Media and Policy[†]

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Abstract

We identify a mechanism through which media concentration reduces political polarization and media competition (via specialization) increases polarization. This mechanism may help explain the patterns of US Congressional polarization. To avoid offending potential customers, a concentrated media seldom makes clear-cut endorsements and, as a result, provides little information. This leads to the convergence of party policy positions. Under competition, media companies specialize to a narrow ideological spectrum and, as a result, can offer strong endorsements without risk of offending customers. This leads to the divergence of party's policy positions; that is, political polarization.

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1. Introduction

McCarty, Poole and Rosenthal (2006) offer extensive data on Representatives' and Senators' political positions in Congress from 1879 to 2003. For the House of Representatives, they conclude that the distance between the median Democratic position and the median Republican position on a liberal-conservative scale has diminished from 1879 until 1935, remained more or less constant between 1935 and 1970, and grown from 1970 until 2003. Polarization in the Senate follows a similar U-shaped pattern.[1] Their main conclusions are as follows: (i) "Polarization in the House and Senate is now at the highest level since the end of Reconstruction."[2] (ii) Gerrymandering cannot explain polarization since it also occurs in the Senate. (iii) The South becoming Republican cannot explain polarization since it also occurs in the North. (iv) Polarization among voters, at least those voters that identify with a party, has also increased but the overall increase in polarization among voters is less than the increase in polarization among Members of Congress.

These findings motivate our analysis. More specifically, our goal is to present a model that yields variation in polarization among elected officials without any changes in election rules or voter preferences. In our model, changes in the extent of media competition affects polarization. Media competition alters voters' level of information and thereby influences their behavior, policy platforms and, ultimately, polarization.

We consider a setting in which citizens observe the parties' policy choices but do not fully understand the relevant background. As a result, citizens do not know which party's position is closest to their own. This information imperfection creates a role for media (henceforth we identify "media" and "newspapers"). Newspapers observe and analyze the relevant background variables and convey their conclusions to their readers: they either support one of the parties or they express no opinion.

[1] To identify polarization, McCarty, Poole and Rosenthal estimate a model in which issues (individual roll call items) and politicians (members of the House and the Senate) are points on a line segment. Each politician's location plus the location of the issue and an idiosyncratic noise term determine how the politician votes. The model simultaneously estimates the locations of the politicians, the location of the issues and whether or not a nay vote is the left-wing choice. Then, they compare the median Republican and the median Democratic position as well as the distribution of positions across the two parties. McCarty, Poole and Rosenthal (2006) provide a much more detailed analysis of the patterns in the House of Representatives and in the Senate than our crude summary which is motivated by our desire to identify polarization with single variable.

[2] Cited from: Keith Poole, http://voteview.com/polarizedamerica.asp#MPRBOOK.

Citizens in our model either cannot process raw information or choose not to do so. Instead, they summarize and interpret the newspaper's comments on party platforms as *approval, disapproval* or *neutrality* and use their understanding of the media outlet's endorsement strategy to relate these endorsements to their own preferences. Within their limitations, citizens process information correctly. That is, they understand that an endorsement from a media outlet that favors a particular party is a weaker signal than an endorsement from a media outlet that favors the opposing party.

When voters choose media outlets, they seek media that agree with their views. Thus, voters do not seek information but *agreement*. This, however, does not mean that voters prefer to remain uninformed. Ideally, a voter would choose a media outlet that matches her *ex post* view of parties. If such a media outlet is not available, the voter chooses one that she finds least offensive, that is, least contradicting her ex post ranking.

Our main result shows that a media monopoly leads to policy convergence while media competition leads to polarization. The mechanism that generates this result is as follows: first, parties have political preferences. That is, politicians derive utility from the implemented policies.[3] Democratic candidates prefer policies on the left end of the spectrum ($p_i < 0$) while Republicans prefer policies on the right ($p_i > 0$). Citizens observe the parties' policy choices but are uncertain about a state variable that affects their utility. As a result, citizens do not know which party's position is closest to their own.

