A Citizen-Editors Model of News Media

Sobbrio, Francesco

IMT Institute For Advanced Studies, Lucca

April 2011

A Citizen-Editors Model of News Media*

Francesco Sobbrio†

April 13, 2011

Abstract

This paper provides a model of the market for news where profit maximizing media outlets choose their editors from a population of rational citizens. The results show that, when information acquisition is costly, citizens find it optimal to acquire information from a media outlet with an editor with similar idiosyncratic preferences. At the same time, there is always an upper bound on the possible "extremism" of an editor above which the citizens' demand for news is strictly decreasing. Depending on the distribution of citizens' ideological preferences, a media outlet may choose to hire a non-moderate editor even in a monopolistic market. Moreover, the higher the degree of competition in the market for news, the more likely it is that media outlets will hire non-moderate editors. Finally, less moderate editors are more likely to be hired in a news market where the opportunity cost of acquiring information for citizens is low.

JEL Classification: D72, D81, D83

Key Words: Media Slant, Information Acquisition, Valence, Competition

---

*I am very grateful to Juan Carrillo, Francesco De Sinopoli, Mark Dincecco, Helios Herrera, Andrea Mattozzi, Paolo Pin, Guofu Tan, Edilio Valentini, Simon Wilkie, Kenneth Wilburn for many useful suggestions. I would also like to thank seminar audiences at the 2010 Congress of the European Economic Association, 7th Workshop in Media Economics, 2009 European Meeting of the Econometrics Society, the 2009 Meeting of the Association for Public Economic Theory, the 8th Journées Louis-André Gérard-Varet, the 2009 Meeting of the European Public Choice Society, University of Bologna, University of Namur, University of Padova and IMT Lucca. All remaining errors are mine.

†Department of Economics, IMT Lucca, Piazza San Ponziano 6, 55100, Lucca, Italy. Email: f.sobbrio@imtlucca.it

"Whatever the social effects of talk radio or the partisan agendas of certain hosts, it is a fallacy that political talk radio is motivated by ideology. It is not. Political talk radio is a business, and it is motivated by revenue" David Foster Wallace, "Host", *The Atlantic Magazine*, April 2005

1 Introduction

In regulating the market for news in the US, the Federal Communication Commission pursues three strategic policy goals: competition, diversity and localism.[1] Despite the self-evident importance for democratic decision-making of fostering an efficient market of information, such policy goals still lack an exhaustive theoretical foundation and a comprehensive analysis of their consequences on consumers' welfare and optimal media ownership's rules.

This paper contributes to the understanding of the market for news in general and these policy goals in particular, by providing a theoretical framework to analyze the relationship between two of them: competition and diversity. More specifically, this paper is the first to show the presence of a direct link between competition and diversity in a market for news where consumers are rational (i.e., they do not derive any exogenous utility from receiving biased information), they share the same prior beliefs and media outlets are just profit-maximizers. Overall, the analysis suggests that a higher degree of competition leads to more viewpoint diversity in the form of different media outlets hiring editors with different ideological preferences.

The model analyses a market for news driven by the citizens' demand for information. More specifically, citizens have to choose between two alternative candidates (or policies). Citizens differ in their idiosyncratic preferences, but all equally value the *valence* (i.e., quality) of alternative candidates (or public benefit of alternative policies). Citizens may acquire some information about the quality of different candidates by watching news reports. News reports are produced by editors hired by media outlets from the population of citizens. That is, once hired by a media outlet, a citizen-editor can gather (costly) information about the candidates' quality and then report it to the viewers.

The results show that editors with different idiosyncratic preferences have different optimal information acquisition strategies. A moderate editor (i.e., one who is *ex-ante* indifferent between the two candidates) uses a balanced information acquisition strategy. The amount of evidence in support of the leftist candidate that she requires in order to stop collecting information and produce a report in favor of such candidate is the same as the one she requires to produce a report in favor of the rightist candidate. Instead, a non-moderate editor acquires information in a slanted way. That is, a small amount of evidence in support of the leftist candidate is sufficient to induce a leftist editor to stop investing in information

[1] Source: http://www.fcc.gov/mediagoals/

acquisition and produce a report in favor of that candidate. On the other hand, such an editor would produce a report in favor of the rightists candidate only after having collected a large amount of evidence in support of that candidate. Moreover, on average, the more moderate an editor is, the higher the expected accuracy of its news reports (i.e., higher probability of endorsing the high valence candidate).

In order to access news reports, citizens have to pay an opportunity cost. Hence, in choosing whether or not to watch a media outlet report, and if so, which of them to watch, a citizen will take into account two different components. She will consider how much information the editor of a media outlet may have collected before producing a news report. At the same time, she will also take into account how *valuable* the information gathered by an editor could be for her final choice. Suppose, for example, that a liberal citizen has to decide whether to watch a media outlet having a moderate editor or one having a liberal editor. Citizens knows that the moderate editor is the one who, in expectation, will produce the most accurate news report. Instead, the liberal editor has a lower probability of endorsing a low-valence conservative candidate and a higher probability of endorsing a low-valence liberal candidate. Indeed, the liberal editor is the one who will collect more evidence in support of the conservative candidate before producing a favorable report. Hence, since a liberal citizen cares more about not choosing a low-valence conservative candidate than not choosing a low-valence liberal one, the report coming from a liberal editor is more valuable for her than the one coming from a moderate editor. That is, citizens find it optimal to acquire information from a media outlet having an editor with similar idiosyncratic preferences even though they do not have any exogenous preferences for like-minded sources of information. At the same time, since the less moderate an editor is, the lower the expected accuracy of her news reports (i.e., higher probability of endorsing the low valence candidate), there is always an upper bound on the possible "extremism" of an editor above which the demand for news of citizens is strictly decreasing.

Media outlets anticipate this behavior by citizens and hence they choose which editor to hire taking into account the expected demand for news reports produced by editors with different idiosyncratic preferences. That is, by choosing a more leftist, moderate or rightist editor, media outlets implicitly choose their product location in the political space. When the distribution of citizens is such that the number of leftist and rightist citizens is higher than the number of moderate citizens, a media outlet may choose to hire a non-moderate editor even in a monopolistic market. Hence, even though citizens do not derive any exogenous utility from acquiring biased information and the media outlet is just maximizing profits, the endogenous acquisition of costly information may induce the media outlet to choose an editor whose optimal information acquisition strategy is slanted in favor of the alternative *ex-ante* preferred by a subset of citizens. This is true even in the case where all citizens share the same *ex-post* ranking of preferences over candidates.

It is also shown that, even in the case where citizens are uniformly distributed in the policy space, there is a threshold in the number of media outlets present in the market for news above which media outlets may find optimal to hire non-moderate editors. More specifically, the lower the opportunity cost of watching news, the more likely it is that media outlets would hire non-moderate editors for a given number of media outlets present in the market for news.

Overall, the results suggest that more moderate editors should be present in news markets where the opportunity cost that citizens incur to access information is high. Indeed, when opportunity cost is high, the expected benefit of watching news reports for extremist citizens is lower than the cost. Hence, media outlets will be more likely to hire moderate editors since the bulk of the demand for news comes from moderate citizens. Instead, when the opportunity cost is low, even extremist citizens may find convenient to watch news reports when such news reports come from an editor with similar idiosyncratic preferences. Hence, a media outlet may find it optimal to locate its news product to capture this demand for news by non-moderate citizens (i.e., hire a non-moderate editor). A clear application of such a result is represented by the market for news in the broadcast media sector with respect to the press. The opportunity cost of watching a broadcast media report is arguably lower than the one of reading a newspaper. The analysis thus suggests that more moderate editors should be present in the press than in the broadcast media sector. At the same time, extremist citizens should be more likely to acquire information from broadcast media than from newspapers and broadcast media should face a higher overall demand with respect to the one faced by the press.

1.1 Related Literature

A recent empirical literature has shown the presence of systematic bias in the market for news using a variety of instruments to measure such bias (e.g., Grosenclose and Milyo 2005, Ho and Quinn 2008, Gentzkow and Shapiro 2010).[2] In parallel, a fast growing theoretical literature has tried to rationalize the presence of such systematic bias in the media. This literature has identified, so far, two different forces creating a bias in media reports. The first one is a supply-driven bias: media bias may arise from the idiosyncratic preferences of journalists (Baron 2006), owners (Djankov et al. 2003, Anderson and McLaren 2010), governments (Besley and Prat 2006) or advertisers (Ellman and Germano 2009, Germano and Meier 2010, Blasco et al. 2011). The second one is a demand-driven bias. Part of this literature assumes that consumers like to receive information confirming their bias and thus media just reflect and confirm the bias of their audience (Mullainathan and Shleifer 2005). On the other hand, Gentzkow and Shapiro (2006) show that even when consumers do not

[2] For evidence on the empirical effects of media bias see DellaVigna and Kaplan (2007), Gerber et al. (2009) and DellaVigna and Gentzkow (2010).

like biased information, if media outlets have reputation concerns and there is uncertainty on the quality of media outlets, in presence of heterogeneous prior beliefs different media outlets operating in the same market may find it optimal to slant their reports according to the prior beliefs of different segments of consumers. Finally, Chan and Suen (2008) show that media slant emerges when media outlets observe the state of the world but are exogenously constrained to report coarse information.

The present paper contributes to this literature along three main dimensions. First, the model provides a demand-driven rationale for media slant without relying on any exogenous preferences for biased news confirming individuals' beliefs (as in Mullainathan and Shleifer 2005) and without heterogeneous prior beliefs (as in Gentzkow and Shapiro 2006). In my model, the individual's willingness to acquire information from a like-minded source is the result of the cost of acquiring information and the citizen-editors' endogenous information acquisition. Second, while Chan and Suen (2008) assume that a media outlet exogenously commits to a threshold above which it will endorse a candidate, in my model there is a (credible) endogenous commitment by the editor to a given information acquisition strategy. That is, as in the literature on citizen-candidates voters know that a candidate can only credibly commit to her preferred policy, in the present paper viewers know that an editor can only credibly commit to her optimal stopping thresholds. In addition, differently from Chan and Suen where viewers can only learn coarse information from a media outlet (i.e., they are just able to infer in which interval lies the signal observed by the media outlet), in the present framework viewers always learn the underlying (difference of) signals collected by the editor.[3] Moreover, in Chan and Suen, competition does not lead to product differentiation (i.e., two independent profit-maximizing media outlets always choose the same endorsement threshold). Instead, my results show that competing media outlets may find optimal to choose editors with different idiosyncratic preferences.[4] Third, as pointed out by Prat and Strömberg (2010), the relationship between the ideological positions of media outlets and the informativeness of their news reports has not yet been addressed by this literature. By micro-founding the information acquisition process of citizen-editors, the model is able to provide novel insights on this issue. Specifically, the results show that the expected accuracy of news reports (i.e., expected probability of an editor endorsing the high valence candidate) is decreasing moving away from moderate editors. In turn, this implies that there is always an upper bound on the possible "extremism" of an editor above which the demand for news by citizens is strictly decreasing.

The results are consistent with the empirical results of Gentzkow and Shapiro (2010).

[3]From the viewers' perspective, it is equivalent whether the editor produces a coarse news report (e.g., endorsment) or she produces a news report showing all the signals (e.g., evidence) collected. Indeed, upon observing a coarse news report, viewers are able to infer which stopping threshold has been reached by the editor since they know the editor's idyosincratic preferences.

[4]On the other hand, Chan and Suen (2008) endogenize the platform of political parties in their model and provide several interesting and compelling insights also on the role of media on partisan policies.

Using zip-code level data on newspaper circulation in the US, they show that the demand for right-wing newspaper is higher in markets with a higher proportion of Republicans. Moreover, they find that ownership has little or no role in media slant.[5] The present paper suggests that such findings may not be the result of behavioral preferences for biased news but they may rather be the result of the demand for costly information by rational individuals and the consequent optimal ideological location of news by profit maximizing media outlets.[6] The theoretical framework of the paper is also closely related to the empirical analysis of newspaper endorsements and media influence in the US by Chiang and Knight (2010). In line with the predictions of my model, Chiang and Knight find that the degree of influence of a newspaper on voters depends on the credibility of the endorsement.[7]

Formally, the model of optimal acquisition of information by citizen-editors is related to the one of Brocas and Carrillo (2009) on systematic errors in decision-making. In their setting individuals have to decide how much information they want to collect before taking an action whose utility depends on the state of the world. Given any exogenous amount of information, all individuals would choose the same action. However, in presence of endogenous information acquisition different individuals would have different probabilities of choosing a given action. More specifically, they show that individuals favor actions with large payoff-variance. My setting differs because it is assumed that all actions have the same variance in payoffs for any citizen-editor and such variance is equal across citizen-editors. Moreover, in my model citizen-editors differ in their *ex-ante* ranking of actions even when they share the same *ex-post* ordinal preferences over actions.[8]

The paper is organized as follows. Section 2 describes the model and the structure of the game. Section 3 derives the optimal information acquisition strategy by citizen-editors. Section 4 discusses the demand for news. Section 5 contains the results on the optimal choice of editors by media outlets. Section 6 provides a discussion on the implications and the robustness of the results. Section 7 concludes. All the proofs are provided in the appendix.

[5] More specifically, they find that "the slant of co-owned papers is only weakly (and statistically insignificantly) correlated to a newspaper's political alignment" (Gentzkow and Shapiro, 2010, page 38).

[6] Calvert (1985) was the first to point out the positive value of a biased source of information for a rational decision-maker. See also Cukierman and Tommasi (1998) and Li and Suen (2004).

[7] Specifically, "endorsements for the Democratic candidate from left-leaning newspapers are less influential than are endorsements from neutral or right-leaning newspapers and likewise for endorsements for the Republican candidate" (Chiang and Knight, 2010, page 23).

[8] Notice also that in their model the cost of acquiring information is embedded in the discount factor. Their results do not apply in presence of a per unit cost of sampling since individuals differ only in the variance of their payoffs but not in their *ex-ante* ranking between actions.

2 The Model

2.1 Citizens

There is a continuum of *citizens* of measure one who have to make a decision regarding a single issue or policy P. Without loss of generality, the policy space is assumed to be $\Psi = [0, 1]$. There are only two possible alternative candidates/policies L and R (i.e., $P = \{L; R\}$) where $L = 0$ and $R = 1$. There are two possible states of the world $s \in \{l, r\}$. To preserve symmetry, the common prior belief that the state of the world is r is assumed to be $\Pr(s = r) = 1/2$. Citizens care about the ideological distance between their idiosyncratic preferences and the candidates' policy platforms. That is, citizens want to minimize the euclidean distance between their policy preferences and the ones of the chosen candidate. At the same time, citizens also care about the *valence* (i.e., quality) of the candidates. The valence component is captured by an additive constant in the citizen's utility function. That is, regardless of her idiosyncratic policy preferences, each citizen gets an extra positive payoff when she chooses the high valence candidate and a negative one when the low valence candidate is chosen.[9] Hence, citizen i's utility function is:

$$u_i(P, x_i) = \delta I_s I_p - |P - x_i| \tag{1}$$

where x_i represents the idiosyncratic policy preference of citizen i. Moreover, $\delta \in (0, \frac{1}{2}]$ and:

$$I_s = \begin{cases} 1 \text{ if } s = l \\ -1 \text{ if } s = r \end{cases} \quad \text{and} \quad I_p = \begin{cases} 1 \text{ if } P = L \\ -1 \text{ if } P = R \end{cases} \tag{2}$$

As a consequence, candidate L gives a higher utility to citizens when the state of the world is l than when the state is r (*viceversa* for candidate R).[10] In other words, while L and R represent the alternative political platforms of the two candidates, 2δ can be seen as the difference in the *valence* of the two candidates in each state of the world.[11] The idiosyncratic preferences of citizens are distributed with a common knowledge c.d.f. $F(x)$ with density function $f(x)$ where *supp* $[f(x)] = [0, 1]$. To avoid the presence of exogenous asymmetries, the analysis focuses on distributions that are symmetric and monotone in the sub-intervals

[9] As usual in the literature on the demand for news (e.g., Strömberg 2004, Mullainathan and Shleifer 2005, Gentzkow and Shapiro 2006, Chan and Suen 2008, Anderson and McLaren 2010) it is assumed that citizens receive utility from choosing a given candidate/alternative *per se*. Section 6.1 provides a discussion on this assumption.

[10] For a similar specification of the voters' utility function see, for example, Aragones and Palfrey (2002).

[11] As an alternative interpretation of the model, L and R can be seen as two alternative policies (e.g. implementing Kyoto's protocol or not). Hence, if the state of the world is l then the public benefits/cost ratio of policy L is higher than the one of R (*viceversa* if $s = r$). That is, if the state of the world is l policy L is the most efficient one.

