The Political Risks of Separating News from Entertainment

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Abstract

One of the aspects of the ongoing digital revolution is the easier separability of media content. I focus on news and entertainment: how consumer preferences can affect political accountability if both of these contents become easily substitutable? Using a two-period electoral accountability model, I analyze how voters' attention allocation between these two options influences an incumbent politician's effort. The model shows that when entertainment is favored over news, the increased substitutability leads to 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. This is not good for voters, as a re-elected bad incumbent never exerts any effort in the second period. I also show how the distribution of interest in the public good among voters matters for the demand for news: in the context I study, it is the most stable when the distribution is uniform. Therefore, with the interest in public good widely dispersed in the population, the public scrutiny is stronger.[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.

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

The model combines elections, the rent-seeking behavior of an incumbent politician, and imperfect monitoring of the incumbent's behavior by voters. The main 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 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.

[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).

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.

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 $\hat{t}_{J,n}$

[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).

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 and fixed costs for entertainment and news. Each media producer operates under the same profit function and concurrently determines the amount of entertainment and news to produce without the ability to target specific consumers (i.e., their offers are homogeneous).

Following these decisions, the 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.[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 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 ($\tau_1 < \tau_2$)

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.[13]

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 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 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 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

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

news: $\sum_{I=1,I\neq J}^{N} \lambda_I t_{n,I}$.

Each consumer/voter is maximizing the following utility function:

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

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

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. Interestingly, *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:

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

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 producers

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

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

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

$$\text{s.t.:}$$

$$t_n^s + t_e^s = 1, \;\; t_n^s \leq \hat{t}_{n,max}, \;\; t_e^s \leq \hat{t}_{e,max}, \;\; \hat{t}_{n,max} = 1 - \hat{t}_{e,min}$$

As producers know consumers' demand, they take $\hat{t}_{n,J}$, $\forall J \in N$ as given, and choose amount of news t_n^s and entertainment t_e^s within supports: $[min(\hat{t}_n), max(\hat{t}_n)]$, $[min(\hat{t}_e), max(\hat{t}_e)]$. The profit-maximizing amount of news and entertainment produced depends on the distribution of demanded time by voters, the relation between advertisement revenues, and the fixed costs of both contents. Media producers are not strategic players. There might be a situation in which $t_n^s < \min t_{n,J}$, when even the smallest demanded news content is larger than the break-even amount of produced news. In that case, the news is underprovided, and all consumers consume all available news t_n^s.

Given the time constraint $t_n^s + t_e^s = 1$ (and $\hat{t}_{n,max} + \hat{t}_{n,min} = 1$), their problem could be rewritten as follows:

$$\tilde{t}_n^s = arg \max_{t_n^s} \frac{N\left(A_n \int_{\hat{t}_{n,min}}^{t_n^s} f(\hat{t}_n) d\hat{t}_n - A_e \int_{\hat{t}_{n,max}}^{t_n^s} f(1-\hat{t}_n) d\hat{t}_n\right)}{M} - FC_n - FC_e \tag{4}$$

$$\tilde{t}_e^s = 1 - \tilde{t}_n^s$$

After media producers announce their offer, the politician decides on the amount of effort.

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:

$$\hat{e}_1, \hat{e}_2 = arg \max_{e_1, e_2} \{(1 - c(\theta)e_1)r + (1 - c(\theta)e_2)r\rho(\hat{t}_n, e_1)\}$$
$$\text{s.t.}$$
$$e_1, e_2 \in [0, 1]; \quad r > 0 \tag{5}$$
$$\rho(\hat{t}_n, e_1) = \hat{t}_n\sqrt{e_1}$$
$$c(\theta = g) = 0; \quad c(\theta = b) \sim U(0, 1)$$

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, $E(c)$. Appendix includes the definition of an equilibrium together with proofs for its existence and uniqueness.

3 Solution

In equilibrium, three mechanisms determine political accountability:

(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) **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.

Together, these mechanisms ensure that (a) consumers' choices of attention directly discipline incumbents, and (b) political accountability is stronger when news is more attractive (high α), and when ethical concerns (λ_J) are more pronounced.

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 news share.

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

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

implying that higher average news consumption raises political accountability.

(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 (8).*

(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 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, $\tilde{t}_n$. 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:

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

$$\text{If } e_2 = 0 \text{ and } \rho(\tilde{t}_n, e_1) = \tilde{t}_n \sqrt{e_1}, \text{ we have:} \tag{6}$$

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

A bad incumbent's effort is thus increasing with an average amount of news, but decreasing 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 choose the amount of news and entertainment produced that maximizes their profits. Without the knowledge of the distribution of demanded content by consumers ($f(\hat{t}_n)$), we can only state that the equilibrium supplied content, identical for each media outlet, would satisfy the condition:

$$\frac{f(t^s_n)}{f(1 - t^s_n)} = \frac{A_e}{A_n}. \tag{7}$$

Consumers solve their problem first. Their solution follows the FOC:

$$\begin{aligned}
&\underbrace{\left[(1-\alpha)(1-t_{J,n})^q + \alpha\, t_{J,n}^q\right]^{\frac{1}{q}-1} \left[\alpha\, t_{J,n}^{q-1} - (1-\alpha)(1-t_{J,n})^{q-1}\right]}_{\text{Marginal intrinsic utility}} = \\
&\quad - \underbrace{\frac{\lambda_J}{N}\left\{\gamma\left(\tau_1 + \hat{t}_n \tau_2\right) + (1-\gamma)\,\tau_1\left(e_1 + \gamma - \hat{t}_n\,\gamma\sqrt{e_1}\right)\right\}}_{\text{direct own-}\lambda_J t_{J,n}\text{ effect}} \\
&\quad - \underbrace{\frac{1}{N^2}\left(\sum_{I=1}^{N} \lambda_I t_{I,n}\right) \gamma\left(\tau_2 - (1-\gamma)\tau_1\sqrt{e_1}\right)}_{\text{aggregate feedback via } \hat{t}_n}, \qquad \hat{t}_n = \frac{1}{N}\sum_{I=1}^{N} t_{I,n}.
\end{aligned} \tag{8}$$

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 (8) 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 average 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 (6) 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 ($q = \frac{1}{2}$).

- If $q = -1$:

$$
\begin{aligned}
K(\hat{t}_n) &= \gamma\big(\tau_1 + \hat{t}_n\,\tau_2\big) + (1-\gamma)\,\tau_1\big(e_1 + \gamma - \hat{t}_n\,\gamma\sqrt{e_1}\big),\\
K'(\hat{t}_n) &= \gamma\big(\tau_2 - (1-\gamma)\,\tau_1\sqrt{e_1}\big)\\
\hat{t}_n &= \frac{1}{N}\sum_{J=1}^{N} t_{J,n}, \qquad \bar{\Lambda} = \frac{1}{N}\sum_{J=1}^{N} \lambda_I\, t_{J,n}\\
C_J &= \frac{\lambda_J}{N}\,K(\hat{t}_n) + \frac{\bar{\Lambda}}{N}\,K'(\hat{t}_n)\\
y^* &= \frac{-\,C_J\,\alpha(1-\alpha) + \sqrt{\alpha(1-\alpha)\,\big[\,1 + C_J(2\alpha-1)\,\big]}}{\alpha\,(1+C_J\alpha)},\\
&\boxed{t^*_{J,n} = \frac{1}{1+y^*}}.
\end{aligned}
\tag{9}
$$

- If $q = \frac{1}{2}$:

$$
\begin{aligned}
X = 2\alpha - 1 + C_J, \qquad m &= 2\alpha(1-\alpha), \qquad D = X^2 + m^2\\
&\boxed{t^*_{J,n} = \frac{(X+\sqrt{D})^2}{(X+\sqrt{D})^2 + m^2}}
\end{aligned}
\tag{10}
$$

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 Equation 9). Let $X := 2\alpha - 1 + C_J$. It follows directly from the respective closed forms that

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

Thus, the $q = \frac{1}{2}$ specification yields a larger news share than the $q = -1$ specification if and only if $\alpha > (1 - C_J)/2$, and the reverse holds when $\alpha < (1 - C_J)/2$ (please see Appendix for the derivation). 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 the change in λ_J if the environment changes from non-separable to separable media content?

