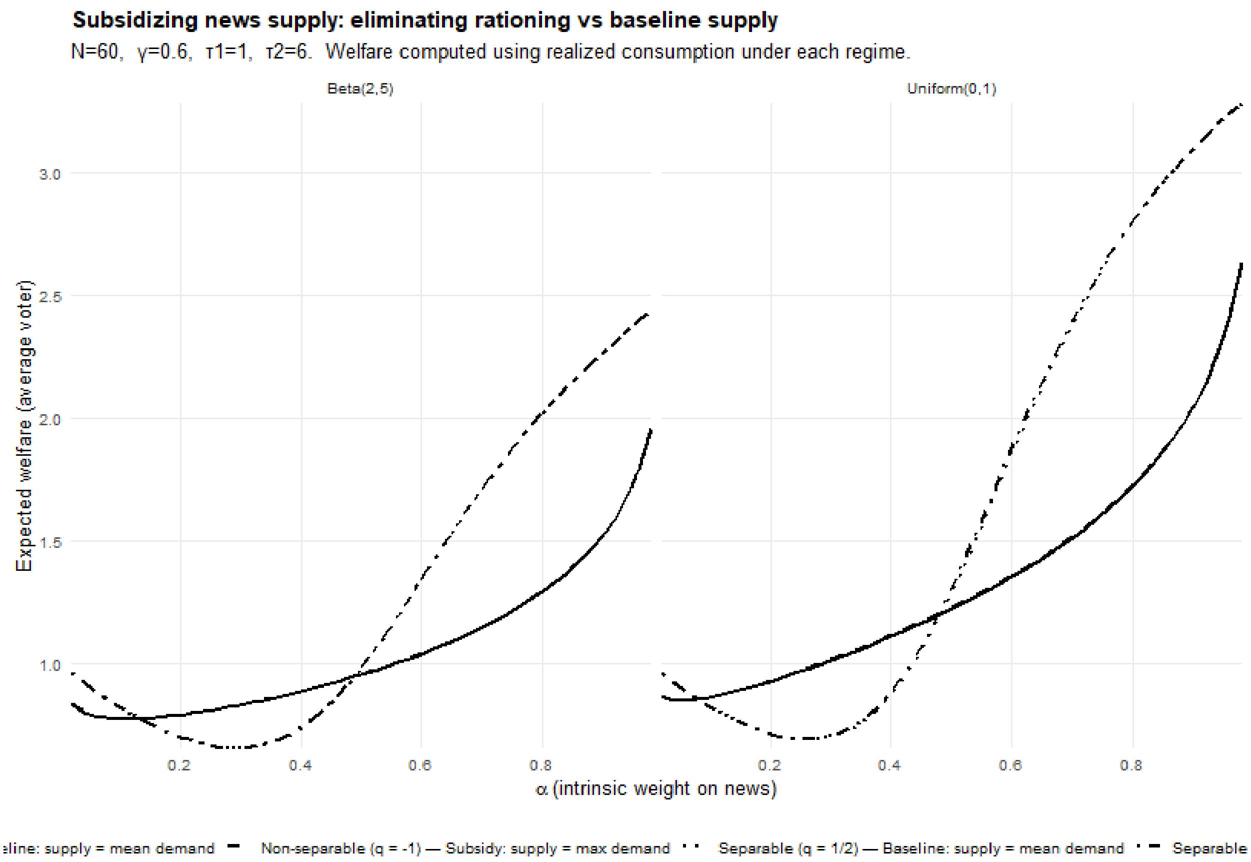

Figure 9

already operate and supply the average demanded news, subsidizing production mainly redistributes surplus without substantially improving political accountability. Moreover, if subsidies are financed through reduced transfers, an optimal policy trades off higher public scrutiny against lower disposable income. Characterizing the welfare-maximizing subsidy under endogenous taxation is beyond the scope of this paper and left for future work. Overall, the analysis highlights a central message of the model: the main constraint on political accountability is not media supply per se, but voters' demand for scrutiny. When interest in news is low, subsidizing production has limited effectiveness, regardless of the media technology.

8 Conclusion

The results show that political oversight can be significantly undermined if voters prefer entertainment over news and when the former becomes easier to substitute. Consequently, incumbents might not invest sufficient effort in producing public goods. As voters' demand for news diminishes, the probability of re-election of a good type decreases. However, for a very high demand for news, bad incumbents might invest "too much" effort and reach the same probability of re-election as good incumbents. Furthermore, the distribution of people's interest in the public good of being informed matters. Proposition 2 formulates general conditions of the impact of the distribution of the ethical parameter on the change in demand for news once the media environment is switched from non-separable to separable. In our example, the smallest drop in demand for news was observed for the uniform distribution, suggesting that a large variation in the interest in politics helps the public scrutiny once news and entertainment become more substitutable.

