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Media Competition and Information Disclosure

Ascensión Andina-Díaz

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Departamento de Teoría e Historia Económica
Facultad de Ciencias Económicas y Empresariales
Universidad de Málaga

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Ascensión Andina-Díaz†

Abstract

This paper analyzes an election game where self-interested politicians can exploit the lack of information that voters have about candidates' preferred policies in order to pursue their own agendas. In such a setup, we study the incentives of newspapers to acquire costly information, and how competition among the media affect such incentives. We show that the higher the number of potential readers and/or the lower the cost or investigating, the more the newspapers investigate. We also show that the readers' purchasing habits play a crucial role in the model. More specifically, we show that if the readers always buy a newspaper, media competition favors information disclosure; whereas if they just buy a newspaper in the case news are uncovered, competition is not so desirable.

JEL classification: D72; D82

Keywords: Media competition; Political accountability; Information disclosure

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†Departamento de Teoría e Historia Económica, Universidad de Málaga, Spain, email: aandina@uma.es

1 Introduction

There is a widely held belief that media play an important role in society by providing information to the public. However, there is not such great consensus on the question whether media competition increases accuracy of news. A large number of recent papers present models in which media competition is desirable. The reasons they point out are various, including the idea that competition in the media market makes it more difficult for a bad government to silence the media (Besley and Prat (2006)); or that media competition solves the problem posed by advertisers, who may dislike accurate information on certain topics (Ellman and Germano (2005)); or that competition in the news market reduces the bias that media outlets may introduce to make their information conform with readers' prior beliefs (Gentzkow and Shapiro (2006)). Some other influential works, however, question this point. Thus, Baron (2006) identifies the journalists' career-concerns as an explanation for media bias that can persist even in case of media competition; Mullainathan and Shleifer (2005) show that media competition does not imply media differentiation unless readers' beliefs diverge; and Panova (2006) argues that competition may segment the market and create incentives for a media to deviate form truthtelling.

Our paper aims to contribute to this discussion by providing a new ingredient, namely the readers' purchasing habits, and studying its implications for the accuracy in the market for news. More precisely, we want to study how the media market structure, and in particular the level of competition in the media industry and the structure of readers' demand for news, affects the incentives of politicians to reveal their information.

To this aim, we set up a model of election campaigns in which self-interested politicians can exploit the lack of information that voters have about candidates' preferred policies in order to pursue their own agendas. As shown by Barro's (1973) and Ferejohn's (1986) seminal papers, the establishment of a control mechanism, such as regular elections, is a way of inducing policy makers to fulfill their campaign promises, and so, to make them choose the policies preferred by the electorate rather than those preferred by themselves. However, for elections to raise reputation concerns, we need to consider a model of repeated elections where voters vote retrospectively, as those by Barro and Ferejohn. In contrast, our paper considers a one shot game, but additionally, it introduces a new player, media outlets, so as to study whether media can be also a control mechanism to discipline policy makers.

We propose a signalling game with three kinds of players: political parties, newspapers and voters. There are two political parties: a left-wing party and a right-wing one. From each of the two parties a candidate emerges, who can be either moderate or extreme. This is private information of the candidate. The two candidates propose non-binding platforms, choosing either a moderate or an extreme platform. The aim of candidates is to win the election. Therefore, they may well choose a platform that does not correspond to their respective type if this were profitable to them. Newspapers observe the candidates' platforms, update beliefs on the candidates' type and based on this information decide, simultaneously, whether to investigate the politicians or not. We model a situation of neutral media that neither lie nor manipulate the information they get, and that all they want is to maximize their number of readers. We assume that voters buy, at most, one newspaper. We further assume that investigating and uncovering news is audience rewarding, as it increases the probability that a voter buys a newspaper. In particular, we consider that if a newspaper chooses to investigate and turns out to uncover new information (information which is different from what the candidates declare), any voter will buy that newspaper with a higher probability than if it does not uncover any news. This links our paper to the literature on competition and innovation (Aghion et al. (2005)), where innovation, namely acquiring information in our model, is a way of improving product quality to differentiate from a competitor.

The aim of voters is to maximize their own utility, but as such utility is not defined on the platforms proposed by the candidates but rather on the post-election policy, voters want to know the true intentions of politicians (their types). Hence, voters value information and, through their buying behavior, remunerate the media from uncovering news. Finally, voters take into account the information reported by the candidates and the newspapers, update their beliefs on the politicians' types and decide for whom to vote. The game finishes when the candidate with the largest support is elected and implements his preferred policy, i.e., his type.

In this setup, we analyze the incentives of the newspapers to acquire costly information, and how competition in the media industry affect such incentives. We show that the higher the number of potential readers and/or the lower the cost or investigating, the more the newspapers investigate. We also show that the readers' purchasing habits, i.e., whether they always buy a newspaper with a positive probability or just in the case some news are uncovered, affect the incentives of the newspapers to investigate. In particular, we show that if the readers always buy a newspaper with a positive probability, media competition is good as it induces newspapers to investigate under weaker conditions. In contrast, when the readers just buy a newspaper in the case some news are uncovered, competition does not affect such incentives. We then study the game in which candidates and newspapers use pure strategies and show that only pooling equilibria can exist, i.e., equilibria where the candidates do not make informative speeches. We also show that the only equilibria in which the newspapers investigate involve mixed strategies. We therefore analyze the mixed strategies equilibrium and observe that the readers' purchasing habits will determine whether media competition favors information disclosure or not. More precisely, we show that whenever readers always buy one newspaper, the greater the number of newspapers, the more the candidates tend to separate their type. On the other hand, if readers just buy one newspaper in the case some news are uncovered, competition is not so desirable. In such a case, a higher number of newspapers neither makes more likely that an equilibrium in mixed strategies exist, nor it implies more revelation of information by candidates. We finally observe that for a large number of newspapers, the readers' purchasing habits have a negligible effect on the candidates' incentives to reveal their information.

This paper fits into the new and blooming literature on the role of media in political competition, which has attracted much attention from economists after the influential work of Strömberg (2004a, 2004b). Strömberg (2004a) studies the incentives of the media to deliver information to different groups of readers, and shows that because of the increasing returns to scale of the media industry, the media provide more news to large groups. In Strömberg (2004b), he tests with data the hypothesis that media affect public policies, and finds that the US counties with more radio listeners received more New Deal relief funds. In a similar vein, Larcinese (2007) shows that information supply is higher in constituencies with closer electoral races. Other recent papers are Mullainathan and Shleifer (2005), who consider a model in which voters like to see their opinions confirmed and analyze the resulting equilibrium in the media sector. Chan and Suen (2005) and Andina-Díaz (2006) also consider voters who may prefer like-minded information, but different from Mullainathan and Shleifer (2005), they focus on its effects on political competition rather than on its implications on the market for news. Gentzkow and Shapiro (2006) are inspired by reputational concerns, and so present a model in which media bias arises as a consequence of the firms' desire to build a reputation for accuracy. Vaidya (2005) and Besley and Prat (2006) analyze the features of the media market that determine the ability of a government to silence the media. Closer to our work it is the paper by Panova (2006), who studies how the market structure affects the media incentives to report truthfully. Although sharing similar concerns, both studies differ in an important number of aspects. Panova (2006) focuses more on the information structure of the game and considers a media that can manipulate news. In contrast, the media in our model cannot manipulate news but rather decide whether to investigate politicians. Additionally, our model deals with media competition but also with political competition, which is not in hers; and it is richer in the structure of the readers' demand for news and in the levels of competition considered in the media market.

The paper is organized as follows. We present the model and some basic ideas in Section 2. In Section 3 we analyze the media game, and study the incentives of the newspapers to acquire costly information and how competition affect such incentives. In Section 4 we deal with the equilibrium analysis. We first analyze the case of candidates and newspapers using pure strategies, and then study the equilibrium in which candidates and newspapers use mixed strategies. Finally, Section 5 concludes.

2 The model

Two political parties compete for office. The left-wing party is labelled L, and the right-wing party R. Political parties face an electorate of n citizens, where $n = n_{\mathcal{L}} + n_{\mathcal{C}} + n_{\mathcal{R}}$ is a finite and odd number. Abusing notation, we denote the group of left-wing agents by $n_{\mathcal{L}}$ and that of right-wing agents by $n_{\mathcal{R}}$. The group of centrist agents is $n_{\mathcal{C}}$. We assume $n_{\mathcal{L}} = n_{\mathcal{R}}$, and so guarantee the median voter is in $n_{\mathcal{C}}$.[1]

We propose a signaling game where Nature moves first and chooses the type of the candidate running for office for each party. A candidate can be either moderate, M, or extreme, E, with $E \in \{L, R\}$ for the left and the right-wing parties respectively. Thus, the set of possible types is $T_{\mathsf{L}} = \{L, M\}$, $T_{\mathsf{R}} = \{R, M\}$ with $t_{\mathsf{L}} \in T_{\mathsf{L}}$, $t_{\mathsf{R}} \in T_{\mathsf{R}}$. A candidate's type is his own private information, although voters have priors on it. We denote the probability of candidate in L being L (resp. M) as q_{L} (resp. $1 - q_{\mathsf{L}}$), and the probability

[1] The groups $n_{\mathcal{L}}$ and $n_{\mathcal{R}}$ need not to be equal. They can be sufficiently close, but always assuring that the median voter is in $n_{\mathcal{C}}$.

of candidate in R being R (resp. M) as q_{R} (resp. $1 - q_{\mathsf{R}}$). We interpret this as the priors citizens have on the proportion of extreme and moderate politicians in each party.