Proposition 1 *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.

The above rankings are reversing only as one approaches corners (very high or very low $t^*_{n,J}$), where the non-separable case can display sharp movements due to near-singular FOCs.

Therefore, if entertainment brings similar or larger utility than news $\alpha \leq 0.5$, and a consumer becomes more concerned about the public good of being informed, he increases the demand for news when they are easier to substitute. This is intuitive: if a consumer cares more about the news, they increase their consumption more when entertainment is easier to substitute. This intuition holds when $\alpha < 0.5$, but not when $\alpha > 0.5$. When preferences are news-loving and complementary, the optimal choice sits near a "knife-edge" where intrinsic marginal utilities and policy incentives nearly offset; a small policy tilt can then generate a disproportionately large shift in the optimal $t^*_{n,J}$. It follows that, holding $\alpha > 0.5$ fixed, the non-separable case can produce a much larger increase in the news share in response to a marginal rise 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 in the case of *decrease* of the interest in being informed as a voter, $\Delta\lambda_J < 0$, the reaction would be negative and stronger in the separable media environment than in the non-separable. In the next section, I outline the demand for news for different λ_J distributions, where the baseline case is uniform, $\lambda_J \sim U(0, 1)$.

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. I estimate the best responses of consumers and plot the histogram of individual optimal news shares $t^*_{J,n}$ in the separable and non-separable media enviornment 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 frictions from the media sector.

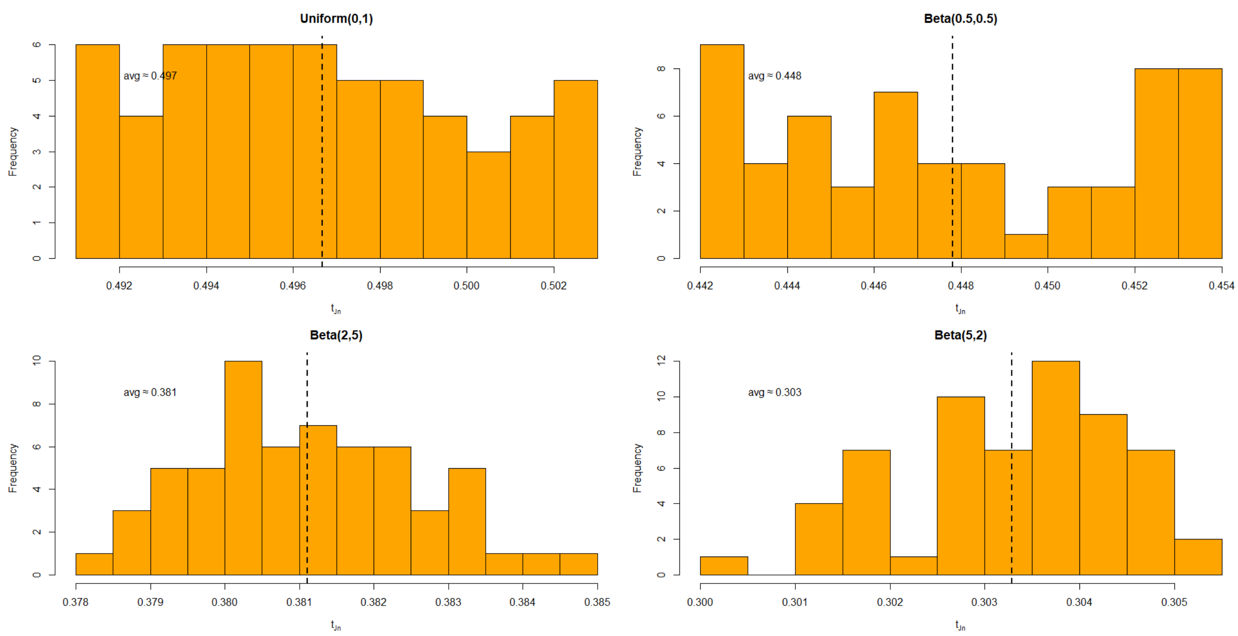

Figure 1: Distribution of the demand for news in the environment of non-separable media content

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.

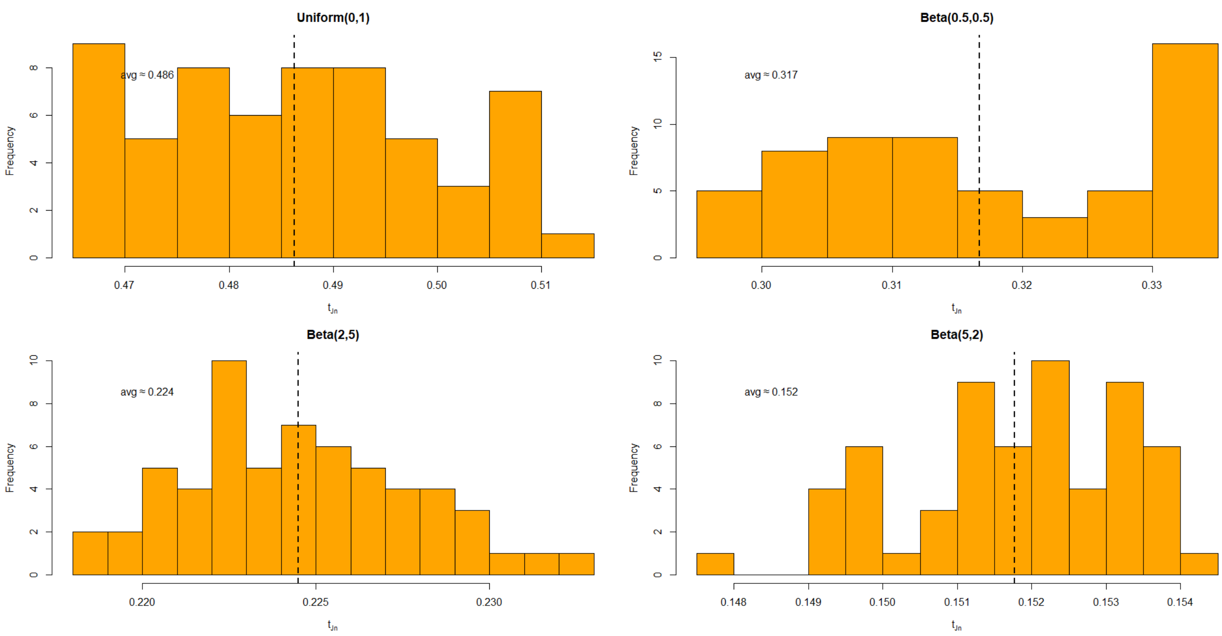

Figure 2: Distribution of the demand for news in the environment of non-separable media content

Similarly to (1), the distribution with the second largest 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, with the steepest absolute difference for the right-skew distribution $Beta(2, 5)$, while relative for the left-skew $Beta(5, 2)$. It follows that in the environment where entertainment is preferred over news ($\alpha = 0.4$), easier substitutability between these contents decreases the average demand for news. In Proposition 2, I formulate the general case, showing how the Beta distribution of λ_J shapes the drop in news when media switch from $q < 0$ to $q > 0$. Assume $t^*_q(C)$ be the best response when the media technology is q and the policy term is $C = \frac{\lambda_J}{N}K + \frac{\bar{\Lambda}}{N}K'$, with $K > 0$ and K' treated as constants at the best response. I define the pointwise "drop" as $h(C) := t^*_{q_-}(C) - t^*_{q_+}(C)$ for a move from $q_- < 0$ to $q_+ \in (0, 1)$, and its average under a distribution F of λ_J:

$$\Delta(F) \ := \ E_{\lambda \sim F}\big[h(a\lambda + b)\big], \qquad a := K/N > 0, \ b := \bar{\Lambda}K'/N. \tag{11}$$

Also, assume h has continuous first, second, and third derivatives with respect to C and is nondecreasing on the relevant C–range. I parametrize: $\lambda \sim \mathrm{Beta}(\kappa\mu, \kappa(1-\mu))$ by mean $\mu \in (0, 1)$ and concentration $\kappa > 0$ (variance $Var(\lambda) = \mu(1-\mu)/(\kappa + 1)$).