$x \in [0, \frac{1}{2}]$ and $x \in [\frac{1}{2}, 1]$.[12] The state contingent utilities of citizen i are, thus, as follows:

$$u_i(L|s) = \begin{cases} \delta - x_i & \text{if } s = l \\ -\delta - x_i & \text{if } s = r \end{cases} \quad \text{and} \quad u_i(R|s) = \begin{cases} -\delta + x_i - 1 & \text{if } s = l \\ \delta + x_i - 1 & \text{if } s = r \end{cases} \tag{3}$$

Notice also that for any citizen i the two candidates have the same variance in payoffs and such variance is equal across citizens since:

$$u_i(L|s = l) - u_i(L|s = r) = u_i(R|s = r) - u_i(R|s = l) = 2\delta \quad \forall i$$

Let $\Sigma = \{\sigma_l, \sigma_r\}$ be the signal space. The signal likelihood function is as follows:

$$\Pr(\sigma_l|s = l) = \Pr(\sigma_r|s = r) = \theta \tag{4}$$

where $\theta \in \left(\frac{1}{2}, 1\right)$ represents the precision of the signal. Suppose now that citizens receive n_l signals σ_l and n_r signals σ_r on the state of the world. Then the citizens' posterior beliefs are:

$$\Pr(s = r|n_l, n_r) = \frac{\theta^{n_r - n_l}}{\theta^{n_r - n_l} + (1 - \theta)^{n_r - n_l}}$$

Therefore, denoting $n = n_r - n_l$, the citizens' posterior beliefs can be denoted as follows:

$$\mu(n) = \frac{1}{1 + \left(\frac{1-\theta}{\theta}\right)^n} \tag{5}$$

Hence, citizen i prefers candidate R to candidate L whenever:

$$\mu(n) > \frac{1}{4\delta}(2\delta - 2x_i + 1) = \mu(\hat{n}_i) = \hat{\mu}_i \tag{6}$$

That is $\hat{n}_i$ is the difference in the number of signals in favor of state r which makes citizen i being indifferent between candidates R and L. Notice that for $\delta = \frac{1}{2}$, then $\hat{\mu}_i > 0, \forall i$. Hence for $\delta = \frac{1}{2}$ all citizens would prefer candidate L when $s = l$ and candidate R when $s = r$. That is, when $\delta = \frac{1}{2}$, *ex-post* all citizens have the same ranking of preferences over candidates. Instead, for $0 < \delta < \frac{1}{2}$ there will be some "stubborn" citizens who will always vote for the same candidate regardless of the state of the world.[13] Moreover:

$$\frac{\partial u_i(R|\mu(n))}{\partial \mu(n)} = -\frac{\partial u_i(L|\mu(n))}{\partial \mu(n)} = 2\delta, \;\; \forall i$$

that is, the utility functions of citizens i and j are always parallel. The utilities of citizens can be represented as follows:

[12] For example, the families of Uniform, Normal, and Cauchy distribution functions satisfy such property.

[13] Notice that assuming $\delta \in (0, \frac{1}{2}]$ is without loss of generality. The same results would hold in a model where $\delta \in \mathbb{R}^+$ and *supp* $[f(x)] = \mathbb{R}$.

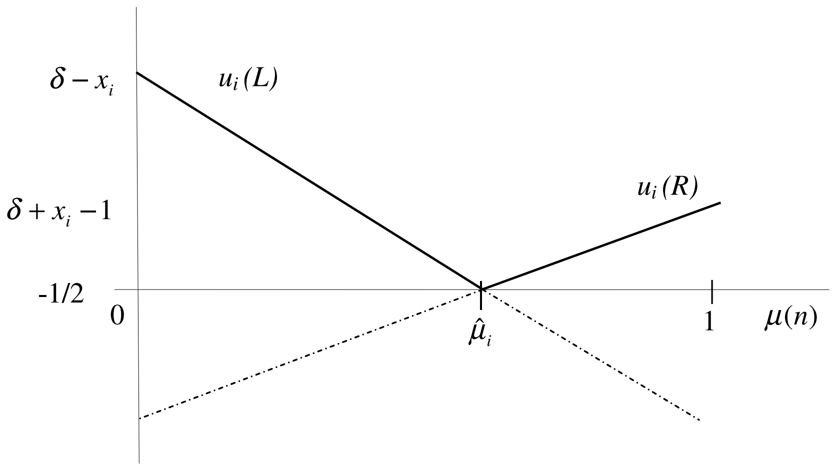

Figure 1. Utility of citizen i for $x_i < 1/2$

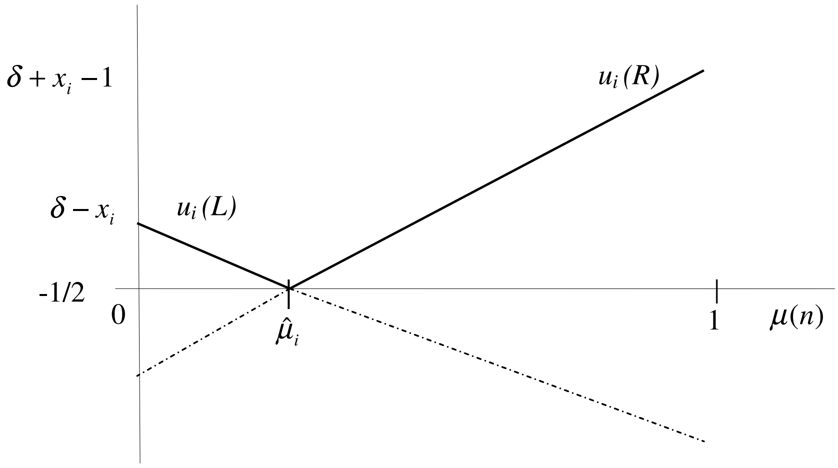

Figure 2. Utility of citizen i for $x_i > 1/2$

For any exogenously given $\mu(n) \in (0,1)$, different citizens may have different ranking of preferences regarding candidates L and R. More specifically:

$$\hat{\mu}_{\frac{1}{2}} = \frac{1}{2} \quad \text{and} \quad \frac{\partial \hat{\mu}_i}{\partial x_i} < 0 \tag{7}$$

Thus, citizens with more "rightist" preferences require less evidence in favor of R in order to choose that candidate with respect to moderate citizens. Notice also that:

$$u_i(L|\hat{\mu}_i) = u_i(R|\hat{\mu}_i) = -\frac{1}{2} \qquad \forall i$$

Moreover, when a citizen cares more about the true state of the world (i.e., when the *valence* component is larger), her indifference threshold is closer to the one of a moderate citizen. That is:

$$\frac{\partial \hat{\mu}_i}{\partial \delta} = \frac{(2x_i - 1)}{4\delta^2} \begin{cases} < 0 & \text{if } \; x_i < \frac{1}{2} \\ > 0 & \text{if } \; x_i > \frac{1}{2} \end{cases} \tag{8}$$

In other words, the more citizens care about the quality of different candidates, the less evidence in favor of the least ideologically closer candidate they require in order to vote for her.

2.2 The Game

There is a media industry composed by $K \geq 1$ media outlets. Each media outlet is assumed to be maximizing its viewership in order to maximize its advertising revenues. In order to produce news reports, each media outlet has to hire an editor from the population of citizens. Once hired, a citizen-editor is endowed with a (costly) technology that allows her to collect evidence on the state of the world. More specifically, an editor has to incur a cost c any time she decides to draw a signal on the state of the world (e.g., effort she has to exert to acquire information, opportunity cost of sending reporters to investigate an issue, etc.).[14] The media outlet will then produce a news report based on the editor's optimal sampling strategy. Citizens will then decide whether to access a media outlet's report by paying an opportunity cost C or not. If they decide to watch a media outlet's report they update their beliefs using Bayes' rule. Hence, the demand for news reports that a media outlet faces is a function of the type of editor that it has hired. That is, given an editor with idiosyncratic preferences x_e, the profit function of media outlet k is $\Pi_k(x_e) = D_k(x_e)$, where $D_k(x_e)$ is the demand for the news report produced by the media outlet.[15] To summarize, the timing of the game is as follows:

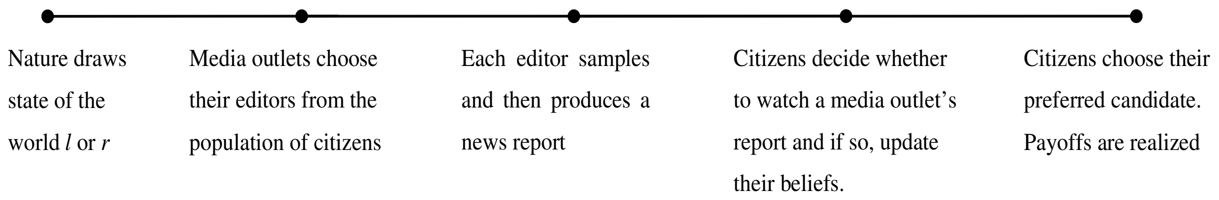

Figure 3. Timing of the Game

Next section provides the analysis of the optimal strategy of a citizen-editor (i.e., her optimal sampling strategy). Then, I characterize the demand for news reports by citizens (i.e., $D_k(x_e)$) as a function of an editor's optimal sampling strategy. Finally, I analyze the profit-maximizing strategy of media outlets within different structures of the market for news (i.e., which type of editor maximizes the profits of media outlets in a monopoly, duopoly and in presence of an arbitrary number of media outlets) and then discuss the results.

[14] By "editor" I refer to what is usually called "Editor-in-Chief" for a newspaper and "Managing Editor" in the broadcast media sector. More in general, the model applies to the choice of a profit maximizing media outlet regarding the type of journalists to be hired.

[15] See section 6.2 for a discussion on the structure of media outlets' profits.

3 Optimal Information Acquisition by Citizen-Editors

Suppose that a media outlet has hired a citizen with idiosyncratic preferences x_e to work as its editor (i.e., x_e denotes the idiosyncratic preferences of a citizen-editor). Let $\tau_{e,m}(n)$ be the decision of such a citizen-editor given that she has already drawn $m = \{0, 1, ...\infty\}$ signals and given a current difference of signals in favor of r equal to n. Given any m and n, the choice set of citizen-editor e is $\Gamma_m(n) = \{L, R, d\}$. Thus she can choose candidate L or R or she can pay c and draw another signal on the state of the world (i.e., choose $\tau_{e,m}(n) = d$, where d stands for "draw").

An editor faces a trade-off between the cost of acquiring a signal and the utility she gets from the informative content of each signal. Thus, her problem is thus to find an optimal stopping rule. More specifically, the value function that editor e maximizes after m draws, given a current difference of signals in favor of state r equal to n, is the following:

$$V_e(n) = \begin{cases} \max \left\{ \begin{array}{l} \delta(1 - 2\mu(n)) - x_e; \\ \nu(n)V_e(n+1) + (1 - \nu(n))\, V_e(n-1) - c \end{array} \right\} & \text{if } \mu(n) < \hat{\mu}_e \\ \max \left\{ \begin{array}{l} \delta(2\mu(n) - 1) - (1 - x_e); \\ \nu(n)V_e(n+1) + (1 - \nu(n))\, V_e(n-1) - c \end{array} \right\} & \text{if } \mu(n) \geq \hat{\mu}_e \end{cases} \tag{9}$$

where $\nu(n) = \mu(n)\theta + (1 - \mu(n))(1 - \theta)$. In other words, if after m draws editor e has a posterior $\mu(n) < \hat{\mu}_e$ she will choose between alternative L with an expected payoff of $(1 - \mu(n))\,(\delta - x_e) + \mu(n)(-\delta - x_e)$ or paying c and getting another signal. In this case, with probability ν the editor will get signal σ_r in which case the value function becomes $V_e(n+1)$ and with probability $(1 - \nu)$ she will get signal σ_l in which case the value function becomes $V_e(n - 1)$. Instead, if after m draws editor e has a posterior $\mu(n) \geq \hat{\mu}_e$ she will choose between alternative R with an expected payoff of $(1 - \mu(n))\,(x_e - \delta - 1) + \mu(n)(x_e + \delta - 1)$ or paying c and getting another signal. In this case, with probability ν the editor will get signal σ_r in which case the value function becomes $V_e(n + 1)$ and with probability $(1 - \nu)$ she will get signal σ_l in which case the value function becomes $V_e(n - 1)$. Notice also that the value function of editor e does not depend on how many draws she has already done (i.e., m), since the only relevant variable for her decision is the current difference of signals in favor of r (i.e., the state variable is n).

The following proposition characterizes the properties of the optimal information acquisition strategy by an editor.

Proposition 1 *For all $c > 0$, there exist $(\underline{n}_e^*, \bar{n}_e^*)$ such that for $\forall m, \forall x_e$:*

1. $\tau_{e,m}(n) = L$ *if* $n \leq \underline{n}_e^*$, $\tau_{e,m}(n) = R$ *if* $n \geq \bar{n}_e^*$ *and* $\tau_{e,m}(n) = d$ *if* $n \in (\underline{n}_e^*, \bar{n}_e^*)$.
2. $\frac{d\underline{n}_e^*}{dx_e} < 0$, $\frac{d\underline{n}_e^*}{d\delta} < 0$ *and* $\frac{d\underline{n}_e^*}{dc} > 0$

3. $\frac{d\bar{n}_e^*}{dx_e} < 0, \frac{d\bar{n}_e^*}{d\delta} > 0$ *and* $\frac{d\bar{n}_e^*}{dc} < 0$

Moreover

$$\left|\frac{d\bar{n}_e^*}{dx_e}\right| \begin{cases} < \left|\frac{d\underline{n}_e^*}{dx_e}\right| & \text{for } x_e < \frac{1}{2} \\ = \left|\frac{d\underline{n}_e^*}{dx_e}\right| & \text{for } x_e = \frac{1}{2} \\ > \left|\frac{d\underline{n}_e^*}{dx_e}\right| & \text{for } x_e > \frac{1}{2} \end{cases} \quad \text{and} \quad \left|\frac{d\bar{n}_e^*}{d\delta}\right| \begin{cases} < \left|\frac{d\underline{n}_e^*}{d\delta}\right| & \text{for } x_e < \frac{1}{2} \\ = \left|\frac{d\underline{n}_e^*}{d\delta}\right| & \text{for } x_e = \frac{1}{2} \\ > \left|\frac{d\underline{n}_e^*}{d\delta}\right| & \text{for } x_e > \frac{1}{2} \end{cases}$$

The following graph illustrates the optimal strategy of editor e after m draws, given a current difference of signals in favor of r equal to n:

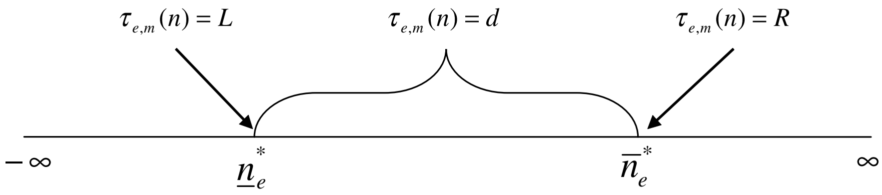

Figure 4. Optimal Strategy of editor e

In other words, $\underline{n}_e^*$ is the threshold below which editor e does not sample anymore and reports $|\underline{n}_e^*|$ more signals in favor of candidate L. Similarly, $\bar{n}_e^*$ is the threshold above which editor e does not sample anymore and reports $\bar{n}_e^*$ more signals in favor of candidate R.

For any given n a more "rightist" editor is always more likely to produce a report in favor of candidate R than in favor of L, with respect to a more "leftist" editor. That is, $x_{e'} > x_e$ implies that $\underline{n}_{e'}^* < \underline{n}_e^*$ and $\bar{n}_{e'}^* < \bar{n}_e^*$. Moreover, given editors e and e' with $x_{e'} < x_e \leq \frac{1}{2}$, then $\bar{n}_{e'}^* - \underline{n}_{e'}^* < \bar{n}_e^* - \underline{n}_e^*$. That is, a more leftist editor requires even less signal in favor of L than more in favor of R to stop sampling, with respect to a more moderate editor. Similarly, given editors e and e' with $x_{e'} > x_e \geq \frac{1}{2}$, then $\bar{n}_{e'}^* - \underline{n}_{e'}^* < \bar{n}_e^* - \underline{n}_e^*$. That is, a more rightist editor requires even less signals in favor of R than more in favor of L with respect to a more moderate editor. Hence, the more moderate an editor is, the larger is her "information acquisition set" $N_e = \{n | \tau_{e,m}(n) = d\}$ (i.e., the set of the difference in the number of signals in favor of r (or in favor of l) such that editor e will keep sampling).[16] At the same time, an increase in the importance of the valence component of the editor's utility function (δ) makes an editor sample more in both directions (i.e., N_e becomes larger). Moreover, an increase in δ induces a leftist editor to increase her "leftist" stopping rule more than her "rightist" stopping rule (i.e., $|\underline{n}_e^*|$ increases more than $\bar{n}_e^*$). The opposite is true for a rightist editor. That is, a higher δ is associated with more sampling in both directions *and* more symmetric stopping rules for all types of editors. Therefore, proposition 1 suggests that when δ is higher any type of editor: *i)* acquires more information; *ii)* behaves *as if* she were more moderate (i.e., has more symmetric stopping rules).