The two candidates propose non-binding platforms, choosing either a moderate or an extreme platform, and run for office. The space of platforms is $\mathsf{P_L} = \{l, m\}$, $\mathsf{P_R} = \{r, m\}$ for candidates in party L and R respectively, with $\mathsf{p_L} \in \mathsf{P_L}$, $\mathsf{p_R} \in \mathsf{P_R}$. We assume that platforms are non-binding, and so, candidates implement their types as their policies if elected. A strategy for a candidate from party L is a function $\Upsilon_{\mathsf{L}} : T_{\mathsf{L}} \to \Delta(\{l, m\})$, and that of a candidate from party R is $\Upsilon_{\mathsf{R}} : T_{\mathsf{R}} \to \Delta(\{r, m\})$. These functions map the types of a candidate into the choice of a platform (allowing for stochastic decisions). Candidates' objective is to win the elections.

There is a set $\mathcal{S} = \{1, 2, ..., s\}$ of newspapers that want to maximize their readership share. Newspapers observe politicians platforms, update their beliefs on the candidates' types, and based on this information decide (simultaneously) whether to investigate the two candidates or not. A strategy for an outlet i is therefore a function $\Psi_i : \mathsf{P_L} \times \mathsf{P_R} \to \Delta(\{I, NI\})$ that maps the platforms proposed by the candidates into the choice of whether to investigate or not (allowing for stochastic decisions).

We model the case of neutral newspapers, i.e., media outlets that do not have a political preference and therefore neither lie nor manipulate the information they disclose. We assume that when a newspaper does not investigate, it gets no additional information on the politicians' true types and therefore reports in the paper what the candidates have previously told in their campaigns. When a newspaper investigates, however, we assume it observes the true types of the two candidates and reports this information in the paper. It does not imply, however, that readers can directly observe whether a newspaper has investigated, but, in general, readers can only be sure about a newspaper's investigation in the case it uncovers new information. We denote by $\mathsf{M}_i = \{lr, lm, mr, mm\}$ the space of messages for an outlet i, $\forall i \in \mathcal{S} = \{1, 2, ..., s\}$, and by $\mathsf{m}_i \in \mathsf{M}_i$ an element of this set.

In the model it is assumed that *investigating and uncovering new information* is audience rewarding. In particular, we assume that when newspapers do not report any new information on the candidates, voters buy one newspaper with probability $b \in [0, 1]$; whereas when some do investigate and uncover new information, voters buy one of those newspapers investigating with probability one. Hence, if no newspaper investigates, they all divide bn readers evenly; whereas if some do investigate and uncover a lie, those that investigate divide n readers evenly.[2] In this sense, *investigating and uncovering news* is audience rewarding.[3] Note also that investigating and uncovering news is more profitable, as compared to not investigating, the lower the value of parameter b. Thus, in the extreme case in which $b = 0$,

[2] Implicit in this assumption it is the idea that voters observe the information published in all the newspapers and that depending on whether new information is uncovered or not, they buy one newspaper with a different probability. To say it differently, we model a situation in which voters go everyday to a news stand, have a look at the front pages of all the newspapers and based on the news reported, buy or not with a different probability. This implies that even in the case the voters do not buy any newspaper, they have accessibility to information, and more importantly, know what is being published.

[3] It is important to note that investigating is not rewarded *per se*, but rather uncovering news on any of the two candidates. This requires the newspaper to investigate and, furthermore, that at least one of the two politicians cheat in his platform.

investigating and uncovering news allows a newspaper to increase its sales from zero to $\frac{1}{s_1}n$, where s_1 is the number of newspapers investigating and uncovering new information; whereas in the case $b = 1$, sales can only increase from $\frac{1}{s}n$ to $\frac{1}{s_1}n$. Finally, to investigate implies a strictly positive fixed cost, $K > 0$.

Voters observe politicians' platforms and media's messages, update beliefs on the types of the candidates, and based on this information cast their vote. Voters' objective is to maximize (expected) utility, which is defined on the ex-post policy, i.e., the policy implemented by the elected candidate (his type). The Bernoulli utilities are: $\forall k \in n_{\mathcal{L}}$, $u_k(L) > u_k(M) > u_k(R)$; $\forall k \in n_{\mathcal{R}}$, $u_k(R) > u_k(M) > u_k(L)$; and $\forall k \in n_{\mathcal{C}}$, $u_k(M) > u_k(L) = u_k(R)$. We assume that agents in $n_{\mathcal{L}}$ and $n_{\mathcal{R}}$ are captive voters, i.e., they always vote for the candidates L and R respectively.[4] Hence, the game focuses on the centrist voters. A strategy for a centrist voter is a function $\Gamma_{\mathcal{C}} : \prod_{j=\mathsf{L},\mathsf{R}} \mathsf{P}_j \times \prod_{i=1}^{s} \mathsf{M}_i \to \Delta(\{\mathsf{L},\mathsf{R}\})$ that maps the platforms received from both candidates and the messages received from the s newspapers, into the choice of whom to vote for (allowing for stochastic decisions). A centrist voter prefers L instead of R if she believes L to be more likely a moderate type than R. In case of indifference, a coin flip determines her vote.[5] However, in the case of indifference, if (just) one of the two candidates has been shown to be a liar, we consider a tie breaking rule that penalizes the cheating candidate.[6]

The notion of equilibrium we use is the Perfect Bayesian Equilibrium, which, for this game, is a vector of strategies for candidates, newspapers and centrist voters, $(\{\Upsilon_j^*\}_{j\in\{\mathsf{L},\mathsf{R}\}}, \{\Psi_i^*\}_{i\in\mathcal{S}}, \Gamma_{\mathcal{C}}^*)$, and a vector of beliefs for newspapers and centrist voters, $(\{\{\mu_j^*(\cdot \mid \mathsf{p}_j)\}_{\mathsf{p}_j\in\mathsf{P}_j}\}_{j\in\{\mathsf{L},\mathsf{R}\}}, \{\{\gamma_j^*(\cdot \mid \mathsf{p}_\mathsf{L}, \mathsf{p}_\mathsf{R}, \{\mathsf{m}_i\}_{i\in\mathcal{S}})\}_{\mathsf{p}_j\in\mathsf{P}_j}\}_{j\in\{\mathsf{L},\mathsf{R}\}})$, such that:

(i) Candidates maximize the number of votes, newspapers maximize the number of readers and centrist voters maximize their utility.

(ii) The belief of the newspapers on a candidate $j \in \{\mathsf{L},\mathsf{R}\}$ is derived from Bayes' Rule, i.e.,

$\forall \mathsf{p}_j \in \mathsf{P}_j$,

$\mu_j^*(t \mid \mathsf{p}_j) = \frac{\Upsilon_j^*(t)(\mathsf{p}_j)P(t)}{\sum_{t'\in T_j}\Upsilon_j^*(t')(\mathsf{p}_j)P(t')}$ $\forall t \in T_j$, whenever possible.

(iii) The belief of a centrist voter on a candidate $j \in \{\mathsf{L},\mathsf{R}\}$ is derived from Bayes' Rule, i.e.,

$\forall \mathsf{p}_\mathsf{L} \in \mathsf{P}_\mathsf{L}$, $\forall \mathsf{p}_\mathsf{R} \in \mathsf{P}_\mathsf{R}$, $\forall \mathsf{m}_i \in \mathsf{M}_i$,

$\gamma_j^*(t \mid \mathsf{p}_\mathsf{L}, \mathsf{p}_\mathsf{R}, \{\mathsf{m}_i\}_{i\in\mathcal{S}}) = \frac{\xi_j(\{\mathsf{m}_i\}_{i\in\mathcal{S}}|\mathsf{p}_\mathsf{L},\mathsf{p}_\mathsf{R};t)\Upsilon_j^*(t)(\mathsf{p}_j)P(t)}{\sum_{t'\in T_j}\xi_j(\{\mathsf{m}_i\}_{i\in\mathcal{S}}|\mathsf{p}_\mathsf{L},\mathsf{p}_\mathsf{R};t')\Upsilon_j^*(t')(\mathsf{p}_j)P(t')}$ $\forall t \in T_j$, whenever possible,

where $\xi_j\left(\{\mathsf{m}_i\}_{i\in\mathcal{S}} \mid \mathsf{p}_\mathsf{L}, \mathsf{p}_\mathsf{R}; t\right)$ is the probability that the media send the messages $\{\mathsf{m}_i\}_{i\in\mathcal{S}}$, when the candidates have proposed the platforms $\mathsf{p}_\mathsf{L}, \mathsf{p}_\mathsf{R}$, being $t \in T_j$ the type of candidate j.