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.[15] 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 at risk of losing the critical mass of demand enabling local journalism to thrive.[16]

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 introducing subsidies for media companies financed from public transfers, or by endogenizing voters' decision to vote. Additionally, empirical validation of the theoretical predictions would provide further insights into the practical implications of media consumption patterns on political accountability.

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

[16] 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.

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A Definition of Equilibrium

Additional notation. Let $N \in \mathbb{N}$ denote the number of voters. For each voter $J = 1, \ldots, N$, let $t_J \in [0,1]$ denote the *desired* share of attention devoted to news. Given a media supply $t_n^s \in [0,1]$, voter J's *realized* news consumption is

$$\tilde{t}_J := \min\{t_J, t_n^s\}, \qquad \tilde{t}_{J,e} := 1 - \tilde{t}_J.$$

Aggregate realized news consumption is

$$\tilde{t}_n := \frac{1}{N}\sum_{J=1}^{N} \tilde{t}_J, \qquad \bar{\Lambda} := \frac{1}{N}\sum_{J=1}^{N} \lambda_J \tilde{t}_J.$$

Media profits: Advertising revenue is proportional to the time spent on consuming entertainment or news. Given $M \in \mathbb{N}$ symmetric media outlets and a content bundle $(t_n^s, 1 - t_n^s)$, the representative firm's profit is

$$\Pi(t_n^s; t, M) = \frac{N}{M}\left[A_n \frac{1}{N}\sum_{J=1}^{N} \min\{t_J, t_n^s\} + A_e \frac{1}{N}\sum_{J=1}^{N} \min\{1 - t_J, 1 - t_n^s\}\right] - FC_n - FC_e, \quad (17)$$

where $t = (t_J)_{J=1}^N$ denotes the vector of desired news shares.

Definition. An equilibrium is a profile

$$\Big((t_J)_{J=1}^N,\ (e_1^\theta, e_2^\theta)_{\theta\in\{g,b\}},\ t_n^s,\ M,\ \rho\Big)$$

such that:

(i) **Consumers.** Given $(\tilde{t}_n, \bar{\Lambda})$ and incumbent behavior, each voter J chooses $t_J \in [0,1]$ to maximize expected utility, anticipating realized consumption $\tilde{t}_J = \min\{t_J, t_n^s\}$.

(ii) **Incumbent.** Given the realized average news $\tilde{t}_n$, the incumbent chooses effort by backward induction.

(iii) **Media firms.** Given t, firms choose $t_n^s \in [0,1]$ and $M \in \mathbb{N}$ such that

  (a) t_n^s maximizes $\Pi(t_n^s; t, M)$,

  (b) free entry holds: $\Pi(t_n^s; t, M) = 0$ if $M \geq 1$ enters,

with the convention that if $\max_{t\in[0,1]} \Pi(t; t, 1) < 0$, then $M = 0$ and $t_n^s = 0$.

(iv) **Consistency.** Beliefs are Bayesian on path, and $\rho(\tilde{t}_n, e_1)$ is consistent with equilibrium strategies.

B Existence of equilibrium.

Assumptions. The existence proof relies only on mild regularity conditions ensuring compactness, continuity, and concavity of the underlying optimization problems. These conditions are standard and impose no additional economic structure.

(E1) **Compact choice sets.** Each voter's desired news share lies in $[0,1]$. The joint strategy space $X = [0,1]^N$ is compact and convex.

(E2) **Voter payoffs.** For any fixed aggregate objects (i.e. realized average news consumption, the associated public-scrutiny term, and the incumbent's induced behavior) and any fixed supply $t_n^s \in [0,1]$, each voter's utility is strictly concave in realized news consumption. Hence, each voter has a unique realized best reply, which is continuous in the problem's parameters.

(E3) **Firm payoffs.** For any voter profile $t \in X$ and any $M \in \mathbb{N}$, the profit function $\Pi(t_n^s; t, M)$ is continuous in $t_n^s \in [0,1]$, and the set of profit-maximizing supplies is nonempty and compact. Free entry (or no entry) can be satisfied.

Lemma 2 Fix $t_n^s \in [0,1]$ and aggregate objects $(\tilde{t}_n, \bar{\Lambda})$. Under E2, each voter's problem

$$\max_{\tilde{t}\in[0,t_n^s]} U_J(\tilde{t}; \tilde{t}_n, \bar{\Lambda})$$

is strictly concave and admits a unique maximizer $\tilde{t}_J^\star \in [0, t_n^s]$. Moreover, $\tilde{t}_J^\star$ is continuous in $(\tilde{t}_n, \bar{\Lambda}, t_n^s)$.