[16]Notice that it is always the case that either $N_e \equiv \varnothing$ or $N_e \equiv \{\underline{n}_e^*, \underline{n}_e^* + 1, ..., \bar{n}_e^* - 1, \bar{n}_e^*\} \supseteq \{0\}$.

Notice that, for $x_e = \frac{1}{2}$, $\bar{n}_e^* - \hat{n}_e = \hat{n}_e - \underline{n}_e^*$ and thus $\mu(\bar{n}_e^*) = 1 - \mu(\underline{n}_e^*)$. Moreover for $x_{e'} > x_e$:

$$\mu(\underline{n}_{e'}^*) < \mu(\underline{n}_e^*) < 1/2 < \mu(\bar{n}_{e'}^*) < \mu(\bar{n}_e^*) \tag{10}$$

Moreover, given the comparative statics results of proposition 1, it is possible to derive some comparative statics results on the probability of an editor choosing the "wrong" candidate.

Corollary 1 *The expected probability of an editor choosing the low (high) valence candidate is increasing (decreasing) in c and decreasing (increasing) in δ and in $|x_e - P|$. Moreover, the more moderate an editor, the lower this probability.*

As expected, when the cost of sampling is higher, editors will make more "errors" in the sense that they would be less likely to choose the high valence candidate. Instead, when editors care more about the quality of candidates their probability of choosing the low valence candidate decreases (since as shown by proposition 1, when δ is higher editors acquire more information). Moreover, this probability is decreasing in the "ideological distance" between an editor and the candidate, e.g., more "rightist" editors are less likely to choose candidate L when the high quality one is R and are instead more likely to choose candidate R when the high quality one is L. More generally, from an *ex-ante* perspective, moderate editors are less likely to make a report in favor of the low quality candidate. This is due to the fact that, as shown by proposition 1, the more moderate an editor is, the more symmetric her sampling strategy is and also the more information she acquires before making a decision. Therefore, by taking on average a "more informed" decision, moderate editors are less likely to choose the low quality candidate. That is, the less moderate an editor is, the lower the expected accuracy of her news reports (i.e., lower probability of endorsing the high valence candidate)

At this point, it is important to remark that I am not implying in any way that moderate editors have any higher intrinsic value *per se*. Moderate editors simply provides a useful benchmark since their perfectly symmetric stopping thresholds correspond to what is usually considered as a "fair and balanced" news report.[17] Indeed, a moderate editor requires the exact same amount of evidence in favor of either candidate to stop acquiring information and choose that candidate. Hence, moderate editors are used as the benchmark for the discussion throughout the paper simply because the idea of "fair and balanced" news reports may implicitly suggests that rational citizens should always demand this type of news (i.e., there should not be any media slant). Nevertheless, as indeed shown in the next section, these "fair and balanced" news reports are not necessarily the optimal ones from the perspective of every single citizen.

[17] For example, the idea of "fair and balanced" news reports was at the foundation of the FCC Fairness Doctrine in the US. Similarly, as stated by the BBC in the UK, "Impartiality lies at the heart of public service and is the core of the BBC's commitment to its audiences" (www.bbc.co.uk/guidelines/editorialguidelines)

4 The Demand for News

This section analyzes the demand by citizens for the news reports of a media outlet as a function of the optimal stopping rules of its editor. Given the idiosyncratic preferences of a media outlet's editor, each citizen i can infer the set of possible reports of a media outlet (i.e., citizen i knows that the editor will either stop acquiring information after having collected $\underline{n}_e^*$ signals in favor of L or $\bar{n}_e^*$ in favor of R). That is, analogously to the literature on citizen-candidates where citizens know that a candidate has a personal commitment to implement a given policy, in the model citizens know that an editor has a personal commitment to implement a given information acquisition strategy.[18] That is, from the citizens' perspective, it is equivalent whether the editor produces a coarse news report (e.g., endorsement) or she produces a news report showing all the signals (e.g., evidence) collected. Indeed, upon observing a coarse news report, citizens are able to infer which stopping threshold has been reached by the editor since they know the editor's idiosyncratic preferences. Moreover, this stopping threshold contains all the information needed by citizens to update their beliefs (i.e., the net difference of signals in favor of a candidate).

Let the citizens' action space be $A = \{W, NW\}$ where W stands for watching the news reports and NW for not watching the news reports. Then, the expected utility of citizen i from not getting any news report from the media outlet is:

$$U_i(NW) = \begin{cases} U_i\left(L|\frac{1}{2}\right) & \text{for } x_i < \frac{1}{2} \\ U_i\left(R|\frac{1}{2}\right) & \text{for } x_i > \frac{1}{2} \end{cases}$$

If instead citizen i decides to pay a cost C to access the news report, her expected utility will be:

$$\begin{aligned} U_i(W) = &\Pr(n = \underline{n}_e^*) \max\left\{U_i\left(L|\mu(\underline{n}_e^*)\right); U_i\left(R|\mu(\underline{n}_e^*)\right)\right\} \\ &+ \Pr(n = \bar{n}_e^*) \max\left\{U_i\left(L|\mu(\bar{n}_e^*)\right); U_i\left(R|\mu(\bar{n}_e^*)\right)\right\} - C \end{aligned} \tag{11}$$

Where the probabilities of reaching the two stopping threshold $\underline{n}_e^*$ and $\bar{n}_e^*$ are:[19]

$$\Pr(n = \underline{n}_e^*) = \frac{2\mu(\bar{n}_e^*) - 1}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} \tag{12}$$

and

$$\Pr(n = \bar{n}_e^*) = \frac{1 - 2\mu(\underline{n}_e^*)}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} \tag{13}$$

Let's now focus on the marginal viewer. That is, the viewer who is indifferent between watching and not watching the media outlet's reports. More specifically, there will be two marginal viewers. One representing the most rightist citizen willing to watch news

[18] See sections 6.2 and 6.4 for a discussion on this issue.

[19] These are simply the probabilities of hitting the two stopping thresholds in a stochastic process with two absorbing states (see Brocas and Carrillo 2007). The online appendix provides a formal derivation of these probabilities.

reports from a media outlet having an editor with idiosyncratic preferences x_e. The other one representing the most leftist citizen willing to watch such news reports. That is, there will be a $\hat{x}_e = \hat{x}_e(x_e)$ and a $\tilde{x}_e = \tilde{x}_e(x_e)$ with $\hat{x}_e < \tilde{x}_e$ such that only citizens with $x_i \in [\hat{x}_e, \tilde{x}_e]$ will watch the news reports.[20]

Let's start analyzing the marginal viewer for $x_i < \frac{1}{2}$. Then $U_i(NW) = U_i\left(L|\frac{1}{2}\right)$ and since by (10) $\underline{n}_e^* < 0 < \bar{n}_e^*$, it must be the case that:

$$U_i\left(L|\mu(\underline{n}_e^*)\right) > U_i\left(R|\mu(\underline{n}_e^*)\right)$$

Moreover, the following individual rationality constraint must be satisfied for leftist citizens:

$$U_i\left(L|\mu(\bar{n}_e^*)\right) < U_i\left(R|\mu(\bar{n}_e^*)\right) \tag{IR_L}$$

otherwise, if $U_i\left(L|\mu(\bar{n}_e^*)\right) > U_i\left(R|\mu(\bar{n}_e^*)\right)$ (i.e., if citizen i would always prefer alternative L regardless of watching or not the news reports) then watching the news reports would never be *ex-post* rational given the cost C. Thus the marginal leftist viewer will be the one having idiosyncratic preferences $\hat{x}_e$ such that:

$$U_i\left(L\left|\frac{1}{2}\right.\right) = \frac{2\mu(\bar{n}_e^*) - 1}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} U_i\left(L|\mu(\underline{n}_e^*)\right) + \frac{1 - 2\mu(\underline{n}_e^*)}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} U_i\left(R|\mu(\bar{n}_e^*)\right) - C$$

that is:

$$\hat{x}_e = \frac{1}{2} - \delta(2\mu(\bar{n}_e^*) - 1) + \frac{C}{2\Pr(n = \bar{n}_e^*)} \tag{14}$$

Notice also that the *ex-post* rationality constraint (IR_L) is satisfied as long as $x_i > \frac{1}{2} - \delta(2\mu(\bar{n}_e^*) - 1) = x^{\min}$. Hence, since $\hat{x}_e > x^{\min}$, such constraint is automatically satisfied for any citizen willing to watch the news reports.

Let's now focus on the marginal viewer for $x_i > \frac{1}{2}$. Then $U_i(NW) = U_i\left(R|\frac{1}{2}\right)$ and since by (10) $\underline{n}_e^* < 0 < \bar{n}_e^*$, it must be the case that:

$$U_i\left(R|\mu(\bar{n}_e^*)\right) > U_i\left(L|\mu(\bar{n}_e^*)\right)$$

Moreover, the following individual rationality constraint must be satisfied for rightist citizens:

$$U_i\left(L|\mu(\underline{n}_e^*)\right) > U_i\left(R|\mu(\underline{n}_e^*)\right) \tag{IR_R}$$

otherwise, if $U_i\left(L|\mu(\underline{n}_e^*)\right) < U_i\left(R|\mu(\underline{n}_e^*)\right)$ (i.e., if citizen i would always prefer alternative R regardless of watching or not the news reports) then watching the news reports would not be *ex-post* rational given the cost C. Thus the marginal rightist viewer will be the one

[20] Notice that it could also be the case that $\hat{x}_e > \frac{1}{2}$ or $\tilde{x}_e < \frac{1}{2}$ but not both.

having idiosyncratic preferences $\tilde{x}_e$ such that:

$$U_i\left(R\left|\frac{1}{2}\right.\right) = \frac{2\mu(\bar{n}_e^*) - 1}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} U_i\left(L|\mu(\underline{n}_e^*)\right) + \frac{1 - 2\mu(\underline{n}_e^*)}{2\left[\mu(\bar{n}_e^*) - \mu(\underline{n}_e^*)\right]} U_i\left(R|\mu(\bar{n}_e^*)\right) - C$$

that is:

$$\tilde{x}_e = \frac{1}{2} + \delta(1 - 2\mu(\underline{n}_e^*)) - \frac{C}{2\Pr(n = \underline{n}_e^*)} \tag{15}$$

Notice also that the *ex-post* rationality constraint (IR_R) is satisfied as long as $x_i < \frac{1}{2} + \delta(1 - 2\mu(\underline{n}_e^*)) = x^{\max}$. Hence, since $\tilde{x}_e < x^{\max}$, such constraint is automatically satisfied for any citizen willing to watch the news reports. The following condition is assumed:

Assumption 1

$$C < C^{\max} = \delta\left(\frac{1 - \lambda^{\bar{n}_e^*|_{x_e = \frac{1}{2}}}}{1 + \lambda^{\bar{n}_e^*|_{x_e = \frac{1}{2}}}}\right)$$

where $\lambda = \frac{1-\theta}{\theta}$. It is easy to prove that when this assumption does not hold and $C > C^{\max}$, there will never be any leftist or rightist citizen willing to watch any news report.[21] The following lemma contains the main properties of the demand for news.

Lemma 1 *Let $(\bar{n}_e^*, \underline{n}_e^*)$ be the optimal stopping rules of an editor with idiosyncratic preferences x_e. Then, $(\tilde{x}_e - \hat{x}_e)$ is decreasing in C and increasing in δ, $\bar{n}_e^*$ and $|\underline{n}_e^*|$. Moreover, there is always an upper bound on the "extremism" of an editor above which $(\tilde{x}_e - \hat{x}_e)$ is strictly decreasing. Specifically, for $x_e \leq 1/2$, $\tilde{x}_e$ is always increasing in x_e. Instead, for $x_e > 1/2$, $\tilde{x}_e$ is increasing in x_e if and only if $x_e < x_{e_R}^{\max}$. Where, $x_{e_R}^{\max}$ is such that:*

$$\tilde{C}(\bar{n}_e^*(x_{e_R}^{\max}), \underline{n}_e^*(x_{e_R}^{\max})) = C \tag{16}$$

where

$$\tilde{C} \equiv 2\delta \frac{\lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*} + 1\right)^2\left(1 - \lambda^{\bar{n}_e^*}\right)^2}{\lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*} - 1\right)\left(\lambda^{\underline{n}_e^*} + 1\right)^2 + \lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*} + 1\right)^2\left(1 - \lambda^{2\bar{n}_e^*}\right)} \tag{17}$$

and $d\tilde{C}/dx_e < 0$. Similarly, for $x_e \geq 1/2$, $\hat{x}_e$ is always increasing in x_e. Instead, for $x_e < 1/2$, $\hat{x}_e$ is increasing in x_e if and only if $x_e > x_{e_L}^{\min}$. Where $x_{e_L}^{\min}$ is such that:

$$\hat{C}(\bar{n}_e^*(x_{e_L}^{\min}), \underline{n}_e^*(x_{e_L}^{\min})) = C \tag{18}$$

[21]Notice that $C^{\max} = C^{\max}|_{x_e = \frac{1}{2}}$ where instead $C^{\max}|_{x_e \neq \frac{1}{2}} = \delta\frac{\left(\lambda^{\underline{n}_e^*} - 1\right)\left(1 - \lambda^{\bar{n}_e^*}\right)}{\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}}$ and $\frac{dC^{\max}|_{x_e \neq \frac{1}{2}}}{dx_e}\begin{cases} > 0 \text{ for } x_i < \frac{1}{2} \\ = 0 \text{ for } x_i = \frac{1}{2} \\ < 0 \text{ for } x_i > \frac{1}{2}\end{cases}$ hence requiring $C < C^{\max}|_{x_e = \frac{1}{2}}$ is the least restrictive assumption.

where

$$\hat{C} \equiv 2\delta \frac{\lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*}-1\right)^2}{\lambda^{2\underline{n}_e^*}\left(1-\lambda^{2\bar{n}_e^*}\right)\left(\lambda^{\bar{n}_e^*}+1\right)^2+\lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*}-1\right)\left(\lambda^{\underline{n}_e^*}+1\right)^2} \tag{19}$$

and $d\hat{C}/dx_e > 0$.

The above lemma summarizes the main features of the demand for news media by citizens. Hence, it represents the foundation for all the results that will be obtained in the next section when discussing the optimal choice of editors by profit-maximizing media outlets within a given market structure (i.e., monopoly, duopoly or an arbitrary number of competing media outlets).

Obviously, a higher opportunity cost of watching news reports decreases the number of leftist and rightist citizens willing to watch such reports. Instead, the higher the valence component in the citizens utility function, the more leftist and rightist citizens will want to watch news. That is, the more citizens care about knowing the state of the world, the more citizens will get informed. At the same time, all citizens care about receiving the most accurate information, i.e., the lower is $\underline{n}_e^*$ and the higher is $\bar{n}_e^*$, the more citizens will want to get informed. Indeed, all citizens who value information (i.e., the ones whose *ex-post* ranking of candidates is not always the same as their *ex-ante* one) would like to watch a media outlet having an editor who samples in both directions until infinity, since the more information she gets, the higher the citizens' expected utility. However, given the editor's cost of acquiring information and the opportunity cost that each citizen faces when accessing this information, when a citizen is choosing whether to watch a media outlet and/or choosing among alternative news media outlets, she takes into account two different components. That is, she considers how similar an editor's idiosyncratic preferences are to hers (i.e., how "valuable" the information provided by an editor could be to her) but she also values the expected accuracy of information acquisition by an editor (i.e., how much information an editor is acquiring and thus providing, on average).

Specifically, citizens can be divided into two categories depending on their idiosyncratic preferences. Citizens with preferences $x_i < \hat{x}_e|_{x_e=\frac{1}{2}}$ and $x_i > \tilde{x}_e|_{x_e=\frac{1}{2}}$ are "relatively extremists".[22] For these citizens, only a media outlet with an editor with similar idiosyncratic preferences can be pivotal for their choice (i.e., they never find valuable the information coming from a moderate editor). Hence, either they will watch a media outlet with an editor with (sufficiently) similar preferences or they will not watch any media outlet at all.