[4] This is an assumption only in the case of voters facing two candidates which are assigned a probability of being moderates equal to one. In any other case, voters in $n_{\mathcal{L}}$ (resp. $n_{\mathcal{R}}$) always prefer candidate L to R (resp. R to L).

[5] If centrist voters' expected utility is the same by voting for any of the two candidates and either the two have cheated or none have done it, centrists vote for each candidate with a probability of one-half.

[6] In particular, we consider: $\Gamma_{\mathcal{C}}^*(lm, \{lr\}_i) = \mathsf{L}$, $\Gamma_{\mathcal{C}}^*(lm, \{mm\}_i) = \mathsf{R}$, $\Gamma_{\mathcal{C}}^*(mr, \{mm\}_i) = \mathsf{L}$, $\Gamma_{\mathcal{C}}^*(mr, \{lr\}_i) = \mathsf{R}$; where $\Gamma_{\mathcal{C}}^*(lm, \{lr\}_i) = \mathsf{L}$ means that the centrists vote for candidate L when the platform profile they observe from candidates is (lm), and the message profile they observed from at least one newspaper is (lr). We denote this assumption by LP.

3 The media game

We start by analyzing the incentives of newspapers to acquire costly information, and the effect of competition on such incentives.

To this aim, let us denote by θ the generic probability that the newspapers assign to both candidates being truthful in a particular equilibrium. Note that θ might be different in every subgame. Thus, the probability θ is $\mu^*_{\mathsf{L}}(L \mid l)\mu^*_{\mathsf{R}}(R \mid r)$, $\mu^*_{\mathsf{L}}(L \mid l)\mu^*_{\mathsf{R}}(\mathsf{M} \mid m)$, $\mu^*_{\mathsf{L}}(M \mid m)\mu^*_{\mathsf{R}}(R \mid r)$ or $\mu^*_{\mathsf{L}}(M \mid m)\mu^*_{\mathsf{R}}(M \mid m)$, when the platform profile the newspapers observe is either (l, r), (l, m), (m, r) or (m, m), respectively. We provide an example that helps make this point. Let us consider a hypothetical equilibrium where $\Upsilon^*_{\mathsf{L}}(L) = l$, $\Upsilon^*_{\mathsf{L}}(M) = l$, $\Upsilon^*_{\mathsf{R}}(R) = m$, $\Upsilon^*_{\mathsf{R}}(M) = m$, and denote by $x_{\mathsf{R}} \in [0, 1]$ (resp. x_{L}) the belief that the newspapers assign to candidate R (resp. L) R being (resp. L) off the equilibrium path. In this case, there are four possible situations: (i) The newspapers observe the equilibrium platform profile (l, m). Here, $\theta = q_{\mathsf{L}}(1 - q_{\mathsf{R}})$. (ii) The candidate R deviates. Then, the platform profile the media outlets observe is (l, r), and therefore $\theta = q_{\mathsf{L}}x_{\mathsf{R}}$. (iii) The candidate L deviates. The platform profile the newspapers observe is (m, m), and then $\theta = (1 - x_{\mathsf{L}})(1 - q_{\mathsf{R}})$. (iv) Both candidates deviate, and the platform profile the newspapers observe is (m, r). Therefore $\theta = (1 - x_{\mathsf{L}})x_{\mathsf{R}}$.

We now analyze the incentives of newspapers to investigate, and how competition among newspapers affect such incentives. This analysis will allow us to determine the number of newspapers investigating in equilibrium as a function of the number of media outlets competing in the economy.

■ The Monopoly Case

Let us first consider the case of just one newspaper. In such a case, the (expected) payoff of the media outlet if it chooses to investigate is $\theta nb + (1-\theta)n - K$, as with probability θ the candidates are truthful, in which case voters buy the newspaper with probability b, whereas with probability $(1 - \theta)$ the newspaper uncovers a lie and all the voters buy the newspaper. On the other hand, the payoff of the newspaper if it chooses not to investigate is nb, as it cannot uncover any news. Hence, in equilibrium the monopoly is going to investigate whenever $K < (1 - \theta)n(1 - b)$.

This condition tells us that in a particular equilibrium, and for a given platform profile, it is more likely that a monopoly investigates the larger is the number of potential readers (n), the lower is the cost of investigating (K), or the lower is the probability that a voter buys a newspaper in the case of no news (b). We further observe that in the case $b = 1$, i.e., voters always buy a newspaper with probability one, newspaper's sales are constant. In such a case, the monopoly never chooses to investigate.

■ The Oligopoly Case

We now focus on situations in which the media industry is composed of two or more newspapers, which is often the case in democratic and developed countries.

Let us denote by s_1 the number of newspapers that choose to investigate, and by s_2 the number of them that choose not to do so, with $s_1 + s_2 = s \geq 2$. Let us consider a particular platform profile that the newspapers observe from the politicians. This platform profile determines a particular value of θ.

The next result fully characterizes the equilibrium of the media game for each platform profile, i.e., for each θ. This result allows us to identify the number of newspapers that investigate in equilibrium for any number of media outlets s, depending on the value $\frac{(1-\theta)}{K}n$, i.e., on the profitability of investigating.[7]

Proposition 1 *In the oligopoly case of the media game and for each platform profile:*

If $\frac{(1-\theta)}{K}n < 1$, *then* $s_1 = 0$ $\forall b \in [0,1]$.
If $\frac{(1-\theta)}{K}n = 1$, *then* $s_1 = 0$ *if* $b \in (0,1]$, *and* $s_1 \in \{0,1\}$ *if* $b = 0$.
If $1 < \frac{(1-\theta)}{K}n < 2$, *then* $s_1 = 0$ *if* $1 < \frac{(1-\theta)}{K}n \leq \frac{s}{s-b}$, *and* $s_1 = 1$ *if* $\frac{s}{s-b} \leq \frac{(1-\theta)}{K}n < 2$.
If $\frac{(1-\theta)}{K}n = 2$ *and* $s = 2$, *then* $s_1 \in \{0,1,2\}$ *if* $b = 1$, *and* $s_1 \in \{1,2\}$ *if* $b \in [0,1)$.
If $\frac{(1-\theta)}{K}n = 2$ *and* $s > 2$, *then* $s_1 \in \{1,2\}$ $\forall b \in [0,1]$.
If $\frac{(1-\theta)}{K}n \in (2,s]\backslash\{3,4,...,s\}$, *then* $s_1 = \lfloor \frac{(1-\theta)}{K}n \rfloor$ $\forall b \in [0,1]$.
If $\frac{(1-\theta)}{K}n \in \{3,4,...,s\}$, *then* $s_1 \in \left\{\frac{(1-\theta)}{K}n, \frac{(1-\theta)}{K}n - 1\right\}$ $\forall b \in [0,1]$.
If $\frac{(1-\theta)}{K}n > s$, *then* $s_1 = s$ $\forall b \in [0,1]$.

The proof is in the Appendix.

Recall that θ varies with the platform profile. Therefore, the conditions in Proposition 1 must apply correctly in every subgame.

There are three important ideas underlying this result, which we present in the next corollary.

Corollary 1 *In the oligopoly case of the media game and for each platform profile:*

(i) If $K > (1-\theta)n(\frac{s-b}{s})$, *the unique Nash equilibrium is in dominant strategies. In this equilibrium none of the* s *newspapers investigate.*

(ii) If $K < (1-\theta)n\frac{1}{s}$, *the unique Nash equilibrium is in dominant strategies. In this equilibrium all of the* s *newspapers investigate.*

(iii) If $(1-\theta)n\frac{1}{s} < K < (1-\theta)n(\frac{s-b}{s})$, *there is an equilibrium in pure strategies. In this equilibrium the number of newspapers investigating is:* $s_1 = 1$ *if* $(1-\theta)n\frac{1}{2} < K < (1-\theta)n(\frac{s-b}{s})$; $s_1 = i-1$ *if* $(1-\theta)n\frac{1}{i} < K < (1-\theta)n\frac{1}{i-1}$, *for* $i \in \{3,4,...,s\}$; *and* $s_1 = \{i, i-1\}$ *if* $K = (1-\theta)n\frac{1}{i}$, *for* $i \in \{2,3,...,s-1\}$.

The proof is in the Appendix.