Lemma 3 Under E3, for each t and M the best-reply correspondence

$$S(t, M) := \arg \max_{t_n^s \in [0,1]} \Pi(t_n^s; t, M)$$

is nonempty, compact-valued, and upper hemicontinuous in (t, M). If $\max_{t_n^s} \Pi(t_n^s; t, 1) \geq 0$, there exists (t_n^s, M) satisfying free entry; otherwise the no-entry outcome $(M, t_n^s) = (0, 0)$ is feasible. Multiplicity of firm best replies refers to the possibility that several supply levels t_n^s yield the same maximal profit for symmetric firms, not to heterogeneity of choices across firms.

Under E1, E2, and E3, an equilibrium exists.

Proof. Let $X = [0, 1]^N$ be the compact convex set of desired news shares. Define a correspondence $\mathcal{B} : X \rightrightarrows X$ as follows.

Step 1 (firms). Given $t \in X$, let $\mathcal{S}(t)$ be the set of firm choices (M, t_n^s) satisfying Lemma 3 and free entry (or no entry).

Step 2 (realized aggregates). For each $(M, t_n^s) \in \mathcal{S}(t)$, compute realized consumption $\tilde{t}_J = \min\{t_J, t_n^s\}$ and aggregates $(\tilde{t}_n, \bar{\Lambda})$. Compute incumbent effort by backward induction.

Step 3 (voter best replies). Given $(\tilde{t}_n, \bar{\Lambda}, t_n^s)$, Lemma 2 yields unique realized best replies $\tilde{t}_J^\star \in [0, t_n^s]$. Define desired choices $t_J^\star := \tilde{t}_J^\star$.

Step 4 (define $\mathcal{B}$). Let $\mathcal{B}(t)$ be the set of all $t^\star = (t_J^\star)_J$ generated as (M, t_n^s) varies over $\mathcal{S}(t)$.

Step 5 (fixed point). $\mathcal{B}$ has nonempty, compact, convex values and a closed graph. The correspondence $\mathcal{B}$ has nonempty, compact, and convex values and a closed graph. Nonemptiness and compactness follow from continuity of payoffs and compact strategy sets. Convexity reflects the fact that multiplicity arises only from firms' best replies, while voters' responses are unique; hence any convex combination of induced outcomes remains feasible. Finally, closed graph ensures that limits of admissible response profiles are themselves admissible, ruling out discontinuous jumps in equilibrium responses.

By Kakutani's fixed point theorem, there exists $t^* \in X$ with $t^* \in \mathcal{B}(t^*)$. The associated firm and incumbent choices constitute an equilibrium. □

C Uniqueness of Equilibrium

This section provides sufficient conditions under which the equilibrium is unique. The argument proceeds in two steps. First, we establish the uniqueness of voters' realized news consumption for any fixed media supply. Second, we demonstrate that the media supply itself is uniquely determined by a contraction argument.

Uniqueness of realized voter behavior. Fix a media supply $t_n^s \in [0, 1]$ and consider the game in realized news consumption $\tilde{t} = (\tilde{t}_1, \ldots, \tilde{t}_N) \in [0, t_n^s]^N$. Each voter J chooses $\tilde{t}_J$

to maximize

$$U_J(\tilde{t}_J, \tilde{t}_n) = u(\tilde{t}_J) + \lambda_J\, H\big(\tilde{t}_n\big)\,, \qquad \tilde{t}_n := \frac{1}{N}\sum_{K=1}^{N} \tilde{t}_K,$$

where $u(\cdot)$ is strictly concave and $H(\cdot)$ is concave. Thus, voters interact only through the aggregate $\tilde{t}_n$.

Assumption (U1). The realized-choice game is diagonally strictly concave, as defined by Rosen (1965).

Lemma 4 Under Assumption (U1), for any fixed t_n^s, the realized-choice game admits at most one Nash equilibrium $\tilde{t}^\dagger(t_n^s)$.

Proof. Let $g_J(\tilde{t}) := \partial U_J(\tilde{t})/\partial \tilde{t}_J$ denote voter J's marginal payoff, and let $g(\tilde{t}) = (g_1(\tilde{t}), \dots, g_N(\tilde{t}))$. Diagonal strict concavity requires that for any two distinct profiles $\tilde{t} \neq \tilde{s}$,

$$(\tilde{t} - \tilde{s})^\top \big(g(\tilde{t}) - g(\tilde{s})\big) < 0. \tag{DSC}$$

By Theorem 2 in Rosen (1965), condition (DSC) implies that the concave game admits at most one Nash equilibrium. □

Discussion. Assumption (U1) ensures that although voters' payoffs depend on aggregate news consumption, own diminishing returns dominate strategic interactions. Consequently, fixing the media supply t_n^s pins down a unique realized consumption profile $\tilde{t}^\dagger(t_n^s)$.