On the other hand, citizens with preferences $\hat{x}_e|_{x_e=\frac{1}{2}} < x_i < \tilde{x}_e|_{x_e=\frac{1}{2}}$ are "relatively moderate" (i.e., liberal-moderates for $\hat{x}_e|_{x_e=\frac{1}{2}} < x_i < \frac{1}{2}$ and conservative-moderates for $\frac{1}{2} < x_i < \tilde{x}_e|_{x_e=\frac{1}{2}}$). These citizens find the information coming from a moderate editor

[22] Notice that not all these citizens can be properly defined as "extremists" since not everyone of them is stubborn. Some of them may change their *ex-ante* ranking of preferences over candidates if they receive enough information in favor of the ideologically least preferred candidate (notice that, as pointed out in section 2, for $\delta = \frac{1}{2}$ everyone would do so upon knowing the true state of the world).

valuable, but they may find the information coming from an editor with similar idiosyncratic preferences even more valuable. That is, these citizens face a basic trade-off between the "objective" difference in the expected accuracy of news reports coming from different types of editors and their "subjective" value. A citizen can make two specular errors. She may choose L when L is the low quality candidate. Similarly, she may choose R when R is the low quality candidate. A moderate citizen (i.e., $x_i = \frac{1}{2}$) cares about these two errors equally. Hence, she always prefers to watch a media outlet having a moderate editor since such an editor minimizes the overall probability of making errors (see corollary 1). On the other hand, for example, a liberal-moderate citizen cares more about not making the error of choosing R when $s = l$. As shown by corollary 1, a liberal editor has a lower probability of making such error but a higher probability of making a report in favor of L when $s = r$ and a higher overall probability of making errors. Hence, when choosing between a media outlet with a moderate editor and one with an ideologically closer editor, any citizen will trade-off the *expected accuracy* and the *value* of information provided by these different types of editors.[23] In turn, as shown by the above lemma, the presence of this trade-off implies that there will always be an upper bound on the "extremism" of an editor above which the demand for news by rational citizens will be strictly decreasing. That is, depending on the opportunity cost of acquiring information, rational liberal (conservative) citizens may prefer a slightly more moderate-liberal (conservative) editor to a less moderate one.

Therefore, since $\tilde{x}_e$ is always increasing for $x_e \leq 1/2$ and $\hat{x}_e$ is always increasing for $x_e \geq 1/2$, this rational framework is able to explain the presence of preferences for like-minded sources of information . Hence, the above lemma provides a rationale for the presence of a demand for news coming from non-moderate editors. At the same time, it also points out that rational citizens would never find optimal to demand news coming from very ideological editors. Hence, behavioral models (as the one of Mullainathan and Shleifer 2005) remain probably the most suited to explain the presence of a demand for news coming from extremist editors.

The following section analyzes the implications of such demand for news for the optimal choice of editors by profit maximizing media outlets.

5 Optimal Choice of Editors by Media

5.1 Monopoly

This section analyzes the implications of the citizen-editors model in a monopolistic market. The media outlet's owner wants to choose x_e to maximize viewership. Choosing an editor from the population of citizens is analogous to choosing a "product" location on the $[0, 1]$

[23] Durante and Knight (2009) analyze the demand for news in Italy. They show that, indeed, when the ideological position of a media outlet changes, viewers change their choice of news programs accordingly.

line. Suppose the media outlet's owner chooses an editor with idiosyncratic preferences x_e. Then, the profit function is:

$$\Pi(x_e, \hat{x}_e, \tilde{x}_e) = D(x_e, \hat{x}_e, \tilde{x}_e) = F(\tilde{x}_e) - F(\hat{x}_e)$$

Hence, the media outlet owner will choose an editor with preferences x_e^{mon} such that:

$$\left.\frac{d\Pi(x_e)}{dx_e}\right|_{x_e = x_e^{mon}} = 0$$

where $F(\tilde{x}_e)$ and $F(\hat{x}_e)$ are increasing functions of x_e. The following proposition characterizes under which conditions a profit-maximizing media outlet will hire a moderate editor and under which conditions it will hire a non-moderate one.

Proposition 2 *Suppose there is just a monopolist profit-maximizing media outlet in the market for news. For any symmetric $f(x)$, then*:

1. *If:*

$$\frac{\partial f(x)}{\partial x} \begin{cases} \geq 0 \textit{ for } x \leq \frac{1}{2} \\ \leq 0 \textit{ for } x > \frac{1}{2} \end{cases} \tag{20}$$

   then the media outlet will always hire a moderate editor (i.e., $x_e^{mon} = \frac{1}{2}$).

2. *If:*

$$\frac{\partial f(x)}{\partial x} \begin{cases} < 0 \textit{ for } x < \frac{1}{2} \\ > 0 \textit{ for } x \geq \frac{1}{2} \end{cases} \tag{21}$$

   then the media outlet will always hire a non-moderate editor with preferences $x_e^{mon} \in \left[x_{e_L}^{\min}, \frac{1}{2}\right) \cup \left(\frac{1}{2}, x_{e_R}^{\max}\right]$

The above proposition shows that a monopolist media outlet will always choose a moderate editor when citizens are distributed uniformly or when the mass of moderate citizens is higher than the one of non-moderate ones. Instead, if the number of moderate citizens is lower than the one of non-moderate ones, the media outlet will prefer to hire a non-moderate editor. Indeed, in such a case the media outlet may increase its demand since many non-moderate citizens are willing to watch its news reports. At the same time, most moderate citizens will still want to acquire information from such a source rather than not acquiring any information at all.

Hence, when the media outlet is just maximizing profits, even though citizens do not derive any exogenous utility from biased information, the endogenous acquisition of costly information may induce a media outlet to choose an editor whose optimal information acquisition strategy is slanted in favor of the alternative *ex-ante* preferred by a subset of citizens (e.g., the rightists one).

However, even in this case the optimal editor will not be "too extremist". Non-moderate citizens will indeed trade-off the benefit of having an editor with similar preferences and the cost of having an editor who will sample relatively less, i.e., whose news reports have a lower expected accuracy. Hence, as shown by lemma 1, after some point, choosing a more rightist (leftist) editor will decrease even the number of rightist (leftist) citizens willing to watch the media outlet, i.e., for $x_e > x_{e_R}^{\max}$ ($x_e < x_{e_L}^{\min}$).

5.2 Duopoly

Suppose now that $K = 2$. That is, the market for news is composed of two profit maximizing media outlets. The following proposition summarizes the possible Nash equilibria that can arise in this case depending on the distribution of citizens' preferences.[24]

Proposition 3 *Suppose there are two media outlets in the market for news. Then:*

1. *If (20) is satisfied, then both media outlet will hire moderate editors (i.e., $x_{e_1} = x_{e_2} = \frac{1}{2}$).*

2. *If (21) is satisfied then $\exists C^{Dev} < C^{\max}$ such that:*

   (a) If $C > C^{Dev}$,then both media outlet will hire moderate editors (i.e., $x_{e_1} = x_{e_2} = \frac{1}{2}$)

   (b) If $C < C^{Dev}$, then the two media outlets will hire non-moderate editors having symmetric idiosyncratic preferences, i.e., $x_{e_1} = 1 - x_{e_2}$ where $x_{e_1}, x_{e_2} \in \left[x_{e_L}^{\min}, \frac{1}{2}\right) \cup \left(\frac{1}{2}, x_{e_R}^{\max}\right]$. Moreover, the lower is C the higher is $|x_{e_1} - x_{e_2}|$.

When (20) holds, despite the fact that by choosing, for example, a rightist editor a media outlet would increase the number of rightist citizens willing to watch its news (i.e., higher marginal rightist viewer), the net effect on the demand of choosing this editor rather than a moderate one would be always negative. Since choosing a less moderate editor also implies choosing an editor who will sample relatively less with respect to a more moderate one, the negative effect on moderate citizens' viewership would be higher than the positive effect on rightist citizens' viewership.

Moreover, even when (21) holds, if the opportunity cost of acquiring information is high, the two media outlets will both choose moderate editors. This is the only case where a

[24] Each citizen is implicitly assumed to watch at most one media outlet (which is, for example, the case when two television news programs broadcast at the same time or when there is an upper bound on the opportunity cost of watching news, e.g., time constraint). Nevertheless, as discussed in section 6.3, this assumption is without loss of generality. If citizens were to acquire information from multiple sources, the incentives of media outlets to hire non-moderate editors would only be reinforced.

media outlet may not find it convenient to choose a non-moderate editor in a duopoly while it would in a monopoly. The reason behind this difference is that in the monopoly case choosing, for example, a rightist editor instead of a moderate one will decrease the demand for news by leftist citizens. However, moderate citizens will still be willing to watch such media outlet rather than not acquire any information at all. Instead, in the duopoly case, when the opportunity cost of acquiring information is high, by choosing a rightist editor, a media outlet may face a reduction in the demand for its news by *moderate* citizens larger than the increase in the demand by rightist citizens.

On the other hand, when the opportunity cost is low, the demand for news by extremist citizens will be bigger. Hence, the two media outlets will choose specular types of non-moderate editors. That is, while in the monopolistic case there was only a rightist (or leftist) editor, in presence of two media outlets there will be also a leftist (or rightist) editor. Moreover, the lower is the opportunity cost, the higher will be the difference between the idiosyncratic preferences of the editors hired by the two media outlets. Finally, given the results of lemma 1, even in this case optimal editors could never be "too extremist".

5.3 Multiple Media Outlets

This section analyzes the case where there are multiple media outlets in the market for news, i.e., $K > 2$. The above analysis has shown that when moderate citizens are uniformly distributed in the policy space, or when the mass of moderate citizens is higher than the one of non-moderate citizens, media outlets will hire moderate editors both in a monopoly and in a duopoly. The following proposition shows that when there are multiple media outlets in the market for news, this is not always the case. More specifically, when $x_i \sim U[0,1]$, as the number of media outlets present in the market increases, the equilibrium where every media outlet chooses a moderate editor is not sustainable anymore. Indeed, any media outlet would have an incentive to differentiate its "news product" by choosing a non-moderate editor.

Proposition 4 *Suppose that citizen's idiosyncratic preferences are distributed uniformly in* $[0,1]$.*Then,* $\exists K^* \in (2,\infty)$ *such that for* $K > K^*$ *the set* $\left\{x_{e_j} = \frac{1}{2}, \forall j = 1,...,K\right\}$ *is not anymore an equilibrium. In such case, it still exists a symmetric mixed-strategy Nash equilibrium. Moreover,* K^* *is increasing in* C.

The above proposition shows that when the market for "moderate news" gets crowded, media outlets will prefer to choose a different location for their news product. That is, the higher the degree of competition in the market for news, the more likely it is that media outlets will hire non-moderate editors. Nevertheless, it is important to point out that even though more competition brings more slant in news reports, it still has a positive effect on citizens' welfare since it allows a higher portion of population to get informed. Hence, more competition brings more viewpoint diversity which has indeed a positive effect on citizens' welfare. At the same time, in a repeated game the effect of competition and diversity on citizens' welfare could be more subtle. The short run polarization of beliefs is going to reinforce the demand for news coming from like-minded sources (see Gentzkow and Shapiro 2006). Hence, this may result in a long run polarization of beliefs and, thus, of choices by different citizens.[25]

Moreover, since the higher the opportunity cost of acquiring information, the less extremists citizens will find it optimal to acquire information, as such cost increases the likelihood of media outlets choosing non-moderate editors decreases.[26] That is, it is possible to reinterpret the above proposition with respect to C. For a given $K > 2$, there will exist a $C^*(K)$ such that for $C > C^*(K)$, all media outlets will hire a moderate editor from the population of citizens. Instead, for $C < C^*(K)$, media outlets will hire non-moderate editors. This result, along with the ones of propositions 2 and 3, suggests that more moderate editors should be expected to prevail in a news market where the opportunity cost is high. A clear application of this result is represented by the differences between the broadcast media sector with respect to the press. The opportunity cost of watching a report from a broadcast media is arguably lower than the one of reading a newspaper. The analysis thus suggests that more moderate editors should be present in the press sector than in the broadcast media sector. At the same time, there should be more extremist citizens watching broadcast media and a higher overall demand for broadcast media with respect to the one faced by the press.

6 Discussion

6.1 Private Value of Information and Utility

As usual in the literature on the demand for news (e.g., Strömberg 2004, Mullainathan and Shleifer 2005, Gentzkow and Shapiro 2006, Chan and Suen 2008, Anderson and McLaren 2010) I have assumed that citizens receive utility from choosing a given candidate/alternative *per se*.[27] Since news has a public-good nature and the probability of being pivotal is close to zero, the expected benefit of acquiring information is likely to be negligible. That is, acquiring information is a typical free-riding problem. Hence, in my model, as in the rest of this literature, it is necessary to explain why citizens bother spending the opportunity cost of watching TV news or reading newspapers.

[25] See also Suen (2004) for a model with heterogeneous priors and coarse information leading to a "short-run" polarization of beliefs. On the other hand, when media bias originates from the supply-side, a higher degree of competition typically decreases media bias and increases citizens' welfare (Besley and Prat 2006, Ellman and Germano 2009, Anderson and McLaren 2010, Germano and Meier 2010).

[26] Indeed $\lim_{C \to C^{\max}} K^* \to \infty$.

[27] Similarly, the model shares with this literature the implicit assumption that a citizen must watch the news report in order to learn its information content.

A straightforward rationale for the demand for news is the one proposed by Strömberg (2004) and Anderson and McLaren (2010). That is, citizens may be using news reports to decide on a private action whose value depends on the public policy implemented (or candidate elected). For example, the news could cover the quality and virtues of the public school system and the private decision is the choice between enrolling in a public or in a private school. That is, the willingness to acquire information on the state of the world "in order to make a more informed private decision generates a market demand for news, and through the voting system affects the direction of the public decision" (Anderson and McLaren 2010, page 9).

On the other hand, regardless of the possible abstention game among citizens, the subset of individuals who decide to turn out would still choose either to not acquire any information at all or to acquire information from the source which is most valuable from their *own* individual perspective. That is, liberal (conservative) citizens will still either not watch any news at all or watch a media outlet with a liberal (conservative) editor. Hence, the presence of free-riding on information would increase the incentives to not acquire any information, but not the incentives regarding the type of information to acquire. Thus, the overall demand for information would be affected in its size but not in its composition (i.e., liberal citizens would still watch a liberal media outlet or no media outlet at all).

Finally, the predictions of the model are still valid if acquiring information for citizens was assumed to **not** be costly (i.e., $C = 0$). In such case, citizens would not have any incentive to free-ride on information and thus they would all acquire information. At the same time, each citizen would still choose the media outlet providing the most valuable information for her. That is, citizens would still like to get information from a like-minded source.

6.2 Media Outlets' Profits and Information Acquisition

Since the main focus of the paper is on the demand for slanted news, the model provides a stylized representation of media outlets' profits. Considering a more general compensation mechanism for the editor would affect both the revenues and the costs of a media outlet. Once on the job, editors (and journalists) are the ones who will spend time and exert effort to collect evidence on any given issue. That is, media outlets do not directly bear this day to day cost of information acquisition. Nevertheless, in order to increase its profits, a media outlet may try to induce its editor to change her optimal information acquisition strategy by designing an incentive mechanism. As shown by lemma 1, ideally all citizens would like to watch a media outlet whose editor keeps acquiring information until she learns the true state of the world (i.e., $\underline{n}_e^* = -\infty, \bar{n}_e^* = \infty$). However, it is not feasible for the media outlet to induce the editor to adopt such a sampling strategy. This is true for two simple reasons: *i*) information acquisition is costly for the editor and hence it is also costly for the media outlet to compensate the editor for acquiring extra pieces of information; *ii*) the media outlet cannot monitor the information gathered by the editor (i.e., the media outlet cannot observe the draws sampled by the editor). Nevertheless, a media outlet may induce an editor to choose stopping rules which are higher (in absolute value) with respect to the ones she would choose in the absence of any incentive mechanism. In this perspective, the best incentive mechanism that the media outlet can implement is offering to the editor a share α of the media outlet's profit. This would induce the editor to choose higher (in absolute value) stopping rules. Indeed, in the absence of perfect monitoring, any incentive scheme inducing the editor to sample more would produce the same results of a decrease in the marginal cost of sampling c (i.e., any signal acquired is more valuable or, equivalently, less costly). That is, as shown by proposition 1, a lower c induces an editor to acquire more information.[28] Nevertheless, such incentive mechanisms would not change the main results since the stopping rules of non-moderate editors would still be asymmetric. That is, the private value component in the editor's preferences would still induce a non-moderate editor to adopt a "slanted" information acquisition strategy. [29]

Moreover, it would be extremely costly for a media outlet to induce a moderate editor to gather an amount of information such that even extremists citizens would consider this media outlet a valuable source of information.[30] In addition, as discussed in section 4, while all citizens with preferences $\hat{x}_e|_{x_e=\frac{1}{2}} < x_i < \tilde{x}_e|_{x_e=\frac{1}{2}}$ find the information coming from a moderate editor valuable, some of them would find the information coming from an editor with similar idiosyncratic preferences even *more* valuable. Hence, there will always be a demand for "slanted" news by non-moderate citizens that a media outlet may capture by hiring a non-moderate editor.[31]

6.3 Multiple Sources of Information

Throughout the analysis, it was assumed that citizens watch at most one media outlet. Nevertheless, while such assumption greatly simplifies the analysis, the intuition and the results of the model do not rely on it.