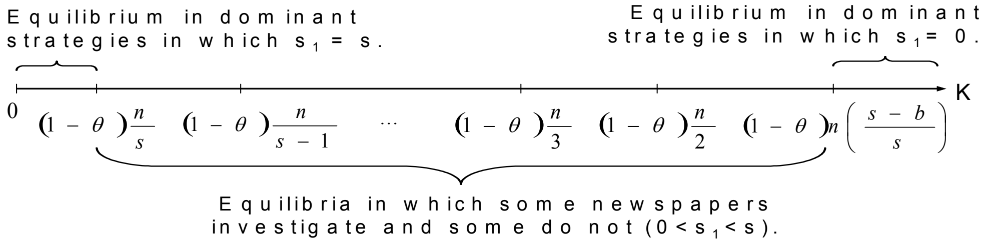
It is interesting to note that the equilibria of the first two cases are in dominant strategies. This implies that, for a given platform profile, whenever the cost of investigating is either too high or too low, any newspaper has a strategy that pays it more, independently on what the other outlets do. Hence, in such cases, there is no room for an equilibrium in mixed strategies, in which the newspapers choose both to investigate and not to investigate with positive probability. As we shall see later on the paper, this result will turn out to be important for our conclusions. For intermediate values of K, however, the equilibrium is no longer in dominant strategies. There is therefore room for an equilibrium in mixed strategies. The reader can also note that in the duopoly case, i.e., $s = 2$, if voters always buy a newspaper,

[7] This ratio is a measure of how profitable is to investigate when no newspaper is currently investigating.

i.e., $b = 1$, only points (i) and (ii) of the corollary above are possible. The equilibrium is therefore in dominant strategies.

■ Competition and the incentives to investigate

We now analyze how competition in the media industry shapes the incentives of the newspapers to acquire costly information. We next present a graph that illustrates this idea.



To interpret the graph, let us a first consider a particular platform profile that newspapers observe from politicians. This platform profile determines a particular value of θ. *Ceteris paribus* θ, we observe that an increase in s, whenever $b \neq 0$, increases the range of values of K for which at least one newspaper investigates in equilibrium. This is an important result, because as we will see later on, the fact that a solely newspaper investigates is enough to "discipline" politicians' behavior. We also note that *ceteris paribus* θ, an increase in n increases the incentives of the newspapers to investigate. Finally, we observe that parameter b plays an important role in determining how competition shapes newspapers' incentives to acquire costly information. In particular, if $b \in (0, 1]$, the upper threshold $(1-\theta)n\left(\frac{s-b}{s}\right)$ increases in s. Competition in the media industry is therefore desirable in such cases, as it makes more likely that at least one newspaper investigates in equilibrium.[8] If $b = 0$, however, the threshold $(1-\theta)n\left(\frac{s-b}{s}\right)$ is simply $(1-\theta)n$, which does not depend on s, and which further coincides with the threshold in the monopoly case. Thus concluding that if $b = 0$, competition does not affect the condition for having (at least) one newspaper investigating. Last, we observe that if $b \in (0, 1]$, the value of the limit $\lim_{s\to\infty}(1-\theta)n\left(\frac{s-b}{s}\right)$ is $(1-\theta)n$, i.e., the value of the threshold when $b = 0$. *Ceteris paribus* θ, it is therefore more likely that at least one newspaper investigates in equilibrium when $b = 0$ than when $b \in (0, 1]$.

We summarize these ideas in the next corollary.

Corollary 2 *Ceteris paribus θ, the range of parameter values of K for which at least one newspaper investigates in the equilibrium of the media game decreases in the probability that the readers buy one*

[8] That is to say, to investigate can now be profitable for values of K for which it was not before.

newspaper in the case no news are provided (b), *increases in the number of potential readers* (n), *and for any* $b \in (0, 1]$, *it also increases in the number of newspapers in the economy* (s).

We can therefore state that whenever $b \in (0, 1]$, competition in the media industry is desirable as it makes more likely that at least one newspaper investigates in equilibrium. This is an important result, because as we will see next, the existence of at least one newspaper investigating, for every platform profile, is enough to rule out the use of pooling strategies by candidates.

4 Equilibrium analysis

Once we have analyzed the equilibrium in the media game and have identified the forces that drives newspapers to undertake investigation, we go into the analysis of the equilibrium of the entire game. By so doing, we want to study how politicians react to the existence of a media industry that may find profitable to investigate the candidates.

The equilibrium analysis that follows is divided into two subsections. In the first subsection, we study the equilibrium in the game in which both candidates and newspapers use pure strategies. We here show that there is no truthful separating equilibrium, i.e., an equilibrium in which candidates self reveal their type. Moreover, we show that only pooling equilibria can exist, i.e., equilibria in which different types propose the same platform. However, for these equilibria to hold we need that newspapers do not always find it profitable to investigate. This implies that no equilibrium in pure strategies exists if there is investigation for every platform profile. We therefore analyze, in the second subsection, the equilibrium of the game in which candidates and newspapers use mixed strategies.

Prior to the analysis of the equilibrium in pure strategies, and in order to study how media shape the behavior of politicians, it is interesting to know how candidates would behave in the absence of newspapers. In such a case, the only equilibria that exist involve candidates using pooling strategies.[9] In these equilibria, the two candidates in each party propose the same platform independently on their types. There is therefore no possibility of having an equilibrium in which candidates make informative speeches, i.e., candidates reveal their types. The reason why such an equilibrium cannot exist is because the extreme type in each party will always find it profitable to mimic the behavior of the moderate type. Thus assuring the inexistence of separating equilibrium.

We now analyze the game with newspapers to see whether the existence of such an industry makes a difference for politicians.

[9] To analyze the mixed strategies equilibrium, and show that there is no equilibrium in such a case, we make two assumptions. First one, that the probability that a moderate type proposes a moderate platform is always one. Second, that the probability of each candidate being extreme is the same in the two parties, i.e., $q_{\mathsf{L}} = q_{\mathsf{R}} = q$. These two assumptions are the ones we make later on the paper, when we analyze the mixed strategies equilibrium in the case with newspapers.

4.1 Equilibrium in pure strategies

We here focus on the case of candidates and newspapers using pure strategies. The first result we obtain from the analysis of this game is that even in the case with newspapers, no truthful separating equilibrium exists. The reason now is that if candidates use a separating strategy and self reveal their type, then there is no role for the media.[10] But if the media do not investigate, then extreme types do better by pooling than by separating. Hence the impossibility result.

The equilibrium strategy for candidates must therefore imply no revelation of information. In fact, our next result says that in pure strategies, only pooling equilibria can exist. But there is one major difference with respect to the pooling equilibria in the case without media. The difference is that for these equilibria to hold, we now need that for some platform profile, no newspaper finds it profitable to investigate.[11] For if it were not the case, i.e., candidates are investigated for every platform profile, politicians would do better by self revealing their type. But in such a case no investigation would be done, as the use of separating strategies by the candidates makes investigation unprofitable. To summarize then, for an equilibrium in pure strategies to exists, we need that newspapers do not always find it profitable to investigate.

Next proposition formalizes these ideas.

Proposition 2 *Let us consider that candidates and newspapers use pure strategies. In such a case:*

(i) *There is no equilibrium in which at least one newspaper investigates for every platform profile.*

(ii) *There is no equilibrium in which at least one candidate separates and the newspapers never investigate.*

(iii) *There are equilibria in which the candidates pool, the newspapers never investigate, and the voters' beliefs off the equilibrium path are:*

(a) $x_{\mathsf{L}} > q_{\mathsf{R}}$ *if* $q_{\mathsf{L}} > q_{\mathsf{R}}$,

(b) $x_{\mathsf{R}} > q_{\mathsf{L}}$ *if* $q_{\mathsf{R}} > q_{\mathsf{L}}$,

(c) $\min\{x_{\mathsf{L}}, x_{\mathsf{R}}\} \geq q$, *if* $q_{\mathsf{L}} = q_{\mathsf{R}} = q$,

where $x_{\mathsf{L}} \in [0,1]$ (*resp.* x_{R}) *is the belief that the voters assign to candidate* L (*resp.* R) *L being* (*resp. R*) *off the equilibrium path, when the newspapers do not investigate.*

The proof is in the Appendix.

Proposition 2 refers to the cases in which the newspapers either always investigate or never do so. There are, however, other possibilities. For instance, the newspapers could find it profitable to investigate in equilibrium but not off the equilibrium path, or the other way round.[12] To this respect, we should point out that only pooling equilibria exist, i.e., there are neither separating nor semi-pooling equilibria,[13]

[10] In such a case, no news can be uncovered (note that $\theta = 1$ always), therefore investigating is not audience rewarding.

[11] The platform profile can be observed either in equilibrium or off the equilibrium path.

[12] This depends on the values of K, n, s, b, and on the beliefs θ, in each corresponding subgame.

[13] By semi-pooling equilibria we mean equilibria in which the candidates in one party pool, whereas those in the other separate their type.

although we do not go into further details.

One clear implication is derived from our analysis: no truthful separating equilibrium exists in this model. Moreover, only pooling equilibria can exist, i.e., equilibria in which no information at all is revealed. But for these equilibria to hold we need that the parameters (K, n, s, and b) and the beliefs of the media (that determine θ) are such that the newspapers do not always find it profitable to investigate. Otherwise, there is no equilibrium in pure strategies.