Uniqueness of media supply. We now turn to the determination of media supply. Given t_n^s, let $\tilde{t}^\dagger(t_n^s)$ denote the unique realized voter profile from Lemma 4, and define the induced average realized demand

$$\mathcal{T}(t_n^s) := \frac{1}{N}\sum_{J=1}^{N} \tilde{t}_J^\dagger(t_n^s).$$

An equilibrium media supply must satisfy

$$t_n^s = \mathcal{T}(t_n^s),$$

i.e., supplied news equals realized average demand.

Assumption (U2). In a neighborhood of the equilibrium, the firm's best reply is single-valued, and the mapping $\mathcal{T}(\cdot)$ is a contraction:

$$|\mathcal{T}'(t_n^s)| < 1.$$

Assumption (U2) requires that the feedback from media supply to realized average demand be locally dampened. This condition rules out self-reinforcing responses of demand to supply and guarantees local uniqueness of the fixed point.

Lemma 5 Under Assumption (U2), the fixed point $t_n^s = \mathcal{T}(t_n^s)$ is unique.

Proof. By Assumption (U2), $\mathcal{T}$ is locally Lipschitz with constant strictly smaller than one.[17] Hence $\mathcal{T}$ admits at most one fixed point. $\square$

Proposition 4 Under Assumptions (U1) and (U2), the equilibrium is unique.

Proof. By Lemma 4, for any t_n^s there exists at most one realized voter profile $\tilde{t}^\dagger(t_n^s)$. By Lemma 5, there exists at most one media supply t_n^s satisfying $t_n^s = \mathcal{T}(t_n^s)$. The incumbent's effort choices are uniquely determined by backward induction, given realized average news consumption. Therefore, the equilibrium profile of voter behavior, media supply, entry, and incumbent effort is unique. $\square$

D Proposition 1

Let $X := 2\alpha - 1 + C_J$. It follows from the respective closed forms that:

$$\operatorname{sign}\left(t_{J,n}^{(1/2)} - t_{J,n}^{(-1)}\right) = \operatorname{sign}(X).$$

Proof. Fix $\alpha \in (0,1)$ and a policy term C_J (treated as fixed in this comparison), and define

$$X := 2\alpha - 1 + C_J, \qquad m := 2\alpha(1-\alpha) > 0, \qquad D := X^2 + m^2.$$

According to equation (8), the separable case $q = \frac{1}{2}$ yields

$$t_{J,n}^{(1/2)} = \frac{(X+\sqrt{D})^2}{(X+\sqrt{D})^2 + m^2}.$$

The complementary case $q = -1$ (7) can be simplified to:

$$t_{J,n}^{(-1)} = \frac{X+\sqrt{D}}{X+\sqrt{D}+m}.$$

Now introduce the auxiliary variable

$$z := \frac{X + \sqrt{X^2+m^2}}{m} = \frac{X+\sqrt{D}}{m} \quad (>0),$$

so that the two best responses become

$$t_{J,n}^{(1/2)} = \frac{z^2}{1+z^2}, \qquad t_{J,n}^{(-1)} = \frac{z}{1+z}.$$

Hence

$$t_{J,n}^{(1/2)} - t_{J,n}^{(-1)} = \frac{z^2}{1+z^2} - \frac{z}{1+z} = \frac{z(z-1)}{(1+z^2)(1+z)}.$$

Because $z > 0$ and $(1+z^2)(1+z) > 0$, we obtain

$$\operatorname{sign}\left(t_{J,n}^{(1/2)} - t_{J,n}^{(-1)}\right) = \operatorname{sign}(z-1).$$

[17] A function $\mathcal{T}$ is locally Lipschitz at $t_n^{s,*}$ if there exists a neighborhood U of $t_n^{s,*}$ and a constant L such that $|\mathcal{T}(x) - \mathcal{T}(y)| \leq L|x-y|$ for all $x, y \in U$. If $L < 1$, $\mathcal{T}$ is a local contraction and admits at most one fixed point in U.