Indeed, if citizens were to acquire information from multiple sources, the incentives of media outlets to hire non-moderate editors would only be *reinforced*. For any citizen, watching two media outlets with a moderate editor has the same value of watching only one. Specifically, after having observed the news report of a moderate editor, watching an additional

[28]Notice that a media outlet may also decrease c by giving the editor more resources to produce the news reports (e.g., more correspondents, better technology, more resources to investigate an issue, etc.).

[29]Moreover, the cost of acquiring information by editors may be also reinterpreted as a discount factor (see Brocas and Carrillo 2009). In such case, each editor has to decide *when* to stop gathering information. Hence, by inducing an editor to sample more, a media outlet would also delay the release of the news report which may have a negative effect on the demand for it and, hence, on the profits.

[30]Indeed, $\hat{x}_e \to 0$ and $\tilde{x}_e \to 1$ if and only if $\underline{n}_e^* \to -\infty, \bar{n}_e^* \to \infty$, $\delta \to 1/2$ and $C \to 0$.

[31]Moreover, it would be cheaper for a media outlet to capture such demand for "slanted" news of non-moderate citizens by hiring an editor with similar idiosyncratic preferences, rather than hiring a moderate one and provide her with incentives to acquire a large amount of information in both directions.

media outlet with another moderate editor would either not change the citizen's ranking of preferences, or it would lead citizen's posterior beliefs to be equal to the prior (i.e., the two reports would just "cancel" each other). Hence, if citizens could access multiple sources of information, the incentives of media outlets to differentiate their products by hiring non-moderate editors would, indeed, be higher.

6.4 Editor's Influence on Citizens

In the model the utility of the editor depends on her own choice. Nevertheless, even if the editor's utility were to depend on the *citizens'* choice, the information acquisition strategy of the editor would not change. Indeed, the only credible strategy by an editor with idiosyncratic preferences x_e is to report $\underline{n}_e^*$ upon reaching $\underline{n}_e^*$ and to report $\bar{n}_e^*$ upon reaching $\bar{n}_e^*$. Since citizens know the idiosyncratic preferences of the editor, even if she were to try to influence citizens' choice by over-reporting the number of signals in favor of a given candidate, citizens would still be able to perfectly discount her "bias" and infer the actual stopping threshold (i.e., any $n > \bar{n}_e^*$ would be interpreted as $\bar{n}_e^*$ and any $n < \underline{n}_e^*$ as $\underline{n}_e^*$).

Notice that the model could indeed be seen as a special case of a commitment-free mechanism of Bayesian persuasion, as defined by Kamenica and Gentzkow (2010), where the Sender (the editor) can influence the choice of a rational Bayesian Receiver (the citizens) by influencing her beliefs. Specifically, in my setting the fact that the Sender's preferences depend on the state of the world and acquiring signals is costly, mitigates the incentive compatibility constraints. That is, there is an endogenous commitment mechanism arising from the editor's idiosyncratic preferences **and** the cost of drawing a signal. The Receiver knows that the only credible signal realization is the one implicitly defined by the two stopping thresholds of the Sender (i.e., the editor can only credibly commit to such signal acquisition strategy).[32] Hence, since there is an alignment of preferences between the Sender and the Receiver (i.e., all citizens willing to acquire information from a given editor will have the same *ex-post* ranking of preferences as the one of the editor), the Sender will truthfully reveal the signal realization.

Obviously, in the presence of uncertainty on the editor's idiosyncratic preferences there would also be uncertainty on the editor's optimal stopping thresholds. That is, if citizens only knew that $x_e \sim g(x)$ with $supp(x) = \left[x_e^A, x_e^B\right]$ and $x_e^A < x_e^B$, then they would also know that $\underline{n}_e^* \sim g(\underline{n}_e^*(x_e))$ with $supp\left[g(\underline{n}_e^*(x_e))\right] = \left[\underline{n}_e^B, \underline{n}_e^A\right]$ where $\underline{n}_e^B = \underline{n}_e^*(x_e^B) < \underline{n}_e^A = \underline{n}_e^*(x_e^A)$, since there is a one-to-one mapping between preferences and optimal stopping thresholds. Similarly, $\bar{n}_e^*(x_e) \sim g(\bar{n}_e^*(x_e))$ with $supp\left[g(\bar{n}_e^*(x_e))\right] = \left[\bar{n}_e^B, \bar{n}_e^A\right]$ where $\bar{n}_e^B = \bar{n}_e^*(x_e^B) < \bar{n}_e^A = \bar{n}_e^*(x_e^A)$. In presence of such additional source of uncertainty, the editor will have an incentive

[32] Any other mechanism would, simply, not be credible. The stopping thresholds represent the **net** difference in the number of signals in favor of one candidate. Hence, once the editor has reached one of the two thresholds, she has always an incentive to hide signals against the endorsed candidate.

to over-report signals in favor of the preferred candidate once she has reached one of the two stopping thresholds. That is, such uncertainty would introduce in the model a "supply-driven" bias in news reports. Nevertheless, if the editor had to report $\bar{n}_e^A$, citizens' posterior beliefs would be $\mu(\bar{n}_e^A) = \mu(E(\bar{n}_e^*(x_e)|\bar{n}_e^A))$.[33] That is, citizens will still be able to infer the interval in which the optimal editor's stopping threshold lies and discount their posterior beliefs accordingly. Hence, the main mechanism and intuition of the model would not change. Obviously, the more ideologically distant from the endorsed candidate the editor is believed to be, the more influential her reports will be. In other words, the editor's endorsement will be stronger: *i*) the more moderate the editor is believed to be, upon endorsing the ideologically closer candidate; *ii*) the less moderate the editor is believed to be, upon endorsing the ideologically least preferred candidate. Hence, in most of the cases (i.e., when endorsing the ideologically closer candidate), an editor would like to be believed to be as "unbiased" (i.e., moderate) as possible.[34]

7 Conclusions

The paper has analyzed a market for news in which profit maximizing media outlets hire their editors from the population of citizens. The results have shown that when information acquisition by editors is costly, citizens may find optimal to acquire information from a like-minded source of information (i.e., from a media outlet having an editor with similar idiosyncratic preferences). Consequently, a profit maximizing media outlet may prefer to hire a non-moderate editor in order to capture the demand for news of non-moderate citizens. Hence, even though citizens do not derive any exogenous utility from biased information, they all share the same prior beliefs and the media outlet is just maximizing profits, the endogenous acquisition of costly information may induce a media outlet to choose an editor whose optimal information acquisition strategy is "slanted" in favor of the alternative *ex-ante* preferred by a subset of citizens. Therefore, my model provides a rationale for the presence of media slant purely based on the citizens' demand for the most valuable source of information. At the same time, the results also show that there is always an upper bound on the possible "extremism" of an editor above which the demand for news by rational citizens is strictly decreasing.

In a market for news where the opportunity cost of acquiring information for citizens is low, there will be a higher demand by non-moderate citizens. Thus, non-moderate editors are more likely to be hired by media outlets in such market with respect to a market where the opportunity cost of acquiring information is high. A straightforward application of this

[33] Similarly, upon reporting $\bar{n}_e^B$, citizens' posterior beliefs would be $\mu(\bar{n}_e^B) = \mu(E(\bar{n}_e^*(x_e)|\bar{n}_e^B))$.

[34] Indeed, consistent with the theoretical predictions of the model, the empirical analysis of Chiang and Knight (2010) shows that the degree of influence of a newspaper on voters depends on the "credibility" of the endorsement.

result lies in the differences between the broadcast media and the press. The model predicts that more moderate editors should be present in the press sector than in the broadcast media sector. Moreover, broadcast media outlets should face a higher demand from extremist citizens (and a higher demand overall) with respect to the one faced by the press.

The results also show that the higher the degree of competition in the market for news, the more likely that media outlets will hire non-moderate editors. That is, when the market for news gets crowded, a media outlet may prefer to differentiate its news product by choosing a different location in the policy space (i.e., hire an editor with different idiosyncratic characteristics), rather than sharing the demand for news of moderate citizens with the other media outlets. Moreover, even though more competition brings more slant in news reports, it still has a positive effect on citizens' welfare since it allows a higher portion of population to get informed.

Nevertheless, I should also point out that in a more general framework the effects of competition on citizens' welfare may not be so straightforward. In a repeated game, the short run polarization of beliefs would reinforce the demand for news coming from like-minded sources which, in turn, may lead to a long run polarization of beliefs and, thus, of choices by different citizens. More generally, this paper has focused only on the demand for slanted news. In order to carefully assess the effects of competition on citizens' welfare, policy regulators should take into account the possible presence of both demand-driven and supply-driven sources of media bias in the market for news.

References

[1] Anderson, S., P., and McLaren, J., (2010) "Media Mergers and Media Bias with Rational Consumers", *CEPR Discussion Paper No. 7768.*

[2] Aragones E., and Palfrey T., R., (2002) "Mixed Equilibrium in a Downsian Model with a Favored Candidate", *Journal of Economic Theory,* 103: 131-161.

[3] Baron, D., P., (2006) "Persistent Media Bias", *Journal of Public Economics*, 90(1): 1-36.

[4] Besley, T., and Coate, S., (1997) "An Economic Model of Representative Democracy", *The Quarterly Journal of Economics*, 112(1): 85-114.

[5] Besley T., and Prat A., (2006) "Handcuffs for the grabbing hand? Media capture and government accountability", *American Economic Review*, 96(3): 720-736.

[6] Blasco, A., Pin, P., and Sobbrio, F. (2011) "Paying Positive to Go Negative: Advertisers' Competition and Media Reports", *mimeo,* IMT Lucca.

[7] Brocas, I. and Carrillo J.D., (2007) "Influence through Ignorance", *RAND Journal of Economics,* 38(4): 931–947.

[8] Brocas, I. and Carrillo J.D., (2009) "Information acquisition and choice under uncertainty", *Journal of Economics and Management Strategy,* 18(2): 423-455.

[9] Calvert, R. L., (1985) "The Value of Information: A Rational Choice Model of Political Advice." *Journal of Politics,* 47: 530–55.

[10] Chan, J., and Suen, W., (2008) "A Spatial Theory of News Consumption and Electoral Competition", *The Review of Economic Studies,* 75(3): 699-728.

[11] Chiang, C., F., and Knight, B., G., (2010) "Media Bias and Influence: Evidence from Newspaper Endorsements", *The Review of Economic Studies*, forthcoming.

[12] Cukierman, A., and Tommasi, M., (1998) "When Does it Take a Nixon to Go to China?", *American Economic Review,* 88(1): 180-197.

[13] Dasgupta, P. and Maskin, E., (1986a) "The Existence of Equilibrium in Discontinuous Economic Games I: Theory", *The Review of Economic Studies,* 53(1): 1-26.

[14] Dasgupta, P. and Maskin, E., (1986b) "The Existence of Equilibrium in Discontinuous Economic Games II: Applications", *The Review of Economic Studies*, 53(1): 27-41.

[15] DellaVigna, S. and Gentzkow, G., (2010) "Persuasion: Empirical Evidence", *Annual Review of Economic*s, 2: 643–69

[16] Della Vigna, S. and Kaplan, E. (2007) "The Fox News Effect: Media Bias and Voting", *The Quarterly Journal of Economics,* 122(3): 1187-1234.

[17] Djankov S., McLiesh C., Nenova T., and Shleifer A., (2003) "Who Owns The Media?", *Journal of Law and Economics*, 46: 341-382.

[18] Durante R. and Knight B., (2009) "Partisan Control, Media Bias, and Viewer Responses: Evidence from Berlusconi's Italy", *Journal of European Economic Association*, forthcoming.

[19] Ellman, M. and Germano, F., (2009) "What do the Papers Sell? A Model of Advertising and Media Bias", *Economic Journal,* 119: 680-704.

[20] Gentzkow M., and Shapiro J., (2006), "Media Bias and Reputation", *Journal of Political Economy*, 114(2): 280-316.

[21] Gentzkow M., and Shapiro J., (2010), "What Drives Media Slant? Evidence from U.S. Daily Newspapers", *Econometrica*, 78(1): 35-71

[22] Gerber, A., Karlan, D., S. and Bergan, D. (2009) "Does the Media Matter? A Field Experiment Measuring the Effect of Newspapers on Voting Behavior and Political Opinions", *American Economic Journal: Applied Economics,* 1(2): 35-52.

[23] Germano, F., and Meier, M., (2010) "Concentration and self-censorship in commercial media", *Working Paper 1256,* Universitat Pompeu Fabra

[24] Groseclose, T. and Milyo, J., (2005). "A Measure of Media Bias," *The Quarterly Journal of Economics,* 120(4): 1191-1237.

[25] Ho, D. E., and Quinn, K. M., (2008) "Measuring Explicit Political Positions of Media", *Quarterly Journal of Political Science,* 3: 353–377.

[26] Kamenica, E., and Gentzkow, M., (2010) "Bayesian Persuasion", *American Economic Review,* forthcoming.

[27] Li, H., and Suen, W., (2004) "Delegating Decisions to Experts", *Journal of Political Economy,* 112(1): 311-335.

[28] Milgrom, P. and Roberts, J., (1986) "Relying on the Information of Interested Parties", *RAND Journal of Economics,* 17: 18-32.

[29] Mullainathan S., and Shleifer A., (2005) "The Market for News", *American Economic Review*, 95(4): 1031-1053.

[30] Osborne M., J., and Slivinsky A., (1996) "A Model of Political Competition with Citizen-Candidates", *The Quarterly Journal of Economics*, 111(1): 65-96.

[31] Prat, A. and Strömberg, D. (2010) "The Political Economy of Mass Media", *mimeo,* LSE and IIES.

[32] Shiryaev, A., N. (2007) *Optimal Stopping Rules*, Springer, Berlin.

[33] Strömberg, D. (2004) "Mass Media Competition, Political Competition, and Public Policy", *The Review of Economic Studies*, 71(1): 265–284.