Proposition 2 ***How λ_J distribution affects change in news demand when technology shifts from non-separable to separable media?***

(i) ***Dispersion at fixed mean.*** *Fix μ. If the drop in the average demand for news $h''(C) \geq 0$ on the relevant range (locally convex), then a* more dispersed *Beta (smaller κ) yields a* larger *drop:*

$$\kappa_1 < \kappa_2 \ \Rightarrow \ \Delta\big(\mathrm{Beta}(\kappa_1\mu, \kappa_1(1-\mu))\big) \ \geq \ \Delta\big(\mathrm{Beta}(\kappa_2\mu, \kappa_2(1-\mu))\big). \tag{12}$$

If $h'' \leq 0$ (concave), the inequality reverses.

(ii) ***Mean shifts (first-order stochastic dominance).*** *Fix κ. If $h'(C) \geq 0$, then average drop Δ is (weakly) increasing in the mean μ: moving mass to higher λ (e.g., Beta$(5,2)$ vs. Beta$(2,5)$) produces a* larger *drop.*

(iii) ***Skewness (third moment).*** *Around a given mean μ, if $h'''(C) > 0$ locally, then* right-skew *(positive third central moment of λ) further* increases *the drop; if $h''' < 0$, it decreases it.*

Proof in the Appendix.

Essentially, the impact of the distribution of λ_J hinges on whether the difference between the best responses under non-separable media and separable media, $h(C) = t^*_{q-}(C) - t^*_{q+}(C)$, is convex or concave in the relevant range. Recall that each best response satisfies the first-order condition $M_q(t^*_q(C)) + C = 0$, with $M_q(t)$ denoting the marginal utility from the CES aggregator, and $C = \frac{\lambda_J}{N}K + \frac{\bar{\Lambda}}{N}K'$. By implicit differentiation, $\frac{dt^*_q}{dC} = -\frac{1}{M'_q(t^*_q(C))}$. Since $M'_q(t) < 0$ (diminishing marginal utility), we have $\frac{dt^*_q}{dC} > 0$: more policy weight C always raises demand for news. Differentiating again gives $\frac{d^2 t^*_q}{dC^2} = \frac{M''_q(t^*_q(C))}{\left(M'_q(t^*_q(C))\right)^3}$. Hence the curvature of $t^*_q(C)$ depends on the *second derivative of marginal utility* $M''_q(t)$: if $M''_q(t)$ has the same sign as $M'_q(t)$, then $t^*_q(C)$ is concave; if the opposite sign, it is convex. Then, if we subtract across media technologies,

$$h''(C) = \frac{M''_{q-}(t^*_{q-}(C))}{\left(M'_{q-}(t^*_{q-}(C))\right)^3} - \frac{M''_{q+}(t^*_{q+}(C))}{\left(M'_{q+}(t^*_{q+}(C))\right)^3}. \tag{13}$$

Thus the sign of (13) is governed by the *relative curvature* of the two best-response functions: if the non-separable case ($q_- < 0$) bends upward more strongly, then $h''(C) > 0$ (convex gap); if the separable case ($q_+ > 0$) bends more, then $h''(C) < 0$ (concave gap). Intuitively, when goods are *complements* ($q < 0$), the marginal utility of news is "lumpy": at low t_n both goods are needed together, so once policy tilts toward news, demand ramps up quickly. This makes $t^*_q(C)$ relatively convex at low C. When goods are *substitutes* ($q > 0$), adjustment is smoother and the best-response curve is closer to linear. Consequently, for *low* C, complementarity produces faster acceleration in news demand, so $h''(C) > 0$. For *moderate/high* C, both curves flatten, and the substitute case may bend more, yielding $h''(C) < 0$.

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:

$$h'(C_0) < 0, \qquad h''(C_0) > 0, \qquad h'''(C_0) > 0. \tag{14}$$

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

$$\mu(\text{Beta}(2,5)) < \mu(\text{Uniform}) < \mu(\text{Beta}(5,2)) \tag{15}$$

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,

$$Var\big(\text{Beta}(0.5,0.5)\big) > Var\big(\text{Uniform}\big) \quad \Rightarrow \quad \Delta\big(\text{Beta}(0.5,0.5)\big) > \Delta\big(\text{Uniform}\big), \tag{16}$$

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,

$$\kappa_3\big(\text{Beta}(5,2)\big) > 0 \ \text{ boosts } \ \Delta, \qquad \kappa_3\big(\text{Beta}(2,5)\big) < 0 \ \text{ drags } \ \Delta \text{ down.} \tag{17}$$

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:

$$\boxed{\Delta(\text{Beta}(2,5)) \;>\; \Delta(\text{Beta}(5,2)) \;>\; \Delta(\text{Beta}(0.5,0.5)) \;>\; \Delta(\text{Uniform})}. \tag{18}$$

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 (18) 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. In short, the largest drop arises when the λ distribution both *pulls the mean toward the region where h is larger* (lower mean with $h' < 0$) and *adds dispersion* in a region where h is locally convex.

Economically, this means that when voters' media preferences are very heterogeneous, the effect of changing media technology is muted: individuals at the extremes (either highly motivated toward news or almost entirely indifferent) respond little, and their prevalence reduces the aggregate impact. With less dispersion (e.g. Beta$(2,5)$ or Beta$(5,2)$), more mass is concentrated in the middle range of λ, precisely where the gap is largest, so the average drop in the average demand for news is correspondingly larger.

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 (3) shows the best response of a bad incumbent (in exerting effort) to the average demand for news by voters.

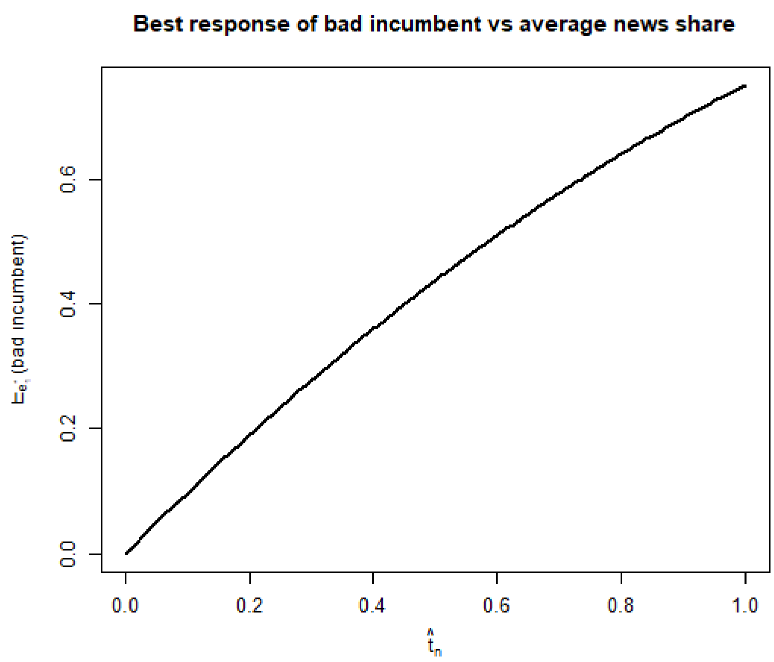

Figure 3

This is not necessarily good for voters: hypothetically, in case the incumbent is bad, they might be better off consuming less news, and with a bad incumbent putting less effort, she would be 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 (4) shows re-election probability as a function of average news share when $\theta = g$ and $\theta = b$.