However, from the previous section, in which we have studied the media game, we know that for a given platform profile, i.e., for a given θ, the higher is the number of newspapers (whenever $b \neq 0$), the more likely to find an equilibrium in the media game in which at least one outlet investigates. In such a case, and if this occurs for every platform profile, no pooling equilibria exist. Even more, no equilibrium in pure strategies exists. Hence, we next analyze the case of mixed strategies equilibrium.

4.2 Equilibrium in mixed strategies

We consider candidates and newspapers that make stochastic decisions. The reason we do so is because for any given platform profile, and considering $b \neq 0$, an increase in the number of newspapers increases the likelihood of an equilibrium in which at least one outlet investigates. But if this occurs for every platform profile, then no equilibrium in pure strategies exists. We therefore allow candidates and newspapers to use mixed strategies, and study the features of the equilibrium that arise in such a case.

We assume $q_{\mathsf{L}} = q_{\mathsf{R}} = q$, and focus on the symmetric mixed strategies equilibrium. For the sake of simplicity, we just analyze those equilibria in which the moderate types do never propose extreme platforms. Hence, we just have to define the probability of the extreme types proposing an extreme platform, p; and the probability of the extreme types proposing a moderate platform, $1- p$.

Recall that the newspapers decide whether to investigate the politicians only after they have observed the platforms proposed by the candidates. This means that the probability of the media investigating varies, depending on the platform profile observed in equilibrium. Thus, we have to define three probabilities, which correspond to the three different situations the newspapers can face. Let us denote the probability that a newspaper investigates when it observes the profile (l, r) by z_1. Let z_2 be the probability that a newspaper investigates when the profile observed is either (l, m) or (m, r). Finally, let z_3 be the probability that a newspaper investigates when it observes the profile (m, m). Thus, $(1 - z_i)^s$ with $i \in \{1, 2, 3\}$, is the probability that no newspaper investigates in situation i, and $1 - (1 - z_i)^s$ is the probability that at least one does. We now outline the conditions that define the symmetric mixed strategies equilibrium.

Proposition 3 *In the symmetric mixed strategies equilibrium:*

(a) *Moderate types propose moderate platforms with a probability of one.*

(b) *Newspapers investigate with a probability of zero when the platform profile observed is* (l, r).

(c) *Extreme types propose extreme platforms with a probability of* p, *the newspapers investigate with a probability of* z_2 *when the platform profile observed is either* (l, m) *or* (m, r), *and with a probability of* z_3

when the profile observed is (m, m)*. The probabilities* p, z_2 *and* z_3 *are implicitly defined by the next three equations:*

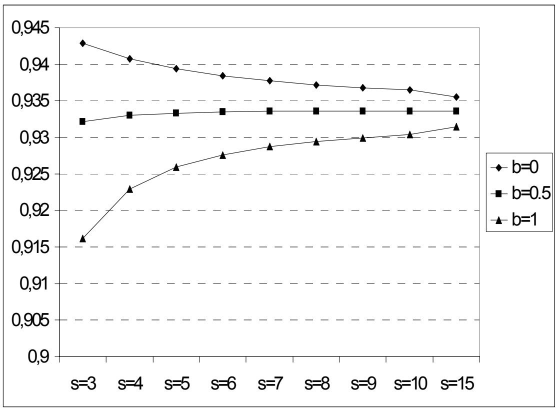
$$q\frac{1}{2}n_{\mathcal{C}} - (1-z_2)^s q n_{\mathcal{C}} - (1-z_3)^s(1-q)\frac{1}{2}n_{\mathcal{C}} = 0$$
$$\frac{q(1-p)}{1-pq}\left[nb\frac{1}{s}(1-z_2)^{s-1} - \sum_{j=0}^{s-1}\binom{s-1}{j}z_2^j(1-z_2)^{s-j-1}\frac{n}{j+1}\right] + K = 0$$
$$(1 - \frac{(1-q)^2}{(1-pq)^2})\left[nb\frac{1}{s}(1-z_3)^{s-1} - \sum_{j=0}^{s-1}\binom{s-1}{j}z_3^j(1-z_3)^{s-j-1}\frac{n}{j+1}\right] + K = 0$$

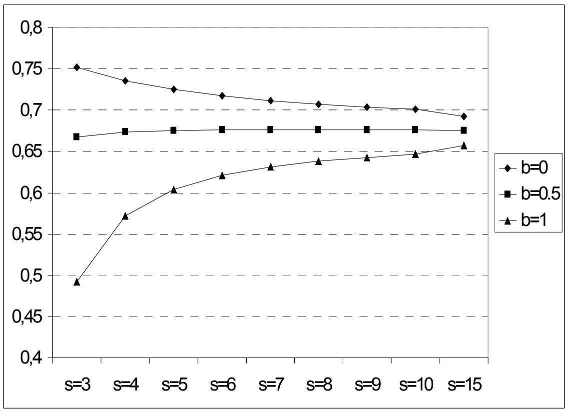
The proof is in the Appendix.

The aim of analyzing the mixed strategies equilibrium is to study whether politicians reveal more or less information as competition in the media industry becomes fiercer. However, the reader may note that this is not an easy task in this case. Hence, as we cannot procure generic expressions for the probabilities p, z_2 and z_3, and therefore cannot do a comparative static analysis, we provide some numerical simulations that give an intuition on the way the mixed strategies equilibrium goes. The data from the simulations is provided in Table 1 in the Appendix. This table presents the equilibrium values for the probabilities p, z_2 and z_3, for different values of the parameters $K, n, n_{\mathcal{C}}$ and q, and for $s \in \{3, 4, 5, 6, 7, 8, 9, 10, 15\}$. The results for the case of two newspapers are omitted, as in most of the examples considered there is no equilibrium in mixed strategies for such a case. The reason is that when $s = 2$, the range of the parameters for which an equilibrium in mixed strategies can exist is so small that, for most of the numerical examples we consider, we fall in the interval in which the newspapers have a dominant strategy, therefore do not find profitable to mix.[14]

Analyzing the data in Table 1 we observe that an increase in the cost of investigating, K, implies an increase in the probability that the extreme candidates propose the moderate platform, $1-p$; whereas a rise in the number of potential readers, n, increases the probability of the extreme candidates sending the extreme proposal, p. We are, however, specially interested in studying how the probability of sending an extreme platform, p, changes as s does. To this respect, in all the examples we have analyzed, the relationship between p and s follows the same pattern. We next present two graphs which correspond to two of the representative examples considered in Table 1, where we depict p as a function of s.

[14] However, in the example 4 ($n = 100$, $n_c = 60$, $K = 40$, $q = 0.8$) with $s = 2$, there is an equilibrium in mixed strategies in which $p = 0.7792$, $z_2 = 0.2940$ and $z_3 = 0.8857$.





Example 3: $n = 100,\ n_c = 60,\ K = 15,\ q = 0.8$ Example 4: $n = 100,\ n_c = 60,\ K = 40,\ q = 0.8$

There is one major conclusion we can derive from the analysis of the data: the incentives of politicians to reveal their types crucially depend on the readers' purchasing habits, i.e., on the value of parameter b. In particular, we observe that for any number of newspapers, when $b = 0$ the extreme candidates reveal their type with a higher probability than when $b = 1$. The reason is that the payoff of a newspaper if it does not investigate is zero when $b = 0$, whereas it may be positive if $b = 1$. Thus, for a newspaper being indifferent between investigating and not, the rents from investigating must be greater in the latter than in the former case. Therefore requiring that the candidates cheat more when $b = 1$ than when $b = 0$. However, we observe that for s sufficiently large, the probability that an extreme type proposes an extreme platform does not depend so much on the value of parameter b. This means that for a high enough number of newspapers, the readers' purchasing habits have a negligible effect on the incentives of candidates to reveal their types. The reason is that, as s increases, the payoff of a newspaper that chooses not to investigate approaches zero when $b \neq 0$, whereas it is always zero when $b = 0$. Therefore, for a high number of newspapers, the three functions that define the equilibrium do no longer depend on b, neither so the equilibrium values for p, z_2 and z_3 .

Finally, we observe that an increase in the number of newspapers do not always imply more information disclosure. More specifically, we observe that in order to identify whether newspaper competition is good or bad for information disclosure, we must carefully differentiate some cases based on the readers' purchasing habits. Thus, if the readers always buy one newspaper, independently of whether newspapers uncover new information or not, i.e., if $b = 1$, then competition is good.[15] In contrast, if the readers do not buy any newspaper unless some news are uncovered, i.e., if $b = 0$, then competition is not so desirable.[16] To see the intuition, let us first note that an increase in the number of newspapers has always the same effect on the rents derived from investigating, regardless the readers' purchasing habits, whereas it affects the rents from not investigating differently, depending on parameter b. Specifically, the rents from investigating always decrease in s. On the other hand, the rents from not investigating also

[15] As in such a case, the greater the competition among the media, the more the extreme candidates tend to propose an extreme platform, i.e., the more the candidates tend to separate their types.