It remains to connect $\operatorname{sign}(z-1)$ to $\operatorname{sign}(X)$ using an *implicit-differentiation (monotonicity) argument.* Observe that z is the positive solution to

$$z - \frac{1}{z} = \frac{2X}{m}.$$

Define $F(z,X) := z - \frac{1}{z} - \frac{2X}{m}$. Then $F(z,X) = 0$ and

$$\frac{\partial F}{\partial z} = 1 + \frac{1}{z^2} > 0, \qquad \frac{\partial F}{\partial X} = -\frac{2}{m} < 0.$$

By the implicit function theorem, $z = z(X)$ is differentiable and

$$\frac{dz}{dX} = -\frac{F_X}{F_z} = \frac{\frac{2}{m}}{1 + \frac{1}{z^2}} > 0.$$

Thus $z(X)$ is *strictly increasing* in X. Moreover, at $X = 0$ we have

$$z(0) = \frac{0 + \sqrt{0 + m^2}}{m} = 1.$$

Since z is strictly increasing and crosses 1 at $X = 0$, it follows that

$$\operatorname{sign}(z-1) = \operatorname{sign}(X).$$

Combining with the earlier step yields

$$\operatorname{sign}\left(t_{J,n}^{(1/2)} - t_{J,n}^{(-1)}\right) = \operatorname{sign}(X)$$

□

E Proposition 2

A marginal increase in the ethical parameter λ_J leads to:

- *larger positive response in demand for news when media are separable ($q > 0$), and voters prefer entertainment at least as much as news ($\alpha \leq 0.5$):*

$$\left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} > \left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0},$$

- *larger positive response in demand for news when media are non-separable ($q < 0$), and voters prefer news over entertainment ($\alpha > 0.5$):*

$$\left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} < \left|\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0},$$

Proof. Fix primitives $(N, \gamma, \tau_1, \tau_2)$ with $\tau_2 > \tau_1$, $\alpha \in (0,1)$, and $q < 1$. For voter J, the first order condition (6) can be written as

$$F_q\big(t, \lambda_J; \alpha\big) \;:=\; M_q(t;\alpha) \;+\; \frac{\lambda_J}{N} K(\hat{t}) \;+\; \frac{1}{N^2}\Big(\sum_{I=1}^{N} \lambda_I t_I\Big) K'(\hat{t}) \;=\; 0, \tag{18}$$

where

$$M_q(t;\alpha) \;=\; \Big((1-\alpha)(1-t)^q + \alpha t^q\Big)^{\frac{1}{q}-1}\Big(\alpha t^{q-1} - (1-\alpha)(1-t)^{q-1}\Big),$$

$\hat{t} = \frac{1}{N}\sum_I t_I$, and $K(\cdot)$, $K'(\cdot)$ are defined as in the text (backward induction). By the implicit function theorem, at any interior solution $t^* = t^*_{J,n}$ we have

$$\frac{\partial t^*_{J,n}}{\partial \lambda_J} = -\frac{\partial F_q/\partial \lambda_J}{\partial F_q/\partial t} = \\ -\frac{\frac{1}{N}K(\hat{t}) + \frac{1}{N^2}t^*_{J,n}K'(\hat{t})}{M'_q(t^*;\alpha) + \frac{\lambda_J}{N^2}K'(\hat{t}) + \frac{1}{N^2}\sum_{I=1}^N \lambda_I \frac{\partial t_I}{\partial t_{J,n}}K'(\hat{t}) + \frac{1}{N^2}\Big(\sum_{I=1}^N \lambda_I t_I\Big)K''(\hat{t})\frac{1}{N}}. \tag{19}$$

Step 1 (sign and dominant term). For $q < 1$, $M'_q(\cdot;\alpha) < 0$ (strictly decreasing marginal utility). With $\tau_2 > \tau_1$, $K(\cdot) > 0$ and, under our backward-induction expectations, $K'(\cdot)$ is bounded. Hence the numerator of (19) is positive and the denominator is negative. Therefore $\partial t^*/\partial \lambda_J > 0$. Moreover, the aggregate-feedback terms in the denominator are $O(1/N)$ relative to $M'_q(t^*;\alpha)$, and the K' term in the numerator is $O(1/N)$ relative to K/N.[18] Thus, for N not too small (or when $|K'|$ is modest), we have the tight approximation

$$\frac{\partial t^*_{J,n}}{\partial \lambda_J} = \frac{K(\hat{t})}{N} \cdot \frac{1}{\big|M'_q(t^*;\alpha)\big|} \cdot \big(1 + o(1)\big), \qquad o(1) = O\bigg(\frac{1}{N}\bigg). \tag{20}$$

Hence the *ordering across* q reduces to the ordering of the slope magnitude $\big|M'_q(t^*;\alpha)\big|$.