[34] Suen, W., (2004). "The Self-Perpetuation of Biased Beliefs", *The Economic Journal,* 114: 337-396

Appendix

Proof of Proposition 1

The problem involves analyzing a stochastic process with two absorbing states. More specifically, the equations characterizing these two absorbing states (i.e., $\underline{n}_e^*$ and $\bar{n}_e^*$) must be determined. After $\bar{n}_e^*$ draws, given that a current difference in signals in favor of r equal to n, the value function of editor e is given by (9). This is a standard problem of sequential testing of two simple hypotheses (see Chapter 4 in Shiryaev, 2007). Hence, it can be proven that $\bar{n}_e^*$ and $\underline{n}_e^*$ are defined implicitly by the following two first order conditions:[35]

$$\frac{\partial V_e}{\partial \bar{n}_e^*}|_{\bar{n}_e^*} = \frac{(\ln \lambda)\, \lambda^{\bar{n}_e^*}}{\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}} \left[(2x-1)\left(\lambda^{\underline{n}_e^*}+1\right) - \left(\lambda^{\underline{n}_e^*}-1\right)(2\delta - H(\bar{n}_e^* - \underline{n}_e^*))\right] - H\left(1-\lambda^{\bar{n}_e^*}\right) = 0$$

$$\frac{\partial V_e}{\partial \underline{n}_e^*}|_{n=\underline{n}_e^*} = \frac{(\ln \lambda)\, \lambda^{\underline{n}_e^*}}{\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}} \left[(2x-1)\left(\lambda^{\bar{n}_e^*}+1\right) + \left(1-\lambda^{\bar{n}_e^*}\right)(2\delta - H\,(\bar{n}_e^* - \underline{n}_e^*))\right] + H\left(\lambda^{\underline{n}_e^*}-1\right) = 0$$

[35] The online appendix contains an extended proof where these first order conditions are formally derived.

where $H = \frac{c}{2\theta - 1}$ and $\lambda = \frac{1-\theta}{\theta} < 1$. Where it must be always the case that $\underline{n}_e^* < 0$ and $\bar{n}_e^* > 0$.[36] It is also immediate to verify that for $x_e = \frac{1}{2}$ it must be the case that $\bar{n}_e^* = |\underline{n}_e^*|$. Notice that the optimal stopping rule $\bar{n}_e^*$ and $\underline{n}_e^*$ *do not* depend on n. That is the optimal stopping rule do not change depending on the realization of the signals.[37] Let's consider the two first order conditions and let's denote them as f and g. That is:

$$f = \frac{\partial V_e}{\partial \bar{n}_e^*}|_{\bar{n}_e^*} = 0 \tag{22}$$

$$g = \frac{\partial V_e}{\partial \underline{n}_e^*}|_{n=\underline{n}_e^*} = 0 \tag{23}$$

that is $\bar{n}_e^*$ and $\underline{n}_e^*$ are the solution of the following system of equations:

$$\begin{cases} f(\bar{n}_e^*(x_e,\delta,c), \underline{n}_e^*(x_e,\delta,c), x_e,\delta,c) = 0 \\ g(\bar{n}_e^*(x_e,\delta,c), \underline{n}_e^*(x_e,\delta,c), x_e,\delta,c) = 0 \end{cases}$$

In order to obtain the comparative statics, it is necessary to derive the differential of these functions. That is:

$$\begin{cases} \frac{\partial f}{\partial \bar{n}_e^*} d\bar{n}_e^* + \frac{\partial f}{\partial \underline{n}_e^*} d\underline{n}_e^* + \frac{\partial f}{\partial x_e} dx_e + \frac{\partial f}{\partial \delta} d\delta + \frac{\partial f}{\partial c} dc = 0 \\ \frac{\partial g}{\partial \bar{n}_e^*} d\bar{n}_e^* + \frac{\partial g}{\partial \underline{n}_e^*} d\underline{n}_e^* + \frac{\partial g}{\partial x_e} dx_e + \frac{\partial g}{\partial \delta} d\delta + \frac{\partial g}{\partial c} dc = 0 \end{cases}$$

Let's focus on the comparative statics with respect to x_e. That is, $\frac{d\underline{n}_e^*}{dx_e}$ and $\frac{d\bar{n}_e^*}{dx_e}$ must be determined, holding the other parameter constants. Hence, $d\delta = 0$ and $dc = 0$. Thus:

$$\frac{d\underline{n}_e^*}{dx_e} = \frac{\left(\frac{\partial g}{\partial \bar{n}_e^*}\frac{\partial f}{\partial x_e} - \frac{\partial g}{\partial x_e}\frac{\partial f}{\partial \bar{n}_e^*}\right)}{\left(\frac{\partial g}{\partial \underline{n}_e^*}\frac{\partial f}{\partial \bar{n}_e^*} - \frac{\partial g}{\partial \bar{n}_e^*}\frac{\partial f}{\partial \underline{n}_e^*}\right)} \tag{24}$$

similarly

$$\frac{d\bar{n}_e^*}{dx_e} = \frac{\left(\frac{\partial g}{\partial \underline{n}_e^*}\frac{\partial f}{\partial x_e} - \frac{\partial f}{\partial \underline{n}_e^*}\frac{\partial g}{\partial x_e}\right)}{\left(\frac{\partial g}{\partial \bar{n}_e^*}\frac{\partial f}{\partial \underline{n}_e^*} - \frac{\partial f}{\partial \bar{n}_e^*}\frac{\partial g}{\partial \underline{n}_e^*}\right)} \tag{25}$$

Then, simple calculations yields:

$$\frac{d\underline{n}_e^*}{dx_e} = -\frac{2\lambda^{\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*}+1\right)}{H\left(\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}\right)\left(\lambda^{\underline{n}_e^*}+1\right)} < 0 \tag{26}$$

and

$$\frac{d\bar{n}_e^*}{dx_e} = -\frac{2\lambda^{\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}+1\right)}{H\left(\lambda^{\bar{n}_e^*}+1\right)\left(\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}\right)} < 0 \tag{27}$$

Moreover, $\left|\frac{d\bar{n}_e^*}{dx_e}\right| > \left|\frac{d\underline{n}_e^*}{dx_e}\right|$ if and only if:

$$\left(\lambda^{\underline{n}_e^*} - \lambda^{\bar{n}_e^*}\right)\left(1 - \lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*}\right) < 0$$

[36] Suppose not. That is $\underline{n}_e^* > 0$. Thus $\mu\left(\underline{n}_e^*\right) > \mu\left(n=0\right) = p$. If $x_e > \frac{1}{2}$, this would imply that $\mu\left(\underline{n}_e^*\right) > \hat{\mu}_e$ and thus $\tau_{e,m}(\underline{n}_e^*) = R$ which contradicts the definition of $\underline{n}_e^*$. If $x_e < \frac{1}{2}$, then since $n = 0 < \underline{n}_e^*$, this implies that $\tau_e(n=0) = L$ and thus the voter would never start sampling. A similar proof applies to show that $\bar{n}_e^* > 0$.

[37] A detailed formal derivation of the second order conditions, ensuring that $(\bar{n}_e^*, \underline{n}_e^*)$ is a global maximum, is available upon request to the author.

thus since

$$(1-\lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*})\begin{cases} >0 \text{ for } x_e<1/2 \\ =0 \text{ for } x_e=1/2 \\ <0 \text{ for } x_e>1/2 \end{cases} \tag{28}$$

the result follows. Let's now focus on the comparative statics with respect to δ. Using the same methodology as the one described above:

$$\frac{d\underline{n}_e^*}{d\delta}=-\frac{2\lambda^{\underline{n}_e^*}\left(1-\lambda^{\bar{n}_e^*}\right)}{H\left(\lambda^{\underline{n}_e^*}+1\right)\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)}<0$$

and

$$\frac{d\bar{n}_e^*}{d\delta}=\frac{2\lambda^{\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}-1\right)}{H\left(\lambda^{\bar{n}_e^*}+1\right)\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)}>0$$

Moreover, $\left|\frac{d\bar{n}_e^*}{d\delta}\right|>\left|\frac{d\underline{n}_e^*}{d\delta}\right|$ if and only if:

$$\left(\lambda^{\bar{n}_e^*}+\lambda^{\underline{n}_e^*}\right)\left(\lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*}-1\right)>0$$

hence given (28) the results follow. Finally, the comparative statics with respect to c are:

$$\frac{d\underline{n}_e^*}{dc}=\frac{(2\theta-1)\,\lambda^{\underline{n}_e^*}\left((2x-1)\left(\lambda^{\bar{n}_e^*}+1\right)+2\delta\left(1-\lambda^{\bar{n}_e^*}\right)\right)}{c^2\left(\lambda^{\underline{n}_e^*}+1\right)\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)}>0$$

hence

$$\frac{d\bar{n}_e^*}{dc}=\frac{\lambda^{\bar{n}_e^*}\,(2\theta-1)\left((2x-1)\left(1+\lambda^{\underline{n}_e^*}\right)-2\delta(\lambda^{\underline{n}_e^*}-1)\right)}{\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)c^2\left(\lambda^{\bar{n}_e^*}+1\right)}<0 \qquad \textbf{Q.E.D.}$$

Proof of Corollary 1
Since

$$\Pr(\tau_e=L|s=r)=\frac{2\mu(\bar{n}_e^*)-1}{\mu(\bar{n}_e^*)-\mu(\underline{n}_e^*)}\mu(\underline{n}_e^*)$$

and

$$\Pr(\tau_e=R|s=l)=\frac{1-2\mu(\underline{n}_e^*)}{\mu(\bar{n}_e^*)-\mu(\underline{n}_e^*)}\left[1-\mu(\bar{n}_e^*)\right]$$

Thus it is easy to verify that $\Pr(\tau_e=L|s=r)$ is decreasing in x_e and $\Pr(\tau_e=R|s=l)$ is increasing in x_e. Moreover, the *ex-ante* probability of making a wrong choice is:

$$\Pr(error)=\Pr(s=r)\Pr(\tau_e=L|s=r)+\Pr(s=l)\Pr(\tau_e=R|s=l)$$

hence:

$$\Pr(error)=\frac{\lambda^{\bar{n}_e^*}(\lambda^{\underline{n}_e^*}-1)+(1-\lambda^{\bar{n}_e^*})}{2\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)}$$

It is now possible to perform the comparative statics upon this probability. First of all:

$$\frac{\partial\Pr(error)}{\partial\bar{n}_e^*}=\frac{1}{2}(\ln\lambda)\,\lambda^{\bar{n}_e^*}\frac{\left(\lambda^{\underline{n}_e^*}-1\right)^2}{\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)^2}<0$$

$$\frac{\partial\Pr(error)}{\partial\underline{n}_e^*}=-\frac{1}{2}(\ln\lambda)\,\lambda^{\underline{n}_e^*}\frac{\left(1-\lambda^{\bar{n}_e^*}\right)^2}{\left(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*}\right)^2}>0$$

Hence, since $\frac{d\bar{n}_e^*}{dc} < 0$ and $\frac{d\underline{n}_e^*}{dc} > 0$, then $\frac{d\Pr(error)}{dc} > 0$. Similarly, since $\frac{d\bar{n}_e^*}{d\delta} > 0$ and $\frac{d\underline{n}_e^*}{d\delta} < 0$, then $\frac{d\Pr(error)}{d\delta} < 0$.
Finally given (26) and (27) derived in the proof of Proposition 1, $\frac{d\Pr(error)}{dx_e} > 0$ if and only if:

$$\frac{\left(\lambda^{2\underline{n}_e^*} - \lambda^{2\bar{n}_e^*}\right)\left(1 + \lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*}\right)\left(1 - \lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*}\right)}{\left(\lambda^{\underline{n}_e^*} + 1\right)\left(\lambda^{\bar{n}_e^*} + 1\right)} < 0$$

Thus, given (28):

$$\frac{d\Pr(error)}{dx_e}\begin{cases} < 0 \text{ for } x < \frac{1}{2} \\ = 0 \text{ for } x = \frac{1}{2} \\ > 0 \text{ for } x > \frac{1}{2} \end{cases} \qquad \textbf{Q.E.D.}$$

Proof of Lemma 1
It is immediate to verify that $\tilde{x}_e$ and $|\hat{x}_e|$ are both decreasing in C and increasing in δ. Let's now focus on $\tilde{x}_e$. Then:

$$\frac{d\tilde{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\bar{n}_e^*} = -C\,(\ln\lambda)\,\frac{\lambda^{\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*} - 1\right)}{\left(\lambda^{\underline{n}_e^*} + 1\right)\left(1 - \lambda^{\bar{n}_e^*}\right)^2} > 0$$

$$\frac{d\tilde{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\underline{n}_e^*} = (\ln\lambda)\,\frac{\lambda^{\underline{n}_e^*}}{\left(\lambda^{\underline{n}_e^*} + 1\right)^2}\left(2\delta - C\frac{\left(\lambda^{\bar{n}_e^*} + 1\right)}{\left(1 - \lambda^{\bar{n}_e^*}\right)}\right) < 0$$

First, I want to prove that for any $x_e < 1/2$ it is always the case that $d\tilde{x}_e/dx_e > 0$. From the proof of proposition 1 we know that for $x_e < 1/2$, $\left|\frac{d\underline{n}_e^*}{dx_e}\right| > \left|\frac{d\bar{n}_e^*}{dx_e}\right|$. Hence, a sufficient condition to ensure that $d\tilde{x}_e/dx_e > 0$ is simply:

$$\left|\frac{d\tilde{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\underline{n}_e^*}\right| > \left|\frac{d\tilde{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\bar{n}_e^*}\right|$$

which is true if and only if:

$$C\left(\frac{\lambda^{\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*} - 1\right)}{\lambda^{\underline{n}_e^*}\left(1 - \lambda^{\bar{n}_e^*}\right)^2} + \frac{\left(\lambda^{\bar{n}_e^*} + 1\right)}{\left(1 - \lambda^{\bar{n}_e^*}\right)}\right) < 2\delta$$

Since $\frac{\partial}{\partial\bar{n}_e^*}\left(\frac{1-\lambda^{\bar{n}_e^*}}{1+\lambda^{\bar{n}_e^*}}\right) > 0$ and $\frac{d\bar{n}_e^*}{dx_e} < 0$, then $\left(\frac{1-\lambda^{\bar{n}_e^*}}{1+\lambda^{\bar{n}_e^*}}\right) \geq C^{\max}$. Hence, a sufficient condition for the above condition to be always true is:

$$\left(\lambda^{\bar{n}_e^*}\lambda^{\underline{n}_e^*} - 1\right)\left(\lambda^{\bar{n}_e^*} + \lambda^{\underline{n}_e^*}\right) < 0$$

which it is always the case for $x_e < 1/2$. Moreover, for $x_e = 1/2$, $\underline{n}_e^* = -\bar{n}_e^*$ and thus:

$$\left.\frac{d\tilde{x}_e}{dx_e}\right|_{x_e=1/2} = -\frac{4}{H}\,(\ln\lambda)\,\frac{\lambda^{2\bar{n}_e^*}\left(\delta(1 - \lambda^{\bar{n}_e^*}) - C(\lambda^{\bar{n}_e^*} + 1)\right)}{\left(1 - \lambda^{2\bar{n}_e^*}\right)\left((1 - \lambda^{3\bar{n}_e^*}) + \lambda^{\bar{n}_e^*}(1 - \lambda^{\bar{n}_e^*})\right)} > 0$$

Hence, for any $x_e \leq 1/2$, it is always the case that $d\tilde{x}_e/dx_e > 0$. Let's analyze now the case where $x_e > 1/2$. Then, $d\tilde{x}_e/dx_e > 0$ if and only if:

$$C < \tilde{C} \equiv \frac{2\delta\lambda^{2\underline{n}_e^*}\left(1 - \lambda^{2\bar{n}_e^*}\right)^2}{\lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*} - 1\right)\left(\lambda^{\underline{n}_e^*} + 1\right)^2 + \lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*} + 1\right)^2\left(1 - \lambda^{2\bar{n}_e^*}\right)}$$

hence $\tilde{C} > 0$. Let's now analyze how $\tilde{C}$ changes when x_e increases:

$$\frac{\partial \tilde{C}}{\partial \bar{n}_e^*} = -\frac{4\delta (\ln \lambda) \left(1 - \lambda^{2\bar{n}_e^*}\right) \lambda^{2\underline{n}_e^* + \bar{n}_e^*}}{\lambda^{2\bar{n}_e^*} (\lambda^{\underline{n}_e^*} + 1)^2 (\lambda^{2\underline{n}_e^*} - 1) + \lambda^{2\underline{n}_e^*} (\lambda^{\bar{n}_e^*} + 1)^2 (1 - \lambda^{2\bar{n}_e^*})} Y > 0$$

where

$$Y = \left(2\lambda^{\bar{n}_e^*} + \frac{\left(1 - \lambda^{2\bar{n}_e^*}\right) \left[\lambda^{2\underline{n}_e^*} \left(1 - 2\lambda^{3\bar{n}_e^*} - 3\lambda^{2\bar{n}_e^*}\right) + \lambda^{\bar{n}_e^*} \left(\lambda^{\underline{n}_e^*} + 1\right)^2 \left(\lambda^{2\underline{n}_e^*} - 1\right)\right]}{\left(\lambda^{2\bar{n}_e^*} (\lambda^{\underline{n}_e^*} + 1)^2 (\lambda^{2\underline{n}_e^*} - 1) + \lambda^{2\underline{n}_e^*} (\lambda^{\bar{n}_e^*} + 1)^2 (1 - \lambda^{2\bar{n}_e^*})\right)} \right) > 0$$

since $\left(1 - 2\lambda^{3\bar{n}_e^*} - 3\lambda^{2\bar{n}_e^*}\right) > 0$. Moreover:

$$\frac{\partial \tilde{C}}{\partial \underline{n}_e^*} = -\frac{4\delta (\ln \lambda) \lambda^{2\underline{n}_e^*} \left(\lambda^{\bar{n}_e^*} - 1\right)^2 \left(\lambda^{\bar{n}_e^*} + 1\right)^2 \left(\lambda^{\underline{n}_e^*} + \lambda^{4\underline{n}_e^*} + \lambda^{3\underline{n}_e^*} + 1\right) \left(\lambda^{2\bar{n}_e^*}\right)}{\left(\lambda^{2\bar{n}_e^*} (\lambda^{\underline{n}_e^*} + 1)^2 (\lambda^{2\underline{n}_e^*} - 1) + \lambda^{2\underline{n}_e^*} (\lambda^{\bar{n}_e^*} + 1)^2 (1 - \lambda^{2\bar{n}_e^*})\right)^2} > 0$$

hence since $\frac{d\bar{n}_e^*}{dx_e} < 0$ and $\frac{d\underline{n}_e^*}{dx_e} < 0$:

$$\frac{d\tilde{C}}{dx_e} = \frac{\partial \tilde{C}}{\partial \bar{n}_e^*} \frac{d\bar{n}_e^*}{dx_e} + \frac{\partial \tilde{C}}{\partial \underline{n}_e^*} \frac{d\underline{n}_e^*}{dx_e} < 0$$