[16] In such a case, more newspapers reduces the incentives of the extreme candidates to propose extreme platforms.

decrease in s if $b = 1$, but are independent of s if $b = 0$. Let us now consider that $b = 0$. In such a case, an increase in the number of newspapers affects exclusively the rents derived from investigation, which are reduced. But in equilibrium this decrease in the profitability of investigating must be compensated so that newspapers are still indifferent between investigating and not investigating. It translates into the equilibrium condition for candidates, which now have to reveal less in order to allow the newspapers to increase their rents from investigating. When $b = 1$, however, an increase in the number of newspapers reduces the no-investigation rents by more than it reduces the rents derived from investigating. This means that an increase in s makes relatively more valuable to investigate than not to investigate. But, since the equilibrium condition requires the newspapers to be indifferent between both actions, candidates now have to reveal with a higher probability.

The intuition behind our results on competition and information acquisition is very similar to the one driving to the inverted-U relationship between competition and innovation pointed out by Aghion et al. (2005). They show that competition may increase the incremental profit from innovating, but it may also reduce the postinnovation rents. More precisely, they show that when competition is low, an increase in the number of firms especially affects preinnovation rents; whereas when competition is high, it mainly affects postinnovation rents. This explains the inverted-U relationship between competition and innovation. Our results could be interpreted in similar terms, as in the model we present competition affects the incentives to acquire information differently, depending on b, which could be understood as a measure of the degree of competition in the media industry (namely, a value of b close to zero would indicate a high degree of competition, and a value of b close to one would indicate a low level of competition).

To summarize then, a rise in the number of potential readers implies an increase in the probability that the extreme candidates propose an extreme platform. On the other hand, a rise in the cost of investigating implies an increase in the probability that the extreme candidates propose the moderate platform. Additionally, and more importantly, we observe that a higher number of newspapers does not always imply more information disclosure. To this respect, our numerical simulations suggest that the readers' purchasing habits play a crucial role in the model, provided that the number of media outlets is not very large. However, if the number of outlets is large, we observe that the probability of candidates revealing their information does neither depend on the readers' purchasing habits, nor on the number of newspapers in the economy.

5 Conclusion

The main contribution of this paper is to study whether media competition favors information disclosure. To this aim, we have analyzed an election game where candidates have private information on their own types. Voters want to find out the targets of the parties, since they know that, once in office, politicians will implement their preferred policies. In such a setup, we have analyzed the incentives of newspapers to acquire costly information, and how competition in the media industry affect such incentives. We show that the larger the number of potential readers, or the lower the cost or investigating, the more the newspapers investigate. We also show that the readers' purchasing habits, i.e., whether they always buy a newspaper or just in the case some news are uncovered, play a crucial role in the model. In particular, we show that if the readers always buy a newspaper with a positive probability, media competition is good as it induces newspapers to investigate under weaker conditions. In contrast, when the readers just buy a newspaper in the case some news are uncovered, competition does not affect such incentives. We then study the game in which candidates and newspapers use pure strategies and show that only pooling equilibria can exist, i.e., equilibria in which the candidates do not make informative speeches. We also show that the only equilibria in which the newspapers investigate involve mixed strategies. We therefore analyze the mixed strategies equilibrium and observe that the readers' purchasing habits determine whether media competition is good or bad for information disclosure. More precisely, we show that whenever the readers always buy one newspaper, the greater the number of media outlets, the more the candidates tend to separate their types. On the other hand, if the readers just buy one newspaper in the case some news are uncovered, competition is not so desirable. In such a case, a higher number of newspapers neither makes more likely that an equilibrium in mixed strategies exist, nor it implies more revelation of information by candidates. We finally observe that for a large number of newspapers, the readers' purchasing habits have a negligible effect on the incentives of candidates to reveal their information.

The results in this model suggest that the study of the incentives of media to acquire costly information, as well as the effects of competition on such incentives, is crucial to understand the forces that drives politicians to reveal their private information. There is however much to do on this respect. For example, it would be interesting to introduce ideological considerations in the media setup, therefore allowing newspapers to manipulate news; or to study whether it is better to have neutral or biased media. For such setups, the analysis of the effects of competition on media behavior, and therefore on politicians' behavior, is something still unexplored that we think merits future research.

6 Appendix

Proof of Proposition 1.

Let $S_1 = \{i \in S \ / \ \Psi_i^*(\mathsf{p_L}, \mathsf{p_R})(I) > 0\}$ and $S_2 = \{i \in S \ / \ \Psi_i^*(\mathsf{p_L}, \mathsf{p_R})(NI) > 0\}$.

The payoff of a newspaper $i \in S_2$ is $nb\frac{1}{s}$ if $s_1 = 0$ and $\theta nb\frac{1}{s}$ if $s_1 \geq 1$. On the other hand, the payoff of a newspaper $i \in S_1$ is $\theta nb\frac{1}{s} + (1-\theta)n\frac{1}{s_1} - K$.

In equilibrium, neither do the newspapers in S_2 want to join S_1, nor do those in S_1 want to join S_2. That is to say,

$\theta nb\frac{1}{s} \geq \theta nb\frac{1}{s} + (1-\theta)n\frac{1}{s_1+1} - K$ when $0 < s_2 < s$,

$nb\frac{1}{s} \geq \theta nb\frac{1}{s} + (1-\theta)n - K$ when $s_2 = s$,

$\theta nb\frac{1}{s} + (1-\theta)n - K \geq nb\frac{1}{s}$ when $s_1 = 1$,

$\theta nb\frac{1}{s} + (1-\theta)n\frac{1}{s_1} - K \geq \theta nb\frac{1}{s}$ when $s_1 > 1$.

Rearranging, we have:

$\frac{(1-\theta)}{K}n - 1 \leq s_1$ if $s > s_1 \geq 1$; $\frac{(1-\theta)}{K}n \geq s_1$ if $s_1 > 1$; $\frac{(1-\theta)}{K}n \geq \frac{s}{s-b}$ if $s_1 = 1$; and $\frac{(1-\theta)}{K}n \leq \frac{s}{s-b}$ if $s_1 = 0$, and rewriting, we obtain the conditions in Proposition 1. ■

Proof of Corollary 1.

We first prove that whenever $K > (1-\theta)n(\frac{s-b}{s})$, "not to investigate" is a dominant strategy. This requires that the payoff of a newspaper that chooses the strategy "not to investigate" is always greater than its payoff if it chooses "to investigate", independently on what the other media outlets do. Mathematically, this translates into the next three conditions: $nb\frac{1}{s} > \theta nb\frac{1}{s} + (1-\theta)n - K$ and $\theta nb\frac{1}{s} > \theta nb\frac{1}{s} + (1-\theta)n\frac{1}{s_1+1} - K$ and $\theta nb\frac{1}{s} > \theta nb\frac{1}{s} + (1-\theta)n\frac{1}{s} - K$, which are the conditions for the cases $s_2 = s-1$, $0 < s_1 < s-1$ and $s_1 = s-1$ respectively. Rewriting, we obtain $K > \max\{(1-\theta)n\frac{s-b}{s}, (1-\theta)n\frac{1}{s_1+1}, (1-\theta)n\frac{1}{s}\} = (1-\theta)n\frac{s-b}{s}$ as $\frac{s-b}{s} \geq \frac{1}{2} \geq \frac{1}{s_1+1} \geq \frac{1}{s}$ given that $s \geq 2$ and $b \in [0,1]$.

We shall now show that whenever $K < (1-\theta)n\frac{1}{s}$, "to investigate" is a dominant strategy. Using an analogous argument to the one above, we obtain $K < \min\{(1-\theta)n\frac{1}{s}, (1-\theta)n\frac{1}{s_1+1}, (1-\theta)n\frac{s-b}{s}\} = (1-\theta)n\frac{1}{s}$ as $\frac{1}{s} \leq \frac{1}{s_1+1} \leq \frac{1}{2} \leq \frac{s-b}{s}$ given that $s \geq 2$ and $b \in [0,1]$.

To prove point (iii), let us rewrite the inequality $(1-\theta)n\frac{1}{s} < K < (1-\theta)n(\frac{s-b}{s})$ as $\frac{s}{s-b} < \frac{(1-\theta)}{K}n < s$. We now apply the conditions in Proposition 1, and observe that there is an equilibrium in pure strategies in which the number of newspapers investigating depends on the particular value of $\frac{(1-\theta)}{K}n$. In particular, $s_1 = 1$ if $\frac{s}{s-b} < \frac{(1-\theta)}{K}n < 2$, i.e., $s_1 = 1$ if $(1-\theta)n\frac{1}{2} < K < (1-\theta)n(\frac{s-b}{s})$; and $s_1 = \lfloor \frac{(1-\theta)}{K}n \rfloor$ if $\frac{(1-\theta)}{K}n \in (2, s] \backslash \{3, 4, ..., s\}$, i.e., $s_1 = i-1$ if $(1-\theta)n\frac{1}{i} < K < (1-\theta)n\frac{1}{i-1}$ for $i \in \{3, 4, ..., s\}$. Finally, $s_1 \in \left\{\frac{(1-\theta)}{K}n, \frac{(1-\theta)}{K}n - 1\right\}$ if $\frac{(1-\theta)}{K}n \in \{2, 3, ..., s\}$, i.e., $s_1 = \{i, i-1\}$ if $K = (1-\theta)n\frac{1}{i}$ for $i \in \{2, 3, ..., s-1\}$. ■

Proof of Proposition 2.