Newspapers observe the state and may use this information to endorse either the Republicans, the Democrats or no one. The information that the media provides affects the outcome of the election and hence the parties' incentives as they choose policies. If the median voter is uninformed, the model is Downsian. The median voter chooses the party that is closest to her ex ante ideal point in every state and any departure from the median voter's ideal point ensures an election loss for the departing party.

If the median voter is informed, the parties' tradeoff between win-probability and policy choice is less stark. To see this, note that even if the Republican party is at the ex ante median ideal point, the Democratic party can afford to choose a slightly left-wing platform since in some states the median voter will prefer such a policy. Hence, moving

[3] For simplicity, we assume that parties have derive no benefits from holding office. However, this assumption is not essential and could be relaxed.

away from the ex ante median ideal point does not reduce the Democratic party's chance of winning the election to zero. As Wittman (1973) observers, in equilibrium, this less steep tradeoff causes both parties to move away from the ex ante median ideal point. Hence, party platforms are more polarized when voters are better informed.

The final step of the intuition behind our result requires understanding how media monopoly leads to an uninformed electorate while competitive media and the resulting array of specialized (i.e., biased) media outlets results in an informed electorate. The difficulty for the monopolist is that *any* endorsement strategy will be offensive to some voters. For example, if the endorsement policy mimics the preferences of the median voter, then it will offend (left and right) partisans. If the endorsement policy is slanted to the left or to the right, then the partisans on the other side will take offense. In each case, the monopoly media loses customers in exchange for providing better information to some fraction of the electorate. Our key assumption is that readers derive greater utility from a neutral newspaper than from a newspaper that gets it right only half of the time. This assumption implies that a monopoly newspaper can extract the maximal surplus by remaining neutral. Thus, refraining from endorsing either candidate is the optimal policy for the monopoly media. As a result, voters get no information and the party competition model is Downsian.

As the media market becomes more competitive, specialized media outlets that cater to relatively small market segments emerge. Since the range of ideal points among each newspaper's readers is small, most of the time, each newspaper can (and will) make a recommendation that will be approved by its entire readership. Therefore, such outlets provide just the right endorsement for all of their readers.

In our model, media competition leads to ideological differentiation among media outlets. This differentiation enables each voter to acquire just the information that is relevant for her. Citizens select media sources that match their ideological bias and, as a result, obtain a signal that is tailored to that bias. Thus, the ideological bias of media sources offsets voters' limited information processing capacity and yields effectively well-informed electorates. Of course, this does not mean that individual voters are well informed, rather, that the electorate as a whole behaves similar to an electorate consisting of well informed voters.

Gentzkow, Glaeser and Goldin's (2004) empirical strategy and the theoretical model of Bernhardt, Krasa and Polborn (2008) reveal an altenative view of media bias: these authors treat media as a source of raw information and equate media partisanship or media bias with information censoring. Hence, they assume that media can convey all information to voters but chooses not to do so because of its own political preferences or because it wishes to pander to its readers' expectations.

Gentzkow, et al argue that US media became more informative between 1870 and 1920. They identify partisan language, explicit and implicit party affiliation with bias and equate bias with newspapers being less informative. Similarly, Bernhardt, Krasa and Polborn (2008) interpret recent evidence of media bias as support for their main assumption that media withholds unfavorable information about its preferred party. Media consumers in their model prefer newspapers that withhold unfavorable information about the party they support. But the media's catering to this preference is socially costly since voters become less informed and elections are less efficient because of the media bias.

While Mullainathan and Shleifer (2005) do not analyze voting, their model examines media outlets who confront the same trade-off between catering to the readers' ideology and providing them with better information. In Baron (2004) media bias arises from the conflict between journalists short-term and long-term interests and leads to less informative (and low price) newspapers. Hence, implicitly or explicitly, all these authors view bias as inefficiency caused either by the conflict between readers' and newspapers' (or journalists') preferences or by voters' conflicting needs for information and political affirmation.