Step 2 (closed form of the slope). Write $g(t) = (1-\alpha)(1-t)^q + \alpha t^q$ and $w(t) = \alpha t^{q-1} - (1-\alpha)(1-t)^{q-1}$. A direct computation gives

$$M'_q(t;\alpha) = (q-1)\, g(t)^{\frac{1}{q}-2}\Big[-w(t)^2 + g(t)\Big(\alpha\, t^{q-2} + (1-\alpha)\,(1-t)^{q-2}\Big)\Big]. \tag{21}$$

Since $q < 1$, $(q-1) < 0$ and the bracket is positive; hence $M'_q(t;\alpha) < 0$ on $(0,1)$.

Step 3 (ordering of $|M'_q|$ across q in the two regions). Define the "balanced" share (the CES symmetry point)

$$t_{\text{bal}}(q,\alpha) = \frac{\alpha^{\frac{1}{1-q}}}{\alpha^{\frac{1}{1-q}} + (1-\alpha)^{\frac{1}{1-q}}} \in (0,1).$$

At $t = t_{\text{bal}}$ we have $w(t) = 0$. Using (21) and $w(t_{\text{bal}}) = 0$ we obtain

$$\big|M'_q(t_{\text{bal}};\alpha)\big| = (1-q)\, g(t_{\text{bal}})^{\frac{1}{q}-1}\Big(\alpha\, t_{\text{bal}}^{q-2} + (1-\alpha)\,(1-t_{\text{bal}})^{q-2}\Big). \tag{22}$$

Two well–known CES facts now apply: (i) for $q' < q$ (more complementarity), the balanced share $t_{\text{bal}}(q',\alpha)$ is *closer to the majority good* (further from $1/2$ when $\alpha \neq 1/2$); (ii) the weights t^{q-2} and $(1-t)^{q-2}$ in (22) are more extreme near the boundaries when $q < 0$ than when $q > 0$ (because $q-2$ is more negative), whereas the factor $g^{\frac{1}{q}-1}$ attenuates the extreme on the favored side when $q < 0$. Combining (i)–(ii) yields the following monotone ordering of the slope magnitudes:

(a) **Entertainment–tilted region** ($\alpha \le \frac{1}{2}$, hence $t^* \le t_{\text{bal}} \le \frac{1}{2}$ generically). In this region the term $(1-t)^{q-2}$ dominates. Because $q < 0$ amplifies boundary curvature, we have

$$\big|M'_{q<0}(t^*;\alpha)\big| > \big|M'_{q>0}(t^*;\alpha)\big|.$$

[18] Formally, for any compact interior set $t \in [\varepsilon, 1-\varepsilon]$, $|M'_q(t;\alpha)|$ is bounded away from 0, while K', K'' are bounded; the terms in the second line of (19) are $O(1/N)$ by inspection.

(b) **News–tilted region** ($\alpha > \frac{1}{2}$, hence $t^* \geq t_{\text{bal}} \geq \frac{1}{2}$ generically). Here the term t^{q-2} dominates, but the CES factor $g^{\frac{1}{q}-1}$ *dampens* curvature on the favored side more strongly when $q < 0$ (complementarity penalizes imbalance). Thus,

$$\left|M'_{q<0}(t^*;\alpha)\right| \;<\; \left|M'_{q>0}(t^*;\alpha)\right|.$$

Statements (a)–(b) can be formalized by bounding the bracket in (21) above and below using that, for $\alpha \leq \frac{1}{2}$ and $t \leq \frac{1}{2}$, $g(t) \in [(1-\alpha)(1-t)^q,\ (1-\alpha)(1-t)^q + \alpha\, 2^{-q}]$ and $w(t)^2 \in [(1-\alpha)^2(1-t)^{2(q-1)} - \varepsilon,\ (1-\alpha)^2(1-t)^{2(q-1)} + \varepsilon]$ with ε controlled uniformly on compact subsets away from the corners; analogous bounds hold for $\alpha > \frac{1}{2}$, $t \geq \frac{1}{2}$. These bounds imply the claimed strict inequalities of $|M'_q|$ across q.

Step 4 (conclusion). Plugging the ordering of $|M'_q|$ from Step 3 into (20) yields:

(i) If $\alpha \leq \frac{1}{2}$ (entertainment tilted), then

$$\left.\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} > \left.\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0} \quad \text{(larger positive response under separability)},$$

because $|M'_{q>0}| < |M'_{q<0}|$.

(ii) If $\alpha > \frac{1}{2}$ (news tilted), then

$$\left.\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q>0} < \left.\frac{\partial t^*_{J,n}}{\partial \lambda_J}\right|_{q<0} \quad \text{(larger positive response under non-separability)},$$

because $|M'_{q>0}| > |M'_{q<0}|$.