Before going into the proof, let us comment on the voters' beliefs we consider for situations off the equilibrium path. We will say that voters form beliefs $x_{\mathsf{j}} \in [0,1]$, with $\mathsf{j} \in \{\mathsf{L}, \mathsf{R}\}$, whenever no investigation is done,[17] and will assume that voters trust the media whenever they investigate.[18] The reason for this assumption, which we call TM, is that in our model newspapers do not lie whereas politicians might well do.

(i) Let us consider a hypothetical equilibrium where $K < (1-\theta)n\left(\frac{s-b}{s}\right)$ for every platform profile. Given the strategies of the newspapers, the voters' beliefs are $\gamma_j^*(E \mid p_j, p_k, (\mathsf{m}_i^j = e, \mathsf{m}_i^k)) = 1$, $\gamma_j^*(M \mid p_j, p_k, (\mathsf{m}_i^j = m, \mathsf{m}_i^k)) = 1$.[19] Note that for some of the cases we use the assumption TM. Given these beliefs, the extreme candidates always prefer to reveal their types rather than cheat. This is because the payoff of the extreme candidate j, when he reveals, is either $q_k(n_j + n_{\mathcal{C}}) + (1-q_k)n_j$ if $\Upsilon_k^*(E) = m$, or $q_k(n_j + \frac{1}{2}n_{\mathcal{C}}) + (1-q_k)n_j$ if $\Upsilon_k^*(E) = e$; whereas his payoff, if he cheats, is either $q_k(n_j + \frac{1}{2}n_{\mathcal{C}}) + (1-q_k)n_j$ if $\Upsilon_k^*(E) = m$, or $q_k n_j + (1-q_k)n_j$ if $\Upsilon_k^*(E) = e$. Thus, the extreme candidates prefer to be truthful.[20] Using analogous arguments we prove that the moderate candidates also prefer to reveal. But if the candidates truthfully separate their types, then $\theta = 1$, and therefore $K \not< (1-\theta)n\left(\frac{s-b}{s}\right)$, which contradicts the initial assumption. There is therefore no equilibrium in which the candidates use pure strategies and the newspapers investigate for every platform profile.

(ii) Let us consider a hypothetical equilibrium in which at least one candidate separates and the newspapers never investigate. Here, voters' beliefs coincide with those of the newspapers for the messages that in equilibrium are sent with positive probability. This includes the beliefs on the candidate that separates. Hence, the extreme candidate who separates has an incentive to deviate and mimic the platform proposed by the moderate candidate of his party. This is so as the use of his equilibrium platform is a signal of his type (extreme); likewise, the use of the platform proposed by the moderate type is a signal of his being a moderate. There is therefore no equilibrium in which at least one candidate separates and the newspapers do not investigate for every platform profile.

(iii) Let us now consider a hypothetical equilibrium in which $(1-\theta)n\left(\frac{s-b}{s}\right) < K$ for every platform profile. Let us suppose that candidates in L pool at a generic platform $\widehat{p}_{\mathsf{L}}$, and candidates in R do so at $\widehat{p}_{\mathsf{R}}$. Voters' beliefs coincide with those of the newspapers for the messages $\widehat{p}_{\mathsf{L}}$, $\widehat{p}_{\mathsf{R}}$, i.e., those that in equilibrium are sent with positive probability. For any other message off the equilibrium path, $\overline{p}_{\mathsf{L}}$, $\overline{p}_{\mathsf{R}}$, voters' beliefs on candidate j are $\{\gamma_j^*(t \mid \overline{p}_j, p_k, (\mathsf{m}^j = \overline{p}_j, \mathsf{m}^k)\}_{t \in T_j}$, which we denote as x_j, for $j \in \{\mathsf{L}, \mathsf{R}\}$, for the sake of simplicity. The payoff of candidate j in playing $\widehat{p}_j$ is either n_j if $q_j > q_k$; $n_j + \frac{1}{2}n_C$ if $q_{\mathsf{L}} = q_{\mathsf{R}} = q$; or $n_j + n_C$ if $q_j < q_k$, for $j \in \{\mathsf{L}, \mathsf{R}\}$. For an equilibrium to hold, candidates must not gain from a deviation. This means that voters' beliefs off the equilibrium path must satisfy: $x_{\mathsf{L}} > q_{\mathsf{R}}$ if $q_{\mathsf{L}} > q_{\mathsf{R}}$; $x_{\mathsf{R}} > q_{\mathsf{L}}$ if $q_{\mathsf{R}} > q_{\mathsf{L}}$; or $\min\{x_{\mathsf{L}}, x_{\mathsf{R}}\} \geq q$, if $q_{\mathsf{L}} = q_{\mathsf{R}} = q$. The reader can easily verify that such restrictions do not contradict $(1-\theta)n\left(\frac{s-b}{s}\right) < K$, and the newspapers are therefore not interested in deviating. Thus,

[17] Where $x_{\mathsf{L}} \in [0,1]$ (resp. x_{R}) is the belief voters assign to candidate L (resp. R) L being (resp. R) off the equilibrium path, when no newspaper investigates.

[18] Specifically, we just need the voters to trust in the media more than in the candidates.

[19] Where subindex i refers to any of the newspapers in the case the politicians have told the truth (hence all newspapers publish the same information, regardless of whether they have investigated or not); and to those newspapers investigating in the case they uncovered some news.

[20] We use LP.

there are equilibria in which the candidates pool and the newspapers do never investigate.[21] ■

Proof of Proposition 3.

Let us consider a symmetric mixed strategies equilibrium defined by the strategies:

$$\begin{array}{ll} \Upsilon_{\mathsf{L}}(L)(l) = p \in [0,1] & \Upsilon_{\mathsf{L}}(M)(m) = 1 \\ \Upsilon_{\mathsf{R}}(R)(r) = p \in [0,1] & \Upsilon_{\mathsf{R}}(M)(m) = 1 \end{array}$$

$$\begin{aligned} &\Psi_i(l,r)(I) = z_1 \in [0,1] \ \forall i \in \mathcal{S} \\ &\Psi_i(l,m)(I) = \Psi_i(m,r)(I) = z_2 \in [0,1] \ \forall i \in \mathcal{S} \\ &\Psi_i(m,m)(I) = z_3 \in [0,1] \ \forall i \in \mathcal{S}. \end{aligned}$$

The newspaper's beliefs must be consistent in equilibrium. That is to say:

$$\begin{array}{ll} \mu^*_{\mathsf{L}}(L \mid l) = 1 & \mu^*_{\mathsf{R}}(R \mid r) = 1 \\ \mu^*_{\mathsf{L}}(M \mid m) = \frac{1-q}{1-pq} & \mu^*_{\mathsf{R}}(M \mid m) = \frac{1-q}{1-pq}. \end{array}$$

Let us denote by θ the probability that both candidates are truthful in equilibrium, and recall that θ may be different in each subgame.

We now obtain the expected payoff of a newspaper that chooses not to investigate:

$$\theta nb\frac{1}{s} + (1-\theta)nb\frac{1}{s}(1-z_i)^{s-1}$$

and its payoff if it chooses to investigate:

$$\theta nb\frac{1}{s} + (1-\theta)\sum_{j=0}^{s-1}\binom{s-1}{j} z_i^j (1-z_i)^{s-j-1}\frac{n}{j+1} - K$$

Both expected payoffs must be equal in equilibrium. Thus, we obtain three equations that implicitly define the probabilities z_1, z_2 and z_3. With respect to z_1, we know that it is zero in equilibrium. This is so because the moderate candidates do never propose the extreme platforms, and therefore there is no point for newspapers to investigate when they observe the profile (l, r). With respect to z_2 and z_3, we give the equations that implicitly define these two probabilities.

$$(\frac{q(1-p)}{1-pq})\left[nb\frac{1}{s}(1-z_2)^{s-1} - \sum_{j=0}^{s-1}\binom{s-1}{j} z_2^j (1-z_2)^{s-j-1}\frac{n}{j+1}\right] + K = 0 \qquad (1)$$

$$(1-\frac{(1-q)^2}{(1-pq)^2})\left[nb\frac{1}{s}(1-z_3)^{s-1} - \sum_{j=0}^{s-1}\binom{s-1}{j} z_3^j (1-z_3)^{s-j-1}\frac{n}{j+1}\right] + K = 0. \qquad (2)$$

[21] In these equilibria there is always one type for each candidate that is cheating, even though they do not gain any additional votes from this sort of behavior. Hence, we could argue that such candidates would prefer to deviate from their cheating behavior and be truthful instead, because their payoffs would not change anyway. If this is the case, the only equilibria that exist are those satisfying $q_{\mathsf{L}} = q_{\mathsf{R}} = q < \min\{x_{\mathsf{L}}, x_{\mathsf{R}}\}$.