The majority of the papers on media and bias model media outlets as strategic information transmitting agents. Hence, they are like the sender in Crawford and Sobel's (1982) celebrated model of information transmission. In these models, the media outlets have more information than its readers and different incentives so that revealing all information is not optimal. The most significant difference between the Crawford-Sobel receiver and the readers in these media models is that unlike Crawford and Sobel's receiver, readers have preferences over what information they receive even if the physical consequences of this information is small. However, these preferences only influence readers' decisions regarding which (if any) newspaper to buy not what they do with the information once they get it. To put it differently, these models postulate an exogenous desire for (specific) information but are otherwise standard information economics models. Examples of such media models include Baron (2004), Bernhardt, Krasa and Polborn (2008), Chan and Suen (2008) and the current paper.

In contrast, Campante and Hojman (2009) offer a *persuasion* model of the media. In their formulation, the media's effect on citizens is more direct: if the media says "right" the reader moves to the right. The Compante and Hojman model is not a learning model; there is no true state. In their model, like in our model, the variety (of media outlets) generates polarization but through a mechanism that differs from ours: Their model is not Downsian so that the the distribution of voter preferences (and not just the median preference) influences political outcomes (equilibrium party platforms). Increasing the variety of media outlets has a direct effect on the distribution of voter preferences which in turn affects political outcomes.

In Chan and Suen's (2008) formulation, as in ours, voters' information processing ability is limited. However, their voters choose media outlets to maximize the value of their information given this limited processing ability. When the media market is competitive, their model also yields a segmented market. The difference between our model and their's becomes evident when there is a media monopoly (or limited media competition): In Chan and Suen's model, media, competitive or not, must provide useful information to attract customers. Therefore, their model cannot relate media polarization to media competition.

1.1 Evidence and its Relation to Our Model

The McCarty, Poole and Rosenthal (2006) findings that establish a U-shaped path for political polarization in Congress between 1879 and 2003 motivate our analysis. Our goal is to identify exogenous changes and a mechanism through which these changes could yield this particular path. We have chosen media specialization as our exogenous variable and the level of information that media specialization generates as the mechanism. Evidence of media specialization and its effect on voter information, comparable to what McCarty, Poole and Rosenthal provide for polarization is unavailable.

Measuring media competition and empirically relating this competition to specialization and informativeness is difficult. At least part of this difficulty stems from the difficulty of measuring how the media affect voters' level of information. Here, we will try to identify some factors that might have lead to a pattern of specialization that mimic the U-shaped pattern that McCarty, Poole and Rosenthal identify for polarization. A proper empirical analysis of media specialization and its effect on the information level of the median voter is beyond the scope of the current paper.

In the 1920's, radio emerged as a source of information. By 1931, a majority of American households and by 1950 more than 95% of households were equipped with radios.[4] In their empirical analysis, Campante and Hojman (2009) identify the period from the mid-1930s until 1950 as the period of networkization of radio stations and cite evidence indicating that this networkization led to less content variety. Their notion of less content variety agrees with our notion of less specialization: networkization yielded three more or less identical and neutral media outlets. Similarly, Campante and Hojman identify the 1950s with the advent of television and continued lack of variety. Thus, identifying variety with specialization would enable our model to explain the persistently low levels of polarization that McCarty, Poole and Rosenthal find between 1935 and 1970.

To partially explain the subsequent increase in polarization, we may interpret the targeted information campaigns such as direct mailing and church newsletters of the "moral majority," and the Christian Coalition since the 1980s as an increase in specialization. Similarly, the advent of talk radio, cable news, and online media means that the current level of media specialization is much greater than what Gerbner, Gross, Morgan and Signorielli (1980) called "The 'Mainstreaming' of America." However, identifying new media sources to match the increased polarization between 1970 and 1980 seems more difficult.