Hence, $\tilde{x}_e$ will be increasing in x_e for $x_e > 1/2$ if and only if $C < \tilde{C}$. That is, since $\frac{d\tilde{C}}{dx_e} < 0$, $\tilde{x}_e$ will be increasing in x_e only as long as $x_e < x_{e_R}^{\max}$, where:

$$\tilde{C} \left(\bar{n}_e^*(x_{e_R}^{\max}), \underline{n}_e^*(x_{e_R}^{\max})\right) = C$$

Let's now focus on $\hat{x}_e$. Then:

$$\begin{aligned}
\frac{d\hat{x}_e}{d\bar{n}_e^*} &= (\ln \lambda) \frac{\lambda^{\bar{n}_e^*} \left(2\delta(\lambda^{\underline{n}_e^*} - 1) - C(\lambda^{\underline{n}_e^*} + 1)\right)}{(\lambda^{\underline{n}_e^*} - 1) (\lambda^{\bar{n}_e^*} + 1)^2} < 0 \\
\frac{d\hat{x}_e}{d\underline{n}_e^*} &= -C (\ln \lambda) \lambda^{\underline{n}_e^*} \frac{1 - \lambda^{\bar{n}_e^*}}{(\lambda^{\bar{n}_e^*} + 1) (\lambda^{\underline{n}_e^*} - 1)^2} > 0
\end{aligned}$$

First, we want to prove that for any $x_e > 1/2$ it is always the case that $d\hat{x}_e/dx_e > 0$. From the proof of proposition 1 we know that for $x_e > 1/2$, then$\left|\frac{d\underline{n}_e^*}{dx_e}\right| < \left|\frac{d\bar{n}_e^*}{dx_e}\right|$. Hence, a sufficient condition to ensure that $d\hat{x}_e/dx_e > 0$ is simply:

$$\left|\frac{d\hat{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\underline{n}_e^*}\right| < \left|\frac{d\hat{x}_e(\bar{n}_e^*, \underline{n}_e^*)}{d\bar{n}_e^*}\right|$$

that is

$$C \left(\frac{\lambda^{\underline{n}_e^*} \left(1 - \lambda^{2\bar{n}_e^*}\right)}{\lambda^{\bar{n}_e^*} \left(\lambda^{\underline{n}_e^*} - 1\right)^2} + \frac{(\lambda^{\underline{n}_e^*} + 1)}{(\lambda^{\underline{n}_e^*} - 1)} \right) < 2\delta$$

moreover since $C^{\max} \leq \frac{1 - \lambda^{\bar{n}_e^*}}{(\lambda^{\bar{n}_e^*} + 1)} < \frac{\lambda^{\underline{n}_e^*} - 1}{(\lambda^{\underline{n}_e^*} + 1)}$, a sufficient condition for the above to be verified becomes:

$$\frac{\left(1 - \lambda^{\bar{n}_e^*} \lambda^{\underline{n}_e^*}\right) \left(\lambda^{\bar{n}_e^*} + \lambda^{\underline{n}_e^*}\right)}{\lambda^{\bar{n}_e^*} \left(\lambda^{2\underline{n}_e^*} - 1\right)} < 0$$

hence since $(1 - \lambda^{\bar{n}_e^*} \lambda^{\underline{n}_e^*}) < 0$ for $x_e > 1/2$, we have proved that for $x_e > 1/2$ it is always the case that $d\hat{x}_e/dx_e > 0$. Moreover, for $x_e = 1/2$, $\underline{n}_e^* = -\bar{n}_e^*$ and thus:

$$\left.\frac{d\hat{x}_e}{dx_e}\right|_{x_e=1/2} = -\frac{4}{H}(\ln\lambda)\frac{\lambda^{2\bar{n}_e^*}\left(\delta(1-\lambda^{\bar{n}_e^*}) - C(\lambda^{\bar{n}_e^*}+1)\right)}{(1-\lambda^{2\bar{n}_e^*})\left((1-\lambda^{3\bar{n}_e^*})+\lambda^{\bar{n}_e^*}(1-\lambda^{\bar{n}_e^*})\right)} > 0$$

Hence, for any $x_e \geq 1/2$, it is always the case that $d\hat{x}_e/dx_e > 0$. Let's now analyze the case where $x_e < 1/2$. In this case, $d\hat{x}_e/dx_e > 0$ if and only if:

$$C < \hat{C} \equiv 2\delta\left(\frac{\lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*}-1\right)^2}{\lambda^{2\underline{n}_e^*}\left(1-\lambda^{2\bar{n}_e^*}\right)\left(\lambda^{\bar{n}_e^*}+1\right)^2 + \lambda^{2\bar{n}_e^*}\left(\lambda^{2\underline{n}_e^*}-1\right)\left(\lambda^{\underline{n}_e^*}+1\right)^2}\right)$$

hence $\hat{C} > 0$. Let's now analyze how $\hat{C}$ changes when x_e increases. First of all:

$$\frac{\partial\hat{C}}{\partial\bar{n}_e^*} = 4\delta(\ln\lambda)\lambda^{2\bar{n}_e^*}\frac{\left(\lambda^{2\underline{n}_e^*}-1\right)^2\left(\lambda^{\bar{n}_e^*}+\lambda^{4\bar{n}_e^*}+\lambda^{3\bar{n}_e^*}+1\right)\left(\lambda^{2\underline{n}_e^*}\right)}{\left(\lambda^{2\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}+1\right)^2\left(\lambda^{2\underline{n}_e^*}-1\right)+\lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*}+1\right)^2\left(1-\lambda^{2\bar{n}_e^*}\right)\right)^2} < 0$$

and

$$\frac{\partial\hat{C}}{\partial\underline{n}_e^*} = \frac{4\delta(\ln\lambda)\left(\lambda^{2\underline{n}_e^*}-1\right)\lambda^{\underline{n}_e^*+2\bar{n}_e^*}}{\left(\lambda^{2\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}+1\right)^2\left(\lambda^{2\underline{n}_e^*}-1\right)+\lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*}+1\right)^2\left(1-\lambda^{2\bar{n}_e^*}\right)\right)^2}W < 0$$

where

$$W = 2\lambda^{\bar{n}_e^*}\lambda^{\underline{n}_e^*}\left(\left(\lambda^{2\underline{n}_e^*}-\lambda^{2\bar{n}_e^*}\right)+\left(1+\lambda^{2\underline{n}_e^*}\lambda^{\bar{n}_e^*}\right)\left(1-\lambda^{\bar{n}_e^*}\right)\right)+\left(\lambda^{\underline{n}_e^*}-\lambda^{2\bar{n}_e^*}\right)\left(\lambda^{2\underline{n}_e^*}+\lambda^{\underline{n}_e^*}\lambda^{2\bar{n}_e^*}+\lambda^{3\underline{n}_e^*}\lambda^{2\bar{n}_e^*}+1\right)$$

hence since $\frac{d\bar{n}_e^*}{dx_e} < 0$ and $\frac{d\underline{n}_e^*}{dx_e} < 0$:

$$\frac{d\hat{C}}{dx_e} = \frac{\partial\hat{C}}{\partial\bar{n}_e^*}\frac{d\bar{n}_e^*}{dx_e} + \frac{\partial\hat{C}}{\partial\underline{n}_e^*}\frac{d\underline{n}_e^*}{dx_e} > 0$$

Hence, $\hat{x}_e$ will be increasing in x_e for $x_e < 1/2$ if and only if $C < \hat{C}$. That is, since $\frac{d\hat{C}}{dx_e} > 0$, $\tilde{x}_e$ will be increasing in x_e only as long as $x_e > x_{e_L}^{\min}$, where $x_{e_L}^{\min}$ is such that:

$$\hat{C}\left(\bar{n}_e^*(x_{e_L}^{\min}), \underline{n}_e^*(x_{e_L}^{\min})\right) = C \qquad \textbf{Q.E.D.}$$

Proof of Proposition 2

The optimal strategy for a profit maximizing monopolist media outlet is to choose an editor with idiosyncratic preference x_e such that its profits are maximized. That is x_e^{mon} must be such that:

$$\frac{d\Pi}{dx_e} = \frac{d\Pi}{d\bar{n}_e^*}\frac{d\bar{n}_e^*}{dx_e} + \frac{d\Pi}{d\underline{n}_e^*}\frac{d\underline{n}_e^*}{dx_e} = 0$$

Where:

$$\frac{d\Pi}{d\bar{n}_e^*} = \frac{dF(\tilde{x}_e)}{d\bar{n}_e^*} - \frac{dF(\hat{x}_e)}{d\bar{n}_e^*}$$
$$\frac{d\Pi}{d\underline{n}_e^*} = \frac{dF(\tilde{x}_e)}{d\underline{n}_e^*} - \frac{dF(\hat{x}_e)}{d\underline{n}_e^*}$$

where $\frac{dF(\tilde{x}_e)}{d\bar{n}_e^*} = \frac{d}{d\bar{n}_e^*}\int_\delta^{\tilde{x}_e(\bar{n}_e^*)} f(x)dx$. Hence applying Leibniz's rule:

$$\frac{dF(\tilde{x}_e)}{d\bar{n}_e^*} = \frac{d}{d\bar{n}_e^*}\int_\delta^{\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*)} f(x)dx = f(\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*))\frac{d\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*)}{d\bar{n}_e^*}$$

thus,

$$\frac{d\Pi}{d\bar{n}_e^*} = f(\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*))\frac{d\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*)}{d\bar{n}_e^*} - f(\hat{x}_e(\bar{n}_e^*,\underline{n}_e^*))\frac{d\hat{x}_e(\bar{n}_e^*)}{d\bar{n}_e^*}$$

similarly

$$\frac{d\Pi}{d\underline{n}_e^*} = f(\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*))\frac{d\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*)}{d\underline{n}_e^*} - f(\hat{x}_e(\bar{n}_e^*,\underline{n}_e^*))\frac{d\hat{x}_e(\bar{n}_e^*,\underline{n}_e^*)}{d\underline{n}_e^*}$$

Hence the first order condition becomes:

$$\frac{d\tilde{x}_e/dx_e}{d\hat{x}_e/dx_e} = \frac{f(\hat{x}_e(\bar{n}_e^*,\underline{n}_e^*))}{f(\tilde{x}_e(\bar{n}_e^*,\underline{n}_e^*))} \tag{29}$$

where:

$$\frac{d\tilde{x}_e}{dx_e} = \frac{-2(\ln\lambda)}{H(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*})}\left(2\delta\frac{\lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*}+1\right)}{\left(\lambda^{\underline{n}_e^*}+1\right)^3} - C\left(\frac{\lambda^{2\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}-1\right)}{\left(\lambda^{\bar{n}_e^*}+1\right)\left(1-\lambda^{\bar{n}_e^*}\right)^2} + \frac{\lambda^{2\underline{n}_e^*}\left(\lambda^{\bar{n}_e^*}+1\right)^2}{\left(1-\lambda^{\bar{n}_e^*}\right)\left(\lambda^{\underline{n}_e^*}+1\right)^3}\right)\right)$$

$$\frac{d\hat{x}_e}{dx_e} = \frac{-2(\ln\lambda)}{H(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*})}\left(2\delta\frac{\lambda^{2\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}+1\right)}{\left(\lambda^{\bar{n}_e^*}+1\right)^3} - C\left(\frac{\lambda^{2\underline{n}_e^*}\left(1-\lambda^{\bar{n}_e^*}\right)}{\left(\lambda^{\underline{n}_e^*}+1\right)\left(\lambda^{\underline{n}_e^*}-1\right)^2} + \frac{\lambda^{2\bar{n}_e^*}\left(\lambda^{\underline{n}_e^*}+1\right)^2}{\left(\lambda^{\underline{n}_e^*}-1\right)\left(\lambda^{\bar{n}_e^*}+1\right)^3}\right)\right)$$

From the proof of lemma 1, we know that for $x_e = 1/2$, $d\tilde{x}_e/dx_e = d\hat{x}_e/dx_e > 0$. Hence, for $x_e = 1/2$, $\frac{d\tilde{x}_e/dx_e}{d\hat{x}_e/dx_e} = 1$. More generally, for any x_e :

$$\frac{d\tilde{x}_e}{dx_e} - \frac{d\hat{x}_e}{dx_e} = (1-\lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*})(\lambda^{\underline{n}_e^*}-\lambda^{\bar{n}_e^*})\cdot\alpha\cdot\beta$$

where

$$\alpha = 2\delta\frac{\left(4\lambda^{\bar{n}_e^*}\lambda^{\underline{n}_e^*} + \left(\lambda^{\underline{n}_e^*}+\lambda^{\bar{n}_e^*}\right)\left(1+\lambda^{\underline{n}_e^*}\lambda^{\bar{n}_e^*}\right)\right)}{\left(\lambda^{\underline{n}_e^*}+1\right)^3\left(\lambda^{\bar{n}_e^*}+1\right)^3}$$

and

$$\beta = 4C\frac{\left(\frac{\lambda^{2\bar{n}_e^*}}{\left(\lambda^{\bar{n}_e^*}+1\right)^2\left(1-\lambda^{2\bar{n}_e^*}\right)} + \frac{\lambda^{2\underline{n}_e^*}}{\left(\lambda^{\underline{n}_e^*}+1\right)^2\left(\lambda^{2\underline{n}_e^*}-1\right)}\right)}{\left(\lambda^{\underline{n}_e^*}-1\right)\left(1-\lambda^{\bar{n}_e^*}\right)}$$

where α and β are always positive. Hence given (28):

$$\frac{d\tilde{x}_e/dx_e}{d\hat{x}_e/dx_e}\begin{cases} >1 \text{ for } x_e < \frac{1}{2} \\ =1 \text{ for } x_e = \frac{1}{2} \\ <1 \text{ for } x_e > \frac{1}{2} \end{cases} \tag{30}$$

In other words, for $x_e > \frac{1}{2}$ an increase in x_e increases $\hat{x}_e$ more than $\tilde{x}_e$ (and viceversa for $x_e < \frac{1}{2}$). Then, it is immediate to verify that when the distribution of citizens' idiosyncratic preferences is such that (20) is verified, then $x_e = \frac{1}{2}$ is the unique stationary point and the global maximum.
On the other hand, for $x_{e_R} > \frac{1}{2}$ to be a stationary point it must be the case that $f(\hat{x}_{e_R}(\bar{n}_e^*,\underline{n}_e^*)) < f(\tilde{x}_{e_R}(\bar{n}_e^*,\underline{n}_e^*))$. Moreover, from lemma 1 and (30) we know that for $x_{e_R} > 1/2$, then $\tilde{x}_{e_R}(\bar{n}_e^*,\underline{n}_e^*) > 1-\hat{x}_{e_R}(\bar{n}_e^*,\underline{n}_e^*)$. Lemma 1 also proves that for $x_e = 1/2$, then $d\tilde{x}_e/dx_e = d\hat{x}_e/dx_e > 0$ (i.e., an increase in x_e at $\frac{1}{2}$ increases $\tilde{x}_e$ and $\hat{x}_e$ by the same amount). Now suppose $F(x)$ is such that (21) is verified. Then, $x_e = \frac{1}{2}$ cannot be a global maximum since $\left.\frac{df(x)}{dx}\right|_{x=1/2} > 0$ and

$\left.\frac{d\tilde{x}_e}{dx_e}\right|_{x=1/2} = \left.\frac{d\hat{x}_e}{dx_e}\right|_{x=1/2}$. Thus the stationary point $x_{e_R}^{mon} > \frac{1}{2}$ such that (29) is satisfied will be a global maximum on $(\frac{1}{2}, 1-\delta]$. Then by the symmetry of f, choosing an editor with symmetric preferences will also be profit-maximizing. That is, we have two global maxima in this case $x_{e_R}^{mon}$ and $x_{e_L}^{mon} = 1 - x_{e_R}^{mon}$. Indeed, since the distribution function f is symmetric around $\frac{1}{2}$, so it must be the demand function. To sum up, if $F(x)$ is such that (20) holds the global maximum is always at $x_e = \frac{1}{2}$. Instead, if $F(x)$ is such that (21) holds, there are two symmetric global maxima such that $x_{e_R} = 1 - x_{e_L} > 1/2$. The last part of the proposition follows immediately from lemma 1 **Q.E.D.**