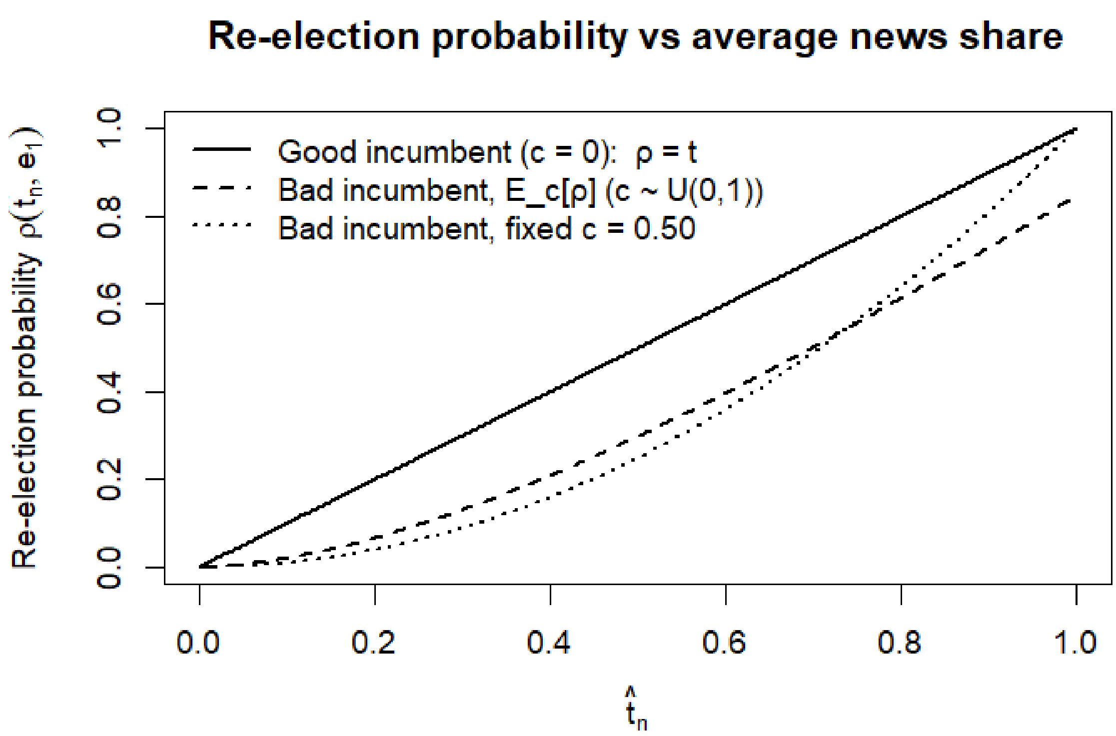

Figure 4

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 the Figure (4), we can see that the gap in re-election probabilities is the largest for the average share of news of around half, while it narrows down 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 being more interested in entertainment, and with heterogeneous ethical parameter λ_J, the shift from non-separable to separable media might worsen public scrutiny defined as an average demand for news (Proposition 2). 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?

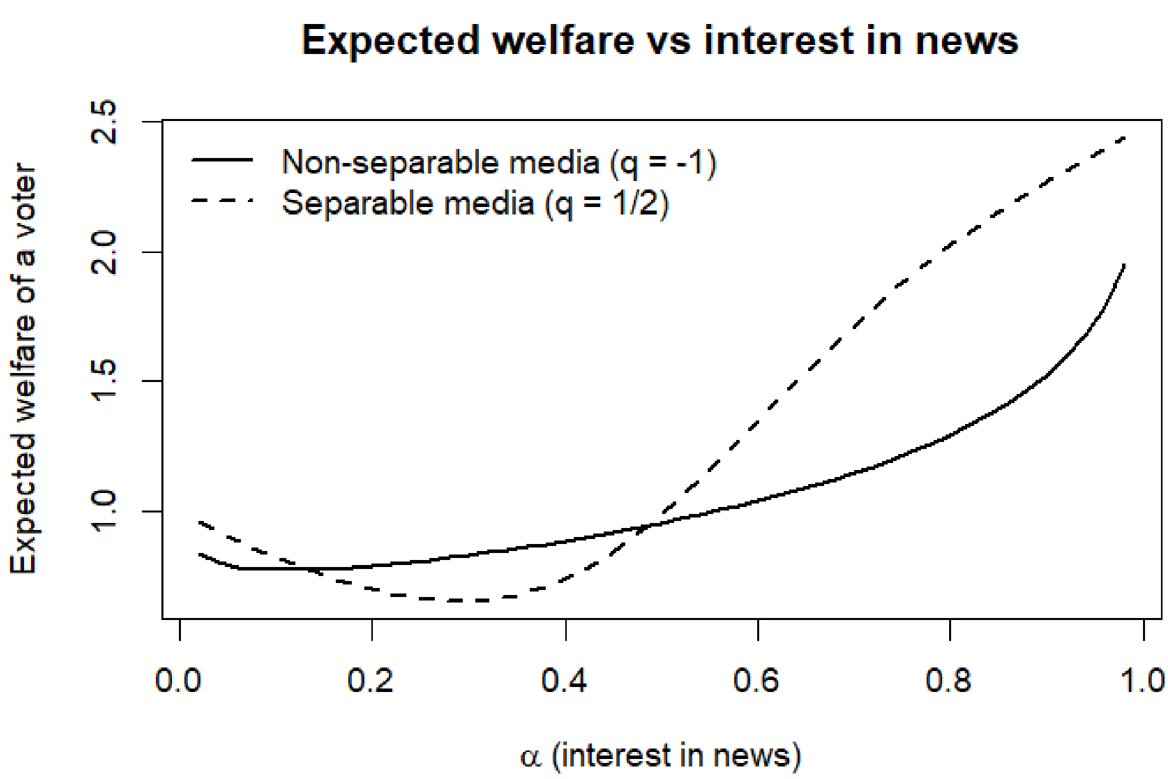

Figure 5

In the calibration from Figure (5), 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 (8). It follows that if voters are moderately interested in news $\alpha \approx 0.3$, and the distribution of the ethical parameter is right-skewed ($Beta(2,5)$), change from non-separable to separable media environment produces a drop in welfare. This is intuitive: when news and entertainment are complements, the non-interested voters have to consume more or less the same amount of both contents, which leads to higher public scrutiny than in the environment of easy substitution.