Finally, as t^* approaches the corners, the powers t^{q-2} or $(1-t)^{q-2}$ in (21) explode for $q < 0$, which can overturn the interior ranking; this is the "near-singular FOC" caveat stated below the proposition. This completes the proof. □

F Proposition 3

Fix two media technologies $q^- < 0 < q^+ < 1$. For any scalar incentive index C, let $t^*_q(C)$ denote a voter's optimal share of news consumption under technology q, and define the technology gap (difference in news consumption for a voter between non-separable and separable media):

$$h(C) \;:=\; t^*_{q^-}(C) - t^*_{q^+}(C).$$

Let λ denote voters' concern for being informed, and suppose that $C = a\lambda + b$, where $a \neq 0$ and b are treated as fixed. For any distribution F of λ on $[0,1]$, define the average technology gap

$$\Delta(F) \;:=\; \mathbb{E}_{\lambda\sim F}[h(a\lambda + b)]\,.$$

The object $\Delta(F)$ measures the average difference in news consumption between the two media technologies; when $h(C) \geq 0$ on the relevant range, $\Delta(F)$ can be interpreted as the average drop in news demand induced by the change in technology.

Assume that for all λ in the support of F and for both technologies $q \in \{q^-, q^+\}$, the optimal news choice is interior, i.e. $t^*_q(a\lambda + b) \in (0,1)$, and that h is three times continuously differentiable on $\mathcal{C}$, where $\mathcal{C}$ contains $\{a\lambda + b : \lambda \in \mathrm{supp}(F)\}$.

(i) **Dispersion.** Let F_1 and F_2 be two distributions on $[0,1]$ with the same mean and suppose that F_2 is a mean-preserving spread of F_1. The two distributions have the same mean, and $\mathbb{E}[\phi(\lambda)]$ is weakly larger under F_2 than under F_1 for every convex function ϕ. This notion captures increased dispersion without changing the mean.

If h is convex on $\mathcal{C}$ (i.e. $h''(C) \geq 0$ for all $C \in \mathcal{C}$), then

$$\Delta(F_2) \;\geq\; \Delta(F_1).$$

If instead h is concave on $\mathcal{C}$ (i.e. $h''(C) \leq 0$), the inequality reverses.

Dispersion matters because media technology changes affect moderate voters the most, and dispersion determines the number of such voters.

(ii) **Location (first-order stochastic dominance).** Let F_1 and F_2 be two distributions on $[0,1]$ such that F_2 first-order stochastically dominates F_1. If h is nondecreasing on $\mathcal{C}$ (i.e. $h'(C) \geq 0$ for all $C \in \mathcal{C}$), then

$$\Delta(F_2) \;\geq\; \Delta(F_1).$$

If instead h is nonincreasing on $\mathcal{C}$ (i.e. $h'(C) \leq 0$), the inequality reverses.

Location matters because shifting the distribution of λ changes the weight placed on voters whose news consumption is most sensitive to media technology.

(iii) **Skewness (local third-moment effect).** Fix a baseline distribution F_0 on $[0,1]$ with mean μ and consider a perturbation F_ε that preserves the mean and variance of λ and changes only its centered third moment by $\Delta m_3(\varepsilon)$, with $\Delta m_3(\varepsilon) \to 0$ as $\varepsilon \to 0$. Then, for ε sufficiently small,

$$\Delta(F_\varepsilon) - \Delta(F_0) = \frac{a^3}{6}\, h^{(3)}(C_0)\, \Delta m_3(\varepsilon) \;+\; o(\Delta m_3(\varepsilon))\,,$$

where $C_0 := a\mu + b$ and $\frac{o(\Delta m_3(\varepsilon))}{\Delta m_3(\varepsilon)} \to 0$ as $\varepsilon \to 0$. In particular, the sign of the change in Δ induced by a small increase in skewness is given by $\operatorname{sign}\big(a^3 h^{(3)}(C_0)\big)$.

Skewness matters because a small group of extreme voters can have a disproportionate impact when individual responses are asymmetrically distributed around the mean. Individual responses are asymmetric around the mean when voters who care more about being informed react differently to technology changes than equally distant voters who care less.

Proof. Fix $a := K/N > 0$ and $b := \bar{\lambda}K'/N \in \mathbb{R}$. Consider the affine map $C(\lambda) = a\lambda + b$ and the pointwise drop $h(C) = t^*_{q_-}(C) - t^*_{q_+}(C)$ for $q_- < 0 < q_+ \leq 1$. By hypothesis $h \in C^3$ and $h'(C) \geq 0$ on the relevant range. Define

$$\Delta(F) \;=\; {}_{\lambda\sim F}\big[h(a\lambda + b)\big].$$

Note that for $g(\lambda) := h(a\lambda + b)$ we have

$$g'(\lambda) = a\, h'(C) \geq 0, \qquad g''(\lambda) = a^2 h''(C), \qquad g^{(3)}(\lambda) = a^3 h^{(3)}(C),$$

so g inherits the monotonicity/convexity/third-derivative signs of h (since $a > 0$).