Proof of Proposition 3

Let's start with the case where (20) holds. We show that in this case the unique equilibrium is such that $x_e^1 = x_e^2 = \frac{1}{2}$. Suppose that media outlet 1 deviates by choosing $x_e^1 > x_e^2 = \frac{1}{2}$. If media outlet one deviates, the indifferent viewer, i.e., the viewer who will be indifferent between watching media outlet 1 and media outlet 2 is the one having preferences x_I such that $U_I(W_1) = U_I(W_2)$. Hence:

$$x_I(\bar{n}_{e_1}^*, \underline{n}_{e_1}^*, \bar{n}_{e_2}^*) = \frac{1}{2} + \frac{\delta}{\left(\lambda^{\underline{n}_{e_1}^*}\lambda^{\bar{n}_{e_1}^*} - 1\right)} \left(\frac{(1-\lambda^{\bar{n}_{e_2}^*})\left(\lambda^{\underline{n}_{e_1}^*} - \lambda^{\bar{n}_{e_1}^*}\right)}{\left(\lambda^{\bar{n}_{e_2}^*}+1\right)} - \left(\lambda^{\underline{n}_{e_1}^*} - 1\right)\left(1 - \lambda^{\bar{n}_{e_1}^*}\right) \right)$$

where since $x_e^2 = \frac{1}{2}$, then $\bar{n}_{e_2}^* = -\underline{n}_{e_2}^*$. The no-deviation condition for media outlet 1 requires that $\nexists x_e > \frac{1}{2}$ such that the demand if deviating is higher than the demand if not deviating. Specifically, the demand that media outlet 1 faces when not deviating is:

$$D^{NDev}(x_e^1) = D^{NDev}\left(x_e^2\right) = \frac{1}{2}\left[F(\tilde{x}_e|_{x_e=\frac{1}{2}}) - F(\hat{x}|_{x_e=\frac{1}{2}})\right] = \left[F(\tilde{x}_e|_{x_e=\frac{1}{2}}) - F\left(\frac{1}{2}\right)\right]$$

Instead the demand that media outlet 1 faces if it deviates is:

$$D^{Dev}(x_e^1) = \left[F(\tilde{x}_e|_{x_e^1}) - F(x_I|_{x_e^1})\right]$$

Notice that for any non-uniform distribution satisfying (20) the mass of citizens is strictly decreasing moving away from the mean of the distribution at 1/2. Hence it is enough to show that this no-deviation condition holds even in the case where citizens' preferences are uniformly distributed in $[0,1]$.[38] In the case of a uniform distribution this no-deviation condition can be rewritten as:

$$x_I(\bar{n}_{e_1}^*, \underline{n}_{e_1}^*, \bar{n}_{e_2}^*) - \frac{1}{2} > \tilde{x}_e|_{x_e^1} - \tilde{x}_e|_{x_e=\frac{1}{2}}$$

hence media outlet 1 would not deviate if and only if:

$$C > C^{THR} = \delta \frac{\left(\lambda^{2\underline{n}_{e_1}^*} - 1\right)\left(1 - \lambda^{\bar{n}_{e_1}^*}\right)}{\left(\lambda^{\underline{n}_{e_1}^*}\lambda^{\bar{n}_{e_1}^*} - 1\right)^2} \left(\frac{\left(\lambda^{\underline{n}_{e_1}^*} - \lambda^{\bar{n}_{e_1}^*}\right)}{\left(\lambda^{\underline{n}_{e_1}^*}+1\right)} - \frac{(1-\lambda^{\bar{n}_{e_2}^*})}{\left(\lambda^{\bar{n}_{e_2}^*}+1\right)}\left(\lambda^{\bar{n}_{e_1}^*}+1\right) \right)$$

where $C^{THR} > 0$ if and only if

$$\frac{\left(\lambda^{\underline{n}_{e_1}^*} - \lambda^{\bar{n}_{e_1}^*}\right)}{\left(\lambda^{\underline{n}_{e_1}^*}+1\right)\left(\lambda^{\bar{n}_{e_1}^*}+1\right)} > \frac{(1-\lambda^{\bar{n}_{e_2}^*})}{\left(\lambda^{\bar{n}_{e_2}^*}+1\right)}$$

[38] Notice also that, as stated in section 2.2 the analysis focuses on symmetric distributions.

Let $A = \frac{\left(\lambda^{\underline{n}^*_{e_1}} - \lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\underline{n}^*_{e_1}}+1\right)\left(\lambda^{\bar{n}^*_{e_1}}+1\right)}$. For $x_e > \frac{1}{2}$, $\frac{dA}{dx_e} < 0$ which implies that:

$$\frac{\left(\lambda^{\underline{n}^*_{e_1}} - \lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\underline{n}^*_{e_1}}+1\right)\left(\lambda^{\bar{n}^*_{e_1}}+1\right)} < \left.\frac{\left(\lambda^{\underline{n}^*_{e_1}} - \lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\underline{n}^*_{e_1}}+1\right)\left(\lambda^{\bar{n}^*_{e_1}}+1\right)}\right|_{x_e=\frac{1}{2}} = \frac{\left(1-\lambda^{\bar{n}^*_{e_2}}\right)}{\left(\lambda^{\bar{n}^*_{e_2}}+1\right)} \tag{31}$$

hence $C^{THR} < 0$. Therefore, in a duopoly when the distribution of citizens' idiosyncratic preferences is such that (20) holds (and where citizens watch at most one media report), there will never be an incentive to deviate from the equilibrium at $x_e^1 = 1 - x_e^2 = \frac{1}{2}$. Moreover, notice that this is the unique Nash equilibrium. If the two media outlets choose editors with different preferences, then each of them would clearly have an incentive to deviate by choosing a moderate editor.
Let's now analyze the case where (21) holds. First of all, in order to ensure that there is someone willing to watch media 1 the following condition must be satisfied

$$x_I(\bar{n}^*_{e_1}, \underline{n}^*_{e_1}, \bar{n}^*_{e_2}) < \tilde{x}_e(x_e^1)$$

that is:

$$C < \bar{C} = 2\delta \frac{\left(1-\lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\bar{n}^*_{e_2}}+1\right)} \tag{32}$$

where obviously $\bar{C} > 0$. Let's now analyze the no deviation condition for $C < \bar{C}$. Media outlet 1 will not hire a non-moderate editor as long as:

$$\frac{F(x_I|_{x_e^1})}{F(\tilde{x}_e|_{x_e^1}) - F(\tilde{x}_e|_{x_e=\frac{1}{2}})} > \frac{1}{2} \tag{33}$$

Let C^{Duop} be the opportunity cost solving the following equation:

$$\frac{F\left(\frac{1}{2} + \frac{\delta}{\left(\lambda^{\underline{n}^*_{e_1}}\lambda^{\bar{n}^*_{e_1}}-1\right)}\left(\frac{(1-\lambda^{\bar{n}^*_{e_2}})\left(\lambda^{\underline{n}^*_{e_1}}-\lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\bar{n}^*_{e_2}}+1\right)} - \left(\lambda^{\underline{n}^*_{e_1}}-1\right)\left(1-\lambda^{\bar{n}^*_{e_1}}\right)\right)\right)}{F\left(\frac{1}{2} + \delta\frac{\lambda^{\underline{n}^*_{e_1}}-1}{\lambda^{\underline{n}^*_{e_1}}+1} - C^{Duop}\frac{1}{\lambda^{\underline{n}^*_{e_1}}+1}\frac{\lambda^{\underline{n}^*_{e_1}}-\lambda^{\bar{n}^*_{e_1}}}{1-\lambda^{\bar{n}^*_{e_1}}}\right) - F\left(\frac{1}{2} + \delta\frac{\left(1-\lambda^{\bar{n}^*_{e_2}}\right)}{\lambda^{\bar{n}^*_{e_2}}+1} - C^{Duop}\right)} = \frac{1}{2} \tag{34}$$

Now let $C^{Dev} = \min\left\{\bar{C}, C^{Duop}\right\}$ then for $C \in \left(0, C^{Dev}\right)$ media outlet 1 will have an incentive to deviate.[39] Hence, in such case there is no equilibrium where both media outlets choose a moderate editor.[40] Let's now show that it can never exist an equilibrium with $x_{e_1} = x_{e_2} \neq \frac{1}{2}$. Suppose the two media outlets choose the same type of non-moderate editors (e.g., $x_{e_1} = x_{e_2} > \frac{1}{2}$). By doing so their demand would be

$$D^1(x_{e_1} = x_{e_2}) = D^2(x_{e_1} = x_{e_2}) = \frac{F(\tilde{x}_{e_1}) - F(\hat{x}_{e_1})}{2}$$

while if media outlet 2 chooses an editor with preferences $x_{e_2} = 1 - x_{e_1}$ its demand would be:

$$D^2(x_{e_2} = 1 - x_{e_1}) = \frac{1}{2} - F(\hat{x}_{e_2})$$

[39] Clearly, if $C^{Dev} < 0$, firm 1 will never have an incentive to deviate. Ideed, as shown in the previous case, for example when F is a uniform c.d.f. $C^{Dev} = C^{THR} < 0$.

[40] Clearly C^{Dev} is always lower than $C^{\max}$ since for $C = C^{\max}$ only citizens with $x_e = \frac{1}{2}$ watch news reports and thus firm 1 would never have an incentive to deviate.

where by symmetry $\hat{x}_{e_2} = 1 - \tilde{x}_{e_1}$. Hence $F(\hat{x}_{e_2}) = 1 - F(\tilde{x}_{e_1})$. Thus no-deviation if and only if:

$$\frac{F(\tilde{x}_{e_1}) - F(\hat{x}_{e_1})}{2} > F(\tilde{x}_{e_1}) - \frac{1}{2}$$

but since $x_{e_1} > \frac{1}{2}$, then $\tilde{x}_{e_1} > 1 - \hat{x}_{e_1}$ and given condition (21) the above condition cannot hold. An analogous proof applies for $x_{e_1} = x_{e_2} < \frac{1}{2}$.
Hence, for $C \in (0, C^{Dev})$ the only possible Nash Equilibrium must be such that $x_{e_1} = 1 - x_{e_2} \neq 1/2$. Let's show that this is indeed an equilibrium.[41] Suppose that $x_{e_1} = 1 - x_{e_2} > \frac{1}{2}$. For this to be an equilibrium, it must be the case that for media outlet 1:[42]

$$\left.\frac{dF(x_I)}{dx_{e_1}}\right|_{x_{e_1}=1-x_{e_2}} = \left.\frac{dF(\tilde{x}_e)}{dx_{e_1}}\right|_{x_{e_1}=1-x_{e_2}} \tag{35}$$

On the other hand, by definition, for $C < C^{Dev}$ the opposite of (33) holds, then $\left.\frac{dF(x_I)}{dx_e}\right|_{x_e=1/2} < \left.\frac{dF(\tilde{x}_e)}{dx_e}\right|_{x_e=1/2}$. Moreover, clearly, for $x_{e_1} = 1 - x_{e_2} > \frac{1}{2}$, then $dx_I/dx_{e_1} > 0$. Hence, given (21), for $x_{e_1} = 1 - x_{e_2} > \frac{1}{2}$ it is always the case that $\left.\frac{dF(x_I)}{dx_{e_1}}\right|_{x_{e_1}=1-x_{e_2}} > 0$. On the other hand, we know from the proof of proposition 2 that $\tilde{x}_e$ is increasing in x_{e_1} only as long as $x_{e_1} < x_R$ (i.e., if and only if $C < \tilde{C}$) where x_R is the solution of (17). Hence, given (21):

$$\left.\frac{dF(\tilde{x}_e)}{dx_{e_1}}\right|_{x_{e_1}=1-x_{e_2}} \begin{cases} > 0 \text{ for } x_e < x_R \\ < 0 \text{ for } x_e > x_R \end{cases}$$

Hence, for $C < C^{Dev}$, it will always exist a $x^*_{e_1} = 1 - x^*_{e_2} < x_R$ such that condition (35) is satisfied. Finally, we need to show that a lower C is associated with a Nash equilibrium where the difference between the idiosyncratic preferences of the editors hired by each media outlet, i.e., $|x_{e_1} - x_{e_2}|$, is higher. Since as C decreases $\frac{d\tilde{x}_e(\bar{n}^*_{e_1}, \underline{n}^*_{e_1})}{dx_e}$ increases, then when C is lower the RHS of (35) increases. Hence also the LHS of (35) must increase. Hence, given that x_I is increasing in x_{e_1}, to increase the LHS of (35) x_{e_1} must increase. That is, a lower C is associated with an equilibrium where the two media outlets choose less moderate editors. The last part of the proposition follows immediately from lemma 1 **Q.E.D.**

Proof of Proposition 4
We have to analyze the no-deviation condition with K media outlets. Let $\bar{n}^*_e = -\underline{n}^*_e$ be the stopping thresholds chosen by a moderate editor. The demand media outlet 1 faces if it hires a moderate editor as all the other media outlets is $\forall j \in \{2, 3, ..., K\}$:

$$D^{NDev}(x^1_e) = D^{NDev}\left(x^j_e\right) = \frac{1}{K}\left[F(\tilde{x}|_{x_e=\frac{1}{2}}) - F(\hat{x}|_{x_e=\frac{1}{2}})\right] = \frac{2}{K}\left[F(\tilde{x}|_{x_e=\frac{1}{2}}) - F(\frac{1}{2})\right]$$

Instead the demand that media outlet 1 faces if it deviates from such position is:

$$D^{Dev}(x^1_e) = \left[F(\tilde{x}|_{x^1_e}) - F(x_I|_{x^1_e})\right]$$

Hence given a uniform distribution, media outlet 1 will prefer not to hire a moderate editor if and only if:

$$\tilde{x}|_{x^1_e} - x_I|_{x^1_e} > \frac{2}{K}\left[\tilde{x}|_{x_e=\frac{1}{2}} - \frac{1}{2}\right]$$

[41] Obviously, for $C \in (0, C^{Dev})$ there are always two symmetric Nash Equilibria, i.e., $x_{e_1} = 1 - x_{e_2} < \frac{1}{2}$ and $x_{e_1} = 1 - x_{e_2} > \frac{1}{2}$.
[42] Symmetric conditions apply for media outlet 2.

hence:

$$K > K^* = \frac{\frac{2}{\left(\lambda^{\underline{n}^*_{e1}} - \lambda^{\bar{n}^*_{e1}}\right)}\left[\delta\frac{\left(1-\lambda^{\bar{n}^*_e}\right)}{\lambda^{\bar{n}^*_e}+1} - C\right]}{\delta\frac{1}{\left(\lambda^{\underline{n}^*_{e1}}\lambda^{\bar{n}^*_{e1}}-1\right)}\left(\frac{\left(\lambda^{\underline{n}^*_{e1}}-1\right)}{\left(\lambda^{\underline{n}^*_{e1}}+1\right)} - \frac{(1-\lambda^{\bar{n}^*_e})}{(\lambda^{\bar{n}^*_e}+1)}\right) - C\frac{1}{\left(\lambda^{\underline{n}^*_{e1}}+1\right)\left(1-\lambda^{\bar{n}^*_{e1}}\right)}}$$

where we know from the proof of proposition 3, that $K^* > 2$. Moreover, the game satisfies the properties of Theorem 4 in Dasgupta and Maskin (1986b) for the existence of an equilibrium in a product competition game. Hence, the K^* media outlets game possesses a symmetric mixed-strategy Nash equilibrium. Moreover, $\frac{dK^*}{dC} > 0$ if and only if:

$$\left(\frac{\left(1-\lambda^{\bar{n}^*_e}\right)}{\lambda^{\bar{n}^*_e}+1} - \frac{\left(1-\lambda^{\bar{n}^*_{e_1}}\right)\left(\lambda^{\underline{n}^*_{e_1}}-1\right)}{\left(\lambda^{\underline{n}^*_{e_1}}-\lambda^{\bar{n}^*_{e_1}}\right)}\right) > 0$$

which is always true since:

$$\frac{\left(1-\lambda^{\bar{n}^*_{e_1}}\right)\left(\lambda^{\underline{n}^*_{e_1}}-1\right)}{\left(\lambda^{\underline{n}^*_{e_1}}-\lambda^{\bar{n}^*_{e_1}}\right)} - \frac{\left(\lambda^{\underline{n}^*_{e_1}}-\lambda^{\bar{n}^*_{e_1}}\right)}{\left(\lambda^{\underline{n}^*_{e_1}}+1\right)\left(\lambda^{\bar{n}^*_{e_1}}+1\right)} = -(1-\lambda^{\underline{n}^*_{e_1}}\lambda^{\bar{n}^*_{e_1}})^2 < 0$$

and $\frac{\left(\lambda^{\underline{n}^*_{e1}}-\lambda^{\bar{n}^*_{e1}}\right)}{\left(\lambda^{\underline{n}^*_{e1}}+1\right)\left(\lambda^{\bar{n}^*_{e1}}+1\right)} < \frac{(1-\lambda^{\bar{n}^*_e})}{(\lambda^{\bar{n}^*_e}+1)}$ by condition (31). Thus $\frac{dK^*}{dC} > 0$. **Q.E.D.**