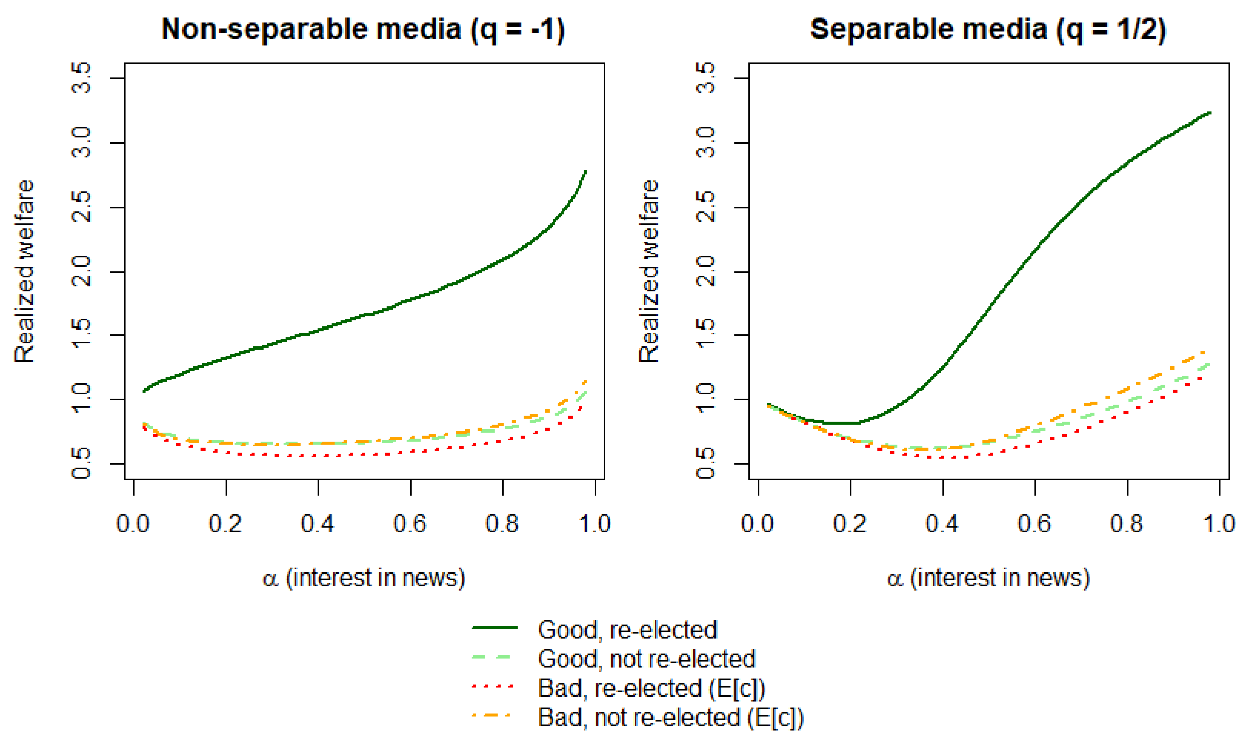

Figure 6

In Figure (6), 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,

$$V^{g,\text{rel}} = \Big((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\Big)^{1/q} + \frac{1}{N}\sum_{J=1}^{N} \lambda_J t_{J,n} \cdot (\tau_1 + \tau_2), \tag{19}$$

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

$$V^{b,\text{rel}} = \Big((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\Big)^{1/q} + \frac{1}{N}\sum_{J=1}^{N} \lambda_J t_{J,n} \cdot (\tau_1 e_1^*), \tag{20}$$

both converge to the intrinsic utility of entertainment alone,

$$\Big((1-\alpha)(1-t_{J,n})^q + \alpha t_{J,n}^q\Big)^{1/q} \;\approx\; (1-\alpha)^{1/q} \;\approx 1. \tag{21}$$

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, we have abstained from the problem od media producers as they are not strategic players. Crucially, the produced news by all media producers is the same and is equal to the average demanded news, $\hat{t}_n$, *unless fixed costs relative to revenue are too high*. Even if a producer can afford to produce a demanded amount, it is always equal to the average: $t_n^s = \hat{t}_n$. Hence, there is always a group of voters for whom $t_{n,J}^* > t_n^s$, that is, who have higher demand for news than the average. Hypothetically, if every voter was able to consume the optimal amount of news, the public scrutiny would improve. In this section, I analyze a policy which subsidize the level of production corresponding to the maximum demanded amount of news, $t_{n,max}$. As voters take into account also the others' interest in the public good, larger supplied news should increase the overall public scrutiny. In this case, an incumbent would consider the maximum demanded news by voters, $t_{n,max}^*$.

In the problem of media producers (3), the distribution of demand for news and entertainment among voters is assumed to be continuous, as it is not likely that voters spend exactly the same amount of time on either content. In the Solution section, the optimality condition for every producer (7) states that $\frac{f(t_n^s)}{f(1-t_n^s)} = \frac{A_e}{A_n}$. Without distributional assumptions, it is not possible to further track the solution to this problem. However, we know that $t_n^s \in (0,1)$, $t_e^s = 1 - t_n^s$. Therefore, I assume that $t_n^s \sim Beta(\alpha_3, \beta_3)$. We can deduce that $1 - t_n \sim Beta(\beta_3, \alpha_3)$. After transformations, we arrive at the following optimality condition for each firm:

$$\left(\frac{t_n^s}{1 - t_n^s}\right)^{\alpha_3 - \beta_3} = \frac{A_e}{A_n} \tag{22}$$

In the case $\alpha < 0.5$, entertainment is preferred to news, and the distribution of demand for the latter is first-order stochastically dominated by the distribution of demand for the former ($F(\hat{t}_n) > F(\hat{t}_e)$). Given the distributional assumption, this implies that $\alpha_3 < \beta_3$.

Suppose we dispose of a policy instrument that can subsidize news production, $A_{n,subs} = A_n + \Delta A_n$. If we subsidize the news to produce it at the maximum demanded amount, then every consumer would consume the amount they demand. From (22) we can get the formula for A_n:

$$A_n = \frac{A_e}{\left(\frac{1}{t_n^s} - 1\right)^{\beta_3 - \alpha_3}} \tag{23}$$

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

$$A_{n,max} - A_n = \Delta A_n = A_e \left(\frac{1}{\left(\frac{1}{t_{n,max}-1}\right)^{\beta_3 - \alpha_3}} - \frac{1}{\left(\frac{1}{t_n^s - 1}\right)^{\beta_3 - \alpha_3}} \right) \tag{24}$$

If a subsidy is larger than ΔA_n, there will be no effect on news consumption unless consumers' preferences change (in favor of news). Note that this policy is meaningful when the majority of the population is not particularly interested in news, as in the opposite case, we might have the problem of "pandering" of a bad incumbent (Figure 3). Nevertheless, for the fixed (α, q) we can conjecture that the welfare cannot be lower if the maximum demanded news is produced as opposed to the average. Indeed, at least in our calibration, as Figure 7 shows, there is virtually no difference in welfare between maximum and average news production, both for the Beta(2,5) and Uniform distribution, regardless of the media environment.

This problem becomes more nuanced if the subsidy was financed from the transfers. In that case, there would be an optimal subsidy that optimizes the public scrutiny with minimal decline in expected transfers. I leave this model extension to future work. Another important issue is the effectiveness of subsidies if fixed costs are too high: while I do not discuss this in the chosen calibration, it is trivial to observe that subsidies might be essential in this case in order to improve public scrutiny. If media producers are not constrained, the main obstacle to the oversight of politicians is people's relatively low interest in politics, as highlighted in the Figure 7. Crucially, if voters are moderately interested in consuming news ($\alpha \approx 0.3$), and the environment changes from non-separable to separable, there might be a noticeable drop in their welfare.