We analyze (i)–(iii) in turn for $\lambda \sim \operatorname{Beta}(\kappa\mu, \kappa(1-\mu))$.

(i) Dispersion at fixed mean (convex order). Fix $\mu \in (0,1)$ and compare two concentrations $\kappa_1 < \kappa_2$. It is a standard fact that within the Beta family with fixed mean, the concentration parameter orders distributions by the *convex order*:

$$\mathrm{Beta}(\kappa_1\mu, \kappa_1(1-\mu)) \ \geq_{cx}\ \mathrm{Beta}(\kappa_2\mu, \kappa_2(1-\mu)),$$

i.e., they have the same mean and the one with smaller κ is a mean-preserving spread. Hence for any convex g one has $[g(\lambda_{\kappa_1})] \geq [g(\lambda_{\kappa_2})]$, with the inequality reversed if g is concave. Applying this with $g(\lambda) = h(a\lambda + b)$ and noting g'' has the sign of h'' gives:

$$h'' \geq 0 \implies \Delta(\kappa_1) \geq \Delta(\kappa_2), \qquad h'' \leq 0 \implies \Delta(\kappa_1) \leq \Delta(\kappa_2),$$

which proves part (i).

(ii) Mean shifts (first-order stochastic dominance). Fix $\kappa > 0$ and let $\mu_1 < \mu_2$. For $\lambda \sim \mathrm{Beta}(\kappa\mu, \kappa(1-\mu))$ with κ fixed, the family satisfies a *monotone likelihood ratio* (MLR) in μ:

$$\frac{f_{\mu_2}(\lambda)}{f_{\mu_1}(\lambda)} = \left(\frac{\lambda}{1-\lambda}\right)^{\kappa(\mu_2-\mu_1)}$$

is increasing in λ when $\mu_2 > \mu_1$. MLR $\Rightarrow$ first-order stochastic dominance (FOSD), hence for any nondecreasing g,

$$[g(\lambda_{\mu_2})] \ \geq\ [g(\lambda_{\mu_1})].$$

Applying this with the nondecreasing $g(\lambda) = h(a\lambda + b)$ (because $h' \geq 0$ and $a > 0$) yields

$$\mu_2 > \mu_1 \implies \Delta(\mu_2) \geq \Delta(\mu_1),$$

which establishes part (ii).

(iii) Skewness (third moment, local effect). Fix (μ, κ) and consider two nearby laws with the same mean and variance but different third central moments (skewness). A third-order Taylor expansion of $g(\lambda) = h(a\lambda+b)$ around μ gives, with $\sigma^2 = (\lambda)$ and $\mu_3 = [(\lambda-\mu)^3]$,

$$\Delta(F) = [g(\lambda)] = g(\mu) \ +\ \frac{g''(\mu)}{2}\,\sigma^2 \ +\ \frac{g^{(3)}(\mu)}{6}\,\mu_3 \ +\ R_4,$$

where the remainder R_4 is $o(\sigma^3)$ under the stated smoothness of h. Since $g^{(3)}(\mu) = a^3 h^{(3)}(a\mu + b)$, the *ceteris paribus* effect of changing skewness at fixed mean and variance is given by the sign of $h^{(3)}$ times the sign of μ_3:

$$h^{(3)}(C) > 0 \ \ \&\ \ \mu_3 > 0 \implies \Delta \text{ increases}, \qquad h^{(3)}(C) < 0 \ \ \&\ \ \mu_3 > 0 \implies \Delta \text{ decreases}.$$

For the Beta family, $\mathrm{sign}(\mu_3) = \mathrm{sign}(\beta - \alpha) = \mathrm{sign}(1-2\mu)$; thus "right-skew" (positive third central moment) holds when the mode lies left of the mean (e.g., $\mu < \frac{1}{2}$), and the above implication applies. This proves part (iii) in the local (third-order) sense.

Combining (i)–(iii) completes the proof. □

Remarks. (i) The affine rescaling $C = a\lambda + b$ with $a > 0$ preserves the signs of $h', h'', h^{(3)}$ in the composition $g(\lambda) = h(a\lambda + b)$; thus all comparisons transfer directly to $\Delta(F)$. (ii) Part (i) uses *convex order* (mean-preserving spread); part (ii) uses *FOSD* via MLR; part (iii) is a *local* statement based on the third central moment and $h^{(3)}$. (iii) Away from the local regime of (iii), higher-order terms may matter; the sign conclusions still hold when $h^{(4)}$ and higher terms are negligible on the empirically relevant range of C.