Gentzkow, Glaeser and Goldin (2004) offer a different view of media's informativeness. Their hypothesis is that less partisan media are more informative and, based on this hypothesis, they identify the period between 1870 and 1920 with "the rise of the informative media." Gentzkow, Glaeser and Goldin measure media bias with the use of "charged language," that is, the frequency of words such as "slander, liar, villainous, honest, honorable, and irreproachable" and conclude that the media was much less biased in 1920 than it was in 1870. Thus, Gentzkow, Glaeser and Goldin perceive the role of the media as disciplining

[4] Craig (2004).

the political parties and conclude that a less partisan media would be better suited for that role.[5]

Gentzkow, Glaeser and Goldin like Mullainathan and Shleifer (2005) interpret slant as a specific variety of a differentiated good along a spectrum in which 0 is neutral (i.e. truth), negative values denote left-wing slant and positive values denote right-wing slant. The media's cost and voters' preferences may not be aligned so that ceteris paribus the media may be better off selling slant while the voter may prefer consuming truth. In the Gentzkow et. al. formulation, the media outlet locates itself on this spectrum with its choice of language: charged words favoring Democrats and criticizing Republicans indicates a left position, charged words favoring Republicans and criticizing Democrats indicates a left position indicates a right position, neutral language means truth and indicates informativeness.

Note, however, one important difference between information and other differentiated commodities: to measure what information is being conveyed, it is not enough to observe the actual transaction; we need to know what would have happened had the facts been different. Thus, media can be truthful (and balanced) without conveying much information. Neutral words are not informative if roughly the same words are used in every state of the world. Conversely, using slightly less charged words might be very informative for a partisan reader of a biased newspaper who usually reads much stronger endorsements of his side.

In our model, a monopoly media outlet indeed chooses a neutral position. It does so to avoid offending the sensibilities of a wide range of potential readers and, in doing so, becomes uninformative. In contrast, media competition leads to differentiated media outlets with positions slanted to the left or to the right. These biased media outlets attract similarly biased readers and, therefore, can often reveal information without offending any of its readers.

[5] The paper ends with the sentence "'It seems a reasonable hypothesis that the rise of the informative press was one of the reasons why the corruption of the Gilded Age was reduced during the subsequent Progressive Era."

2. Platform Competition under Monopoly Media

In this section, we introduce the model with a monopoly media company. The model has one media outlet, two parties and a continuum of citizens. The main result of this section shows that a monopoly media remains *neutral* and thereby limits the degree of polarization. When the media is the only source of information, neutrality completely eliminates political polarization (Proposition 1); when citizens have access to independent sources of information, media neutrality mitigates polarization (Proposition 2). Throughout, we use capital letters for random variables and the corresponding lower case letters for particular realizations.[6]

Citizens are voters and potential consumers of the media product. As voters, they have single-peaked preferences with ideal points equal to the sum of a *political disposition* $t \in I = [-1, 1]$ and a random state of the world S distributed uniformly on the interval $\Omega = [-1/2, 1/2]$. A citizen's political disposition is the persistent and citizen-specific component of his preference while the state reflects the impact of current conditions on all citizens' preferences. A lower t means that the citizen is relatively more predisposed towards the Democratic Party while a lower realized state means that the current political and economic conditions favor the Democratic party relatively more. Political dispositions are uniformly distributed on I and hence the total mass of citizens is 2.

Parties are indexed by $i \in J = \{-1, 1\}$ where -1 denotes the Democratic party and 1 denotes the Republican party. Party i chooses a policy platform $p_i \in \Omega$. Let

$$p = (p_{-1}, p_1)$$
$$\bar{p} = \frac{p_{-1} + p_1}{2}$$

we call p the *policy profile* and $\bar{p}$ the *average policy.*

For any platform $x \in \Omega$, define the random variable

$$\Delta_{tx} = S + t - x \tag{1}$$

We say that citizen t is left-leaning (given policy x in state s) if $\Delta_{tx} < 0$. Conversely, citizen t is right-leaning (given policy x in state s) if $\Delta_{tx} > 0$. The random variable

[6] We identify constant random variables with corresponding constants and we identify two random variables X_1, X_2 whenever $X_1 - X_2 = 0$ with probability 1.