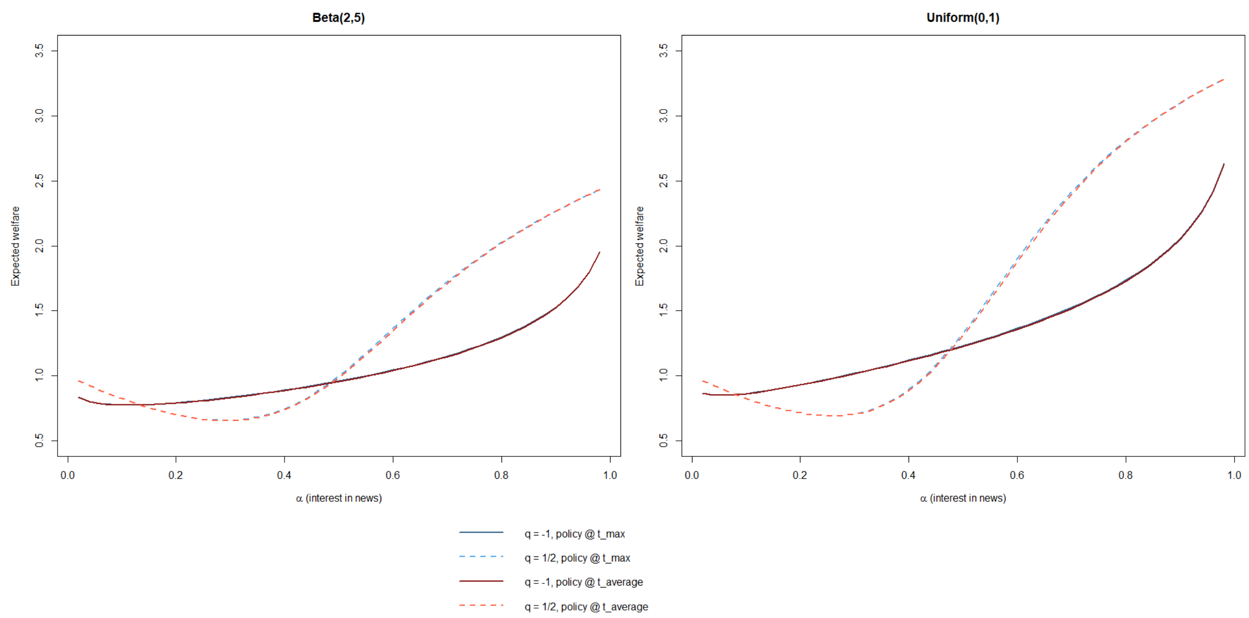

Figure 7

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.[14] 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.[15]

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

[15] On a related angle, using the data for the U.K, Gavazza et al. (2019) show that the Internet penetration

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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Appendix

Additional notation. Let $\hat{T}_n = \sum_{J=1}^{N} t_{J,n}$ and $\hat{t}_n = \hat{T}_n/N$. Let the aggregate (per–firm) profit from choosing (t_n^s, t_e^s) when the cross–sectional demand distributions are $f(\hat{t}_n)$ and $f(\hat{t}_e)$ be

$$\Pi(t_n^s, t_e^s; f, M) \;=\; \frac{N}{M}\Big[A_n\!\int_{\hat{t}_{n,\min}}^{t_n^s} f(\hat{t}_n)\, d\hat{t}_n \;+\; A_e\!\int_{\hat{t}_{e,\min}}^{t_e^s} f(\hat{t}_e)\, d\hat{t}_e\Big] \;-\; FC_n - FC_e,$$

with $t_n^s + t_e^s = 1$ and (t_n^s, t_e^s) constrained to the demand supports $[\hat{t}_{n,\min}, \hat{t}_{n,\max}] \times [\hat{t}_{e,\min}, \hat{t}_{e,\max}]$.

Definition of Equilibrium *An equilibrium is a profile*

$$\big((t_{J,n}, t_{J,e})_{J=1}^{N},\; e_1^\theta, e_2^\theta,\; t_n^s, t_e^s,\; M,\; \rho\big)$$

such that:

(i) ***Consumers.*** *Each J solves (1) s.t. $t_{J,n} + t_{J,e} = 1$, taking $(\hat{t}_n, \bar{\Lambda})$ and $\rho(\hat{t}_n, e_1)$ as given, where $\hat{t}_n = \frac{1}{N}\sum_I t_{I,n}$ and $\bar{\Lambda} = \frac{1}{N}\sum_I \lambda_I t_{I,n}$. Best responses satisfy the FOC (8) and $t_{J,n} \in [0,1]$.*

(ii) ***Incumbent.*** *Given $\hat{t}_n$, types $\theta \in \{g, b\}$ solve (5); we use the induced expectations $E[e_1^*]$ and $E[\sqrt{e_1^*}]$ in voters' payoffs.*

(iii) ***Media firms.*** *Given the demand supports $[\hat{t}_{n,\min}, \hat{t}_{n,\max}]$ and $[\hat{t}_{e,\min}, \hat{t}_{e,\max}]$, a representative firm chooses (t_n^s, t_e^s) solving (3) (equivalently (4)), with M pinned down by free entry $\Pi(\cdot) = 0$.*[16]

(iv) ***Market clearing (news and entertainment).***

$$\tilde{T}_n \;=\; T_n^s \;=\; \sum_{J=1}^{N} t_{J,n}, \qquad \tilde{T}_e \;=\; T_e^s \;=\; \sum_{J=1}^{N} t_{J,e},$$

with $t_n^s \in [\,\hat{t}_{n,\min}, \hat{t}_{n,\max}\,]$ and $t_e^s \in [\,\hat{t}_{e,\min}, \hat{t}_{e,\max}\,]$. (Equivalently: the firm choice lies within the demand supports and equals aggregate consumption; rationing does not occur in equilibrium.)

[16] As content is homogeneous and firms are symmetric, we only require characterization of (t_n^s, t_e^s) and M achieving zero profits.

(v) ***Beliefs and consistency.*** *Beliefs are Bayesian on the equilibrium path;* $\rho(\hat{t}_n, e_1)$ *is correct given* $(t_{J,n})_J$ *and* e_1^θ.

Assumptions

A1 $q < 1$, $\alpha \in (0, 1)$ (strict concavity of the CES aggregator in t), and $\tau_2 > \tau_1$.

A2 f is continuous with compact support $[\hat{t}_{n,\min}, \hat{t}_{n,\max}] \subset [0, 1]$ and $[\hat{t}_{e,\min}, \hat{t}_{e,\max}] \subset [0, 1]$, with $\hat{t}_{n,\min} + \hat{t}_{e,\max} = 1$ and $\hat{t}_{n,\max} + \hat{t}_{e,\min} = 1$.

A3 $\Pi(\cdot)$ is continuous in (t_n^s, t_e^s, M), and for each f there exists at least one $M \geq 1$ and (t_n^s, t_e^s) satisfying free entry $\Pi = 0$ with (t_n^s, t_e^s) *unique.*[17]

Lemma 1 Under (A1), for any $(\hat{t}_n, \bar{\Lambda})$ and induced expectations from the incumbent problem, each voter's problem is strictly concave with a unique maximizer $t^\star_{J,n} \in [0, 1]$, and the best-response BR_J is continuous.

Lemma 2 Under (A2)–(A3), for any demand distribution f generated by $(t_{J,n})_{J=1}^N$, there exists a unique supply pair (t_n^s, t_e^s) with $t_n^s \in [\hat{t}_{n,\min}, \hat{t}_{n,\max}]$, $t_e^s \in [\hat{t}_{e,\min}, \hat{t}_{e,\max}]$, satisfying $\Pi(\cdot) = 0$. Moreover, (t_n^s, t_e^s) depends continuously on f.