Once the newspapers have reported their messages, the voters update their beliefs. They are:

$\gamma_j^*(E \mid e, \cdot, (\cdot, \cdot)) = \mu_j^*(E \mid e) = 1$ for $j \in \{\mathsf{L}, \mathsf{R}\}$
$\gamma_j^*(M \mid m, \cdot, (e, \cdot)) = 0$ for $j \in \{\mathsf{L}, \mathsf{R}\}$
$\gamma_j^*(M \mid m, m, (m, e)) = 1$ for $j \in \{\mathsf{L}, \mathsf{R}\}$
$\gamma_j^*(M \mid m, e, (m, e)) = \frac{q\ p(1-q)}{q\ p(1-q)+q^2\ p(1-p)(1-z_2)^s}$ for $j \in \{\mathsf{L}, \mathsf{R}\}$
$\gamma_j^*(M \mid m, m, (m, m)) = \frac{(1-q)[(1-q)+q(1-p)(1-z_3)^s]}{(1-q)[(1-q)+q(1-p)(1-z_3)^s]+q(1-p)[(1-q)(1-z_3)^s+q(1-p)(1-z_3)^s]}$ for $j \in \{\mathsf{L}, \mathsf{R}\}$.

The extreme candidates take into account the voters' beliefs and the probability that the newspapers investigate, which is different for each platform profile. They then obtain the probability p, such that their expected payoff by proposing the extreme platform is the same than their expected payoff by proposing the moderate one. This give us the third equation:

$$q\frac{1}{2}n_{\mathcal{C}} - (1-z_2)^s q n_{\mathcal{C}} - (1-z_3)^s (1-q)\frac{1}{2}n_{\mathcal{C}} = 0 \tag{3}$$

which implicitly define, together with (1) and (2), the probabilities p, z_2 and z_3.

Finally, we check that the moderate candidates do not want to deviate from proposing a moderate platform. This turns out to be true as the payoff of moderate candidate j is $qp\,(n_j + n_{\mathcal{C}}) + q(1-p)[(1-z_3)^s(n_j + \frac{1}{2}n_{\mathcal{C}}) + (1-(1-z_3)^s)(n_j + n_{\mathcal{C}})] + (1-q)(n_j + \frac{1}{2}n_{\mathcal{C}})$ by proposing m, whereas it is $qp\left(n_j + \frac{1}{2}n_{\mathcal{C}}\right) + q(1-p)[(1-z_2)^s n_j + (1-(1-z_2)^s)(n_j + n_{\mathcal{C}})] + (1-q)n_j$ by proposing e.

■

Table 1: Mixed strategies equilibrium for different number of newspapers.

		s=3			s=4			s=5			s=6			s=7			s=8			s=9			s=10			s=15		
		p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3	p	z_2	z_3
n=100, n_c=60, k=15, q=0.3	b=0	0.4605	0.2168	0.7434	0.4308	0.1765	0.5692	0.4105	0.1486	0.4617	0.3958	0.1281	0.3886	0.3847	0.1126	0.3356	0.3762	0.1003	0.2953	0.3693	0.0904	0.2637	0.3637	0.0823	0.2383	0.3462	0.0568	0.1607
	b=0.5	0.3650	0.2090	0.8356	0.3644	0.1705	0.6111	0.3591	0.1446	0.4854	0.3537	0.1253	0.4038	0.3491	0.1105	0.3462	0.3452	0.0987	0.3031	0.3420	0.0892	0.2697	0.3392	0.0813	0.2430	0.3300	0.0563	0.1626
	b=1	0.2185	0.2063	0.9745	0.2755	0.1648	0.6714	0.2954	0.1403	0.5170	0.3039	0.1223	0.4230	0.3081	0.1083	0.3590	0.3104	0.0971	0.3123	0.3116	0.0879	0.2766	0.3123	0.0803	0.2483	0.3129	0.0559	0.1647
n=120, n_c=60, k=15, q=0.3	b=0	0.5680	0.2152	0.7570	0.5457	0.1747	0.5801	0.5304	0.1470	0.4708	0.5194	0.1267	0.3963	0.5111	0.1112	0.3423	0.5047	0.0991	0.3013	0.4996	0.0893	0.2691	0.4954	0.0813	0.2431	0.4824	0.0560	0.1640
	b=0.5	0.4943	0.2081	0.8549	0.4946	0.1689	0.6252	0.4910	0.1430	0.4964	0.4873	0.1238	0.4129	0.4840	0.1091	0.3539	0.4812	0.0975	0.3098	0.4788	0.0881	0.2756	0.4768	0.0803	0.2483	0.4702	0.0556	0.1662
	b=1	0.3832	0.2062	0.9984	0.4269	0.1636	0.6897	0.4425	0.1389	0.5305	0.4494	0.1209	0.4336	0.4528	0.1069	0.3678	0.4547	0.0958	0.3198	0.4558	0.0867	0.2831	0.4564	0.0792	0.2541	0.4572	0.0551	0.1685
n=100, n_c=60, k=15, q=0.8	b=0	0.9429	0.2075	0.7356	0.9407	0.1611	0.5545	0.9394	0.1317	0.4446	0.9384	0.1114	0.3710	0.9377	0.0965	0.3183	0.9372	0.0851	0.2787	0.9368	0.0761	0.2479	0.9365	0.0688	0.2232	0.9355	0.0465	0.1490
	b=0.5	0.9321	0.2066	0.8338	0.9330	0.1604	0.6020	0.9333	0.1312	0.4724	0.93350	0.1110	0.3892	0.93356	0.0962	0.3311	0.93359	0.0848	0.2882	0.93360	0.0759	0.2553	0.93361	0.0687	0.2291	0.9336	0.0465	0.1515
	b=1	0.9162	0.2063	0.9745	0.9229	0.1597	0.6674	0.9259	0.1307	0.5081	0.9276	0.1106	0.4116	0.9287	0.0959	0.3464	0.9294	0.0846	0.2993	0.9299	0.0757	0.2637	0.9304	0.0685	0.2356	0.9315	0.0464	0.1541
n=100, n_c=60, k=40, q=0.8	b=0	0.7521	0.2113	0.5755	0.7359	0.1649	0.4250	0.7252	0.1350	0.3370	0.7175	0.1143	0.2792	0.7118	0.0991	0.2384	0.7074	0.0875	0.2080	0.7039	0.0783	0.1845	0.7010	0.0708	0.1658	0.6921	0.0479	0.1099
	b=0.5	0.6671	0.2103	0.6067	0.6735	0.1644	0.4364	0.6755	0.1348	0.3425	0.6762	0.1142	0.2823	0.67646	0.0990	0.2403	0.67644	0.0874	0.2093	0.6763	0.0782	0.1854	0.6762	0.0708	0.1664	0.6755	0.0479	0.1102
	b=1	0.4923	0.2090	0.6533	0.5722	0.1639	0.4502	0.6039	0.1346	0.3485	0.6207	0.1141	0.2856	0.6310	0.0989	0.2423	0.6380	0.0873	0.2106	0.6430	0.0782	0.1863	0.6467	0.0707	0.1671	0.6569	0.0479	0.1104
n=120, n_c=60, k=15, q=0.8	b=0	0.9541	0.2073	0.7502	0.9525	0.1609	0.5665	0.9514	0.1315	0.4546	0.9507	0.1112	0.3796	0.9502	0.0963	0.3258	0.9498	0.0849	0.2854	0.9495	0.0759	0.2539	0.9492	0.0687	0.2286	0.9485	0.0464	0.1527
	b=0.5	0.9459	0.2065	0.8536	0.9466	0.1602	0.6170	0.9468	0.1310	0.4843	0.9469	0.1108	0.3991	0.94701	0.0960	0.3396	0.94704	0.0847	0.2956	0.94705	0.0758	0.2618	0.94705	0.0685	0.2349	0.94703	0.0464	0.1554
	b=1	0.9339	0.2062	0.9984	0.9389	0.1596	0.6864	0.9412	0.1305	0.5226	0.9424	0.1104	0.4231	0.9433	0.0957	0.3560	0.9438	0.0845	0.3076	0.9442	0.0756	0.2709	0.9446	0.0684	0.2421	0.9454	0.0463	0.1583

Note: *p* is the probability of an extreme type proposing an extreme platform; z_2 is the probability that a newspaper investigates when it observes the profile *(l,m)* or *(m,r)*; and z_3 is the probability that a newspaper investigates when it observes the profile *(m,m)*.

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