Existence of equilibrium *Under (A1)–(A3), an equilibrium exists.*

Proof sketch. Define the compact convex set $\mathcal{X} = [0, 1]^N$ of consumer strategies. Construct the continuous mapping $\mathcal{B} : \mathcal{X} \to \mathcal{X}$ as follows. Given $t \in \mathcal{X}$, compute $(\hat{t}_n, \bar{\Lambda})$ and the incumbent expectations (by backward induction), and obtain each unique $BR_J(\hat{t}_n, \bar{\Lambda})$. Let $t' = (t'_{J,n})_J$ collect these best responses. From t' compute the empirical demand supports and, by the firm lemma, the unique (t_n^s, t_e^s) solving $\Pi = 0$ with $t_n^s \in [\hat{t}_{n,\min}(t'), \hat{t}_{n,\max}(t')]$. Impose market clearing by projecting t' onto the hyperplane $\sum_J t_{J,n} = N t_n^s$:

$$\tilde{t}_{J,n} \;=\; t'_{J,n} \;+\; \eta\,\big(t_n^s - \hat{t}'_n\big), \qquad \eta \in [0, 1],$$

choosing η so that $\tilde{t}_{J,n} \in [\hat{t}_{n,\min}(t'), \hat{t}_{n,\max}(t')]$ for all J. (Feasibility follows since t_n^s lies within the demand support; hence the projection is well defined.) Set $\mathcal{B}(t) = \tilde{t}$. Continuity of each step (best responses, supports, firm supply, and projection) implies continuity of $\mathcal{B}$. By Brouwer's fixed-point theorem, $\mathcal{B}$ has a fixed point t^*. At t^* we have (i) individual optimality, (ii) firm optimality with $\Pi = 0$, and (iii) $\sum_J t^*_{J,n} = N t_n^s$, i.e., market clearing. The incumbent's effort choices are optimal by construction, completing the equilibrium. □

Uniqueness of equilibrium *Suppose, in addition to (A1)–(A3), that:*

U1 *The consumer game is* diagonally strictly concave *in the sense of Rosen (1965):*

$$\Big|K'(\hat{t}_n)\Big| \;\cdot\; \sup_{J,t}\left|\frac{1}{U''_{J,CES}(t_{J,n})}\right| \;\cdot\; \frac{\sum_{I=1}^N \lambda_I}{N^2} \;<\; 1, \tag{25}$$

yielding a unique demand profile $t^\dagger$ *given any* (K, K').

[17] Uniqueness can be guaranteed if the revenue integrals deliver a strictly concave objective in t_n^s (e.g., decreasing average ad revenue per outlet in t_n^s or M).

U2 *The firm's zero-profit supply* $t_n^s(\cdot)$ *is a* contraction *in the demand support endpoints (equivalently, small enough pass-through from* f *to* t_n^s*), and* t_n^s *lies strictly inside* $[\hat{t}_{n,\min}, \hat{t}_{n,\max}]$ *at the fixed point (no rationing).*

Then the equilibrium is unique.

Proof sketch. (U1) gives a unique $t^\dagger$ for a given (K, K') (hence a unique demand support). (U2) ensures that the mapping from demand supports to the firm's t_n^s and back to the average demand $\hat{t}_n$ is a contraction, so the fixed point $\hat{t}_n = t_n^s$ is unique. Interior clearing eliminates corner rationing multiplicities. Therefore, the coupled consumer–firm system admits a unique solution. □

Existence uses only compactness, continuity, and the fact that firms choose supply within the demand support, allowing us to enforce clearing by a continuous projection. Uniqueness requires (i) strong enough individual curvature relative to political feedback (Rosen's condition) and (ii) sufficiently tame firm responses so that the market-clearing fixed point in the *average* news share is single-valued.

Comparison of the closed-form best responses (p. 10) Let

$$C = \frac{1}{N^2}\left(\sum_{I=1}^{N} \lambda_I\right) \gamma\Big(\tau_2 - (1-\gamma)\tau_1\sqrt{e_1}\Big), \qquad K := \frac{\partial C}{\partial \lambda_J} = \frac{\gamma\big(\tau_2 - (1-\gamma)\tau_1\sqrt{e_1}\big)}{N^2}.$$

We analyze an interior optimum $t^* \equiv t^*_{J,n} \in (0,1)$. Assume $K > 0$ (i.e., $\tau_2 > (1-\gamma)\tau_1\sqrt{e_1}$), so a marginal increase in λ_J raises C.

- Case $q = \frac{1}{2}$.

  Define $X := 2\alpha - 1 + C$, $m := 2\alpha(1-\alpha)$, $D := X^2 + m^2$. The closed form t implies the sensitivity

  $$\frac{\partial t}{\partial \lambda_J} = \frac{\partial t}{\partial C} K = \underbrace{\frac{2\, t^{(1-t)}}{\sqrt{D}}}_{S_{1/2}(t^{,\alpha,C)>0}} K.$$

  Hence for $\alpha < \frac{1}{2}$ and $K > 0$,

  $$\boxed{\frac{\partial t}{\partial \lambda_J} > 0} \qquad \text{(news demand rises).}$$

- Case $q = -1$.
  Let $Z := \alpha + t^{(1-2\alpha)}$ and $H := (1-t^{)+C\,Z}$. The interior comparative statics (valid when $H > 0$) are

  $$\frac{\partial t}{\partial \lambda_J} = \frac{\partial t}{\partial C} K = \underbrace{\frac{t^{\,Z^2}}{2\alpha\, H}}_{S_{-1}(t^{,\alpha,C)\geq 0}} K.$$

  For $\alpha < \frac{1}{2}$ we have $Z \in [\alpha,\, 1-\alpha] \subset (0,1)$ and, for moderate C, $H > 0$. Thus with $K > 0$,

  $$\boxed{\frac{\partial t}{\partial \lambda_J} > 0} \qquad \text{(news demand rises).}$$

Which reaction is stronger when $\alpha < \frac{1}{2}$?
Compare $S_{1/2}$ and S_{-1}. Using $Z \le 1-\alpha,\quad H \ge (1-t^*) + C\alpha,\quad \sqrt{D} \le C + 1 - 2\alpha^2$ yields the pointwise bounds

$$S_{-1}(t^*, \alpha, C) \;\le\; \frac{t^*(1-\alpha)^2}{2\alpha\,[\,(1-t^*) + C\alpha\,]}, \qquad S_{1/2}(t^*, \alpha, C) \;\ge\; \frac{2\,t^*(1-t^*)}{C+1-2\alpha^2}.$$

Therefore a transparent *sufficient* condition for the $q = \frac{1}{2}$ reaction to dominate is

$$\boxed{4\alpha\,(1-t^*)\,[\,(1-t^*) + C\alpha\,] \;\ge\; (1-\alpha)^2\,(C+1-2\alpha^2).}$$

Whenever this inequality holds (it does for $\alpha < \frac{1}{2}$ and moderate $C > 0$ on interior t^*),

$$\boxed{\left|\frac{\partial t^*}{\partial \lambda_J}\right|_{q=1/2} \;\ge\; \left|\frac{\partial t^*}{\partial \lambda_J}\right|_{q=-1} \quad \text{(with strict $>$ away from boundaries).}}$$

A positive policy tilt (increase in λ_J) raises the marginal political return to news. With $q = \frac{1}{2}$ (separable media), the marginal intrinsic trade-off is relatively flat and the sensitivity is driven by $t^*_{n,J}(1-t^*_{n,J})$, which is sizable in the interior; with $q = -1$ (non-separable media), the denominator $H = (1-t^*) + CZ$ stays relatively large on the $\alpha < \frac{1}{2}$ side, damping the response. Hence, the $q = \frac{1}{2}$ case reacts *more strongly* in magnitude if entertainment is preferred to news.

Non-separable media. I define an individual FOC as

$$M(t_{J,n}) \;+\; C_J \;=\; 0, \qquad M(t) := \Big[(1-\alpha)(1-t)^q + \alpha t^q\Big]^{\frac{1}{q}-1}\Big[\alpha t^{q-1} - (1-\alpha)(1-t)^{q-1}\Big],$$
$$C_J \;=\; \frac{\lambda_J}{N}\,K(\hat{t}_n) \;+\; \frac{\bar{\Lambda}}{N}\,K'(\hat{t}_n), \quad \bar{\Lambda} := \tfrac{1}{N}\sum_I \lambda_I t_{I,n}, \quad K'(\hat{t}_n) = \gamma(\tau_2 - (1-\gamma)\tau_1\sqrt{e_1}),$$
with
$$K(\hat{t}_n) = \gamma(\tau_1 + \hat{t}_n\tau_2) + (1-\gamma)\tau_1\big(e_1 + \gamma - \hat{t}_n\gamma\sqrt{e_1}\big). \tag{26}$$

Holding the aggregates $(\hat{t}_n, \bar{\Lambda})$ fixed, a marginal change in λ_J shifts only the first term in C_J, so by the implicit function theorem:

$$\frac{\partial t^*_{J,n}}{\partial \lambda_J} \;=\; \underbrace{\frac{\partial t^*_{J,n}}{\partial C_J}}_{=-1/M'(t^*_{J,n})}\;\frac{\partial C_J}{\partial \lambda_J} \;=\; \boxed{\frac{K(\hat{t}_n)}{N}\;\frac{1}{-\,M'(t^*_{J,n})}}. \tag{27}$$

For $q < 1$ (in particular $q < 0$) the CES aggregator is strictly concave in t, which implies $M'(t^*_{J,n}) < 0$ at any interior optimum; hence the *sign* of the response is governed by $K(\hat{t}_n)$. Under the natural "pro-news" tilt $\tau_2 > (1-\gamma)\tau_1\sqrt{e_1}$ and $\tau_1 > 0$ one has $K(\hat{t}_n) > 0$, so

$$\frac{\partial t_{J,n}}{\partial \lambda_J} > 0:$$

A higher λ_J (greater weight on the social/policy payoff) raises optimal news consumption.

Separable media. The implicit-function theorem yields the same formula as in (27). In the illustrative case $q = \frac{1}{2}$, using the closed form for t^* one obtains an explicit multiplier,

$$X := 2\alpha - 1 + C_J, \quad m := 2\alpha(1-\alpha), \quad D := X^2 + m^2, \qquad \boxed{\frac{\partial t^*_{J,n}}{\partial \lambda_J} = \frac{2\,t^*(1-t^*)}{\sqrt{D}}\;\frac{K(\hat{t}_n)}{N}.}$$

Comparison of non-separable and separable media for $\alpha \approx \frac{1}{2}$. Fix a pro-news environment ($K(\hat{t}_n) > 0$) and consider interior solutions. When $\alpha \approx \frac{1}{2}$, the best-response level t^* is typically near 1/2. For $q > 0$ the CES MRS is relatively flat around the interior, and the factor $t^*(1-t^*)$ is maximized at $t^* \approx \frac{1}{2}$, which *amplifies* the multiplier $-1/M'(t^*)$; consequently the responsiveness $\partial t^*/\partial\lambda_J$ is relatively large. For $q < 0$ the MRS is much steeper; away from the corners (as at $t^* \approx \frac{1}{2}$) this steepness makes $|M'(t^*)|$ comparatively larger, which *dampens* the quantity response. Therefore, holding $(\hat{t}_n, \bar{\Lambda})$ fixed and for α near one half,

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

with the ranking reversing only as one approaches corners (very high or very low t^*), where the non-separable case can display sharp movements due to near-singular FOCs. Therefore, if news brings similar utility as entertainment $\alpha \approx 0.5$, and a consumer becomes more concerned about the public good of being informed, he increases the demand for news when they are easier to substitute. This is intuitive: if a consumer cares more about the news, they increase their consumption more when entertainment is easier to substitute. This intuition holds when $\alpha < 0.5$, but not when $\alpha > 0.5$.

Proposition 1

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 (8) can be written as

$$F_q\big(t, \lambda_J; \alpha\big) \;:=\; M_q(t;\alpha) \;+\; \frac{\lambda_J}{N}\,K(\hat{t}) \;+\; \frac{1}{N^2}\Big(\sum_{I=1}^{N}\lambda_I t_I\Big)\,K'(\hat{t}) \;=\; 0, \tag{28}$$

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

$$\frac{\partial t^*_{J,n}}{\partial\lambda_J} \;=\; -\,\frac{\partial F_q/\partial\lambda_J}{\partial F_q/\partial t} \;=\; -\,\frac{\frac{1}{N}K(\hat{t}) \;+\; \frac{1}{N^2}\,t^*_{J,n}\,K'(\hat{t})}{M_q'(t^*;\alpha) \;+\; \frac{\lambda_J}{N^2}K'(\hat{t}) \;+\; \frac{1}{N^2}\sum_{I=1}^{N}\lambda_I\,\frac{\partial t_I}{\partial t_{J,n}}\,K'(\hat{t}) \;+\; \frac{1}{N^2}\Big(\sum_{I=1}^{N}\lambda_I t_I\Big)K''(\hat{t})\frac{1}{N}}. \tag{29}$$

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 (29) 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

$$\frac{\partial t^*_{J,n}}{\partial\lambda_J} \;=\; \frac{K(\hat{t})}{N} \;\cdot\; \frac{1}{\big|M_q'(t^*;\alpha)\big|} \;\cdot\; \big(1 + o(1)\big), \qquad o(1) = O\Big(\frac{1}{N}\Big). \tag{30}$$

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

[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 (29) are $O(1/N)$ by inspection.

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

$$M_q'(t;\alpha) \;=\; (q-1)\, g(t)^{\frac{1}{q}-2} \Big[-w(t)^2 \;+\; g(t)\Big(\alpha\, t^{\,q-2} + (1-\alpha)\,(1-t)^{\,q-2}\Big)\Big]. \qquad (31)$$

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)

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

At $t = t_{\text{bal}}$ we have $w(t) = 0$. Using (31) and $w(t_{\text{bal}}) = 0$ we obtain

$$\big|M_q'(t_{\text{bal}};\alpha)\big| \;=\; (1-q)\, g(t_{\text{bal}})^{\frac{1}{q}-1} \Big(\alpha\, t_{\text{bal}}^{q-2} + (1-\alpha)\,(1-t_{\text{bal}})^{\,q-2}\Big). \qquad (32)$$

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 (32) 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

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

(b) **News–tilted region** ($\alpha > \frac{1}{2}$, hence $t^* \ge t_{\text{bal}} \ge \frac{1}{2}$ 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,

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

Statements (a)–(b) can be formalized by bounding the bracket in (31) above and below using that, for $\alpha \le \frac{1}{2}$ and $t \le \frac{1}{2}$, $g(t) \in [(1-\alpha)(1-t)^q,\; (1-\alpha)(1-t)^q + \alpha\, 2^{-q}]$ 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 $\alpha > \frac{1}{2}$, $t \ge \frac{1}{2}$. 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 (30) yields:

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

$$\frac{\partial t_{J,n}^*}{\partial \lambda_J}\bigg|_{q>0} \;>\; \frac{\partial t_{J,n}^*}{\partial \lambda_J}\bigg|_{q<0} \quad \text{(larger positive response under separability)},$$

because $|M_{q>0}'| < |M_{q<0}'|$.

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

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

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

Finally, as t^* approaches the corners, the powers t^{q-2} or $(1-t)^{q-2}$ in (31) 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. □

Proposition 2

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 $\lambda \sim \text{Beta}(\kappa\mu, \kappa(1-\mu))$.

(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*:

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

i.e., they have the same mean and the one with smaller κ is a mean-preserving spread.[19] 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 $\lambda \sim \text{Beta}(\kappa\mu, \kappa(1-\mu))$ 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).

[19] See, e.g., Shaked and Shanthikumar (2007), *Stochastic Orders*, Thm. 3.A.12 (and references therein).

(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, $\text{sign}(\mu_3) = \text{sign}(\beta - \alpha) = \text{sign}(1 - 2\mu)$; 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.