$|\Delta_{tx}|$ measures citizen t's *disaffection* with x, i.e., the distance between t's ideal point and the (generic) policy x. Citizens prefer policies that lower disaffection, favor parties that propose such policies and like editorials (media products) that endorse those parties.

We make frequent use of the following notation: for any real number x

$$\langle x \rangle := \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ -1 & \text{if } x < 0 \end{cases}$$

The random variable V_{tp} describes t's preferred party; it takes on the values 1 if t prefers the Republican party, -1 if t prefers the Democratic party and 0 if t is indifferent between the two parties. If parties choose distinct policies, then t prefers the party whose policy is less disaffecting. If parties choose identical policies, then t prefers the Democratic party if he is left-leaning at $\bar{p} = p_1 = p_{-1}$ (i.e., $\Delta_{t\bar{p}} < 0$) and prefers the Republican party if he is right-leaning at $\bar{p}$ (i.e., $\Delta_{t\bar{p}} > 0$). That is, t prefers party V_{tp} where

$$V_{tp} = \begin{cases} \big\langle |\Delta_{tp_{-1}}| - |\Delta_{tp_1}| \big\rangle & \text{if } p_{-1} \neq p_1 \\ \langle \Delta_{t\bar{p}} \rangle & \text{if } p_{-1} = p_1 \end{cases} \tag{2}$$

and $V_{tp} = 0$ means t is indifferent between the two parties. The expected value of V_{tp} determines t's behavior when he does not know the state. Equation (2) implies that

$$V_{tp} = \langle \Delta_{t\bar{p}} \rangle \tag{2$'$}$$

whenever $p_{-1} \leq p_1$ which, given the parties' political preferences, will be the case in any equilibrium of our model.

The *media* has zero costs and chooses an endorsement plan M and a price q to maximize revenue. We interpret the media's news reporting as a part of this endorsement plan. Laws and conventions regarding impartial news reporting may constrain news reporting but slant is very much a part of the media strategy. The media company commits to an M before the state is realized but after parties have chosen their policies.[7] This timing reflects our assumption that media companies set editorial guidelines and hire the staff to

[7] This sequencing is used to establish existence in the game with media competition. Propositions 1 and 2 would be unchanged if we reversed the sequence or assumed that media and parties moved simultaneously.

implement these guidelines. They can change editorial policies in response to policy shifts but not to short term changes in the environment.

After the state is realized, the endorsement plan M picks either the Democratic party ($m = -1$) or the Republican party ($m = 1$) or remains neutral ($m = 0$). Hence, the endorsement plan is a random variable, $M : \Omega \to J \cup \{0\}$. A *monotone* plan M endorses party i in state s only if it endorses i in all states that are more favorable for i than s. Let $z = (z_{-1}, z_1) \in Z = \{(x, y) \in [-1/2, 1/2]^2 \mid x \leq y\}$. For any $z \in Z$, let

$$M_z(s) = \begin{cases} i & \text{if } i(s - z_i) > 0 \\ 0 & \text{otherwise} \end{cases}$$

If $p_1 \geq p_{-1}$ then a monotone plan satisfies $M = M_z$ for some $z \in Z$. If $p_1 < p_{-1}$ then parties switch roles and a monotone plan satisfies $M = -M_z$ for some $z \in Z$. Henceforth, we will restrict attention to monotone plans and identify such plans with the corresponding z. This restriction entails no loss of generality since all of our results hold without it.[8]

Citizen like endorsements that match their own judgements; that is, in each state, a citizen would like the media to endorse his favored party. For simplicity, we assume that the endorsement policy increases the citizen's utility by 1 if it conforms to his view, decreases his utility by $\beta > 1$ if it contradicts his view and leaves his utility unchanged if it hedges. The assumption $\beta > 1$ implies that citizens prefer a plan that hedges to one that always endorses a party but conforms to his view only half of the time. This assumption is important for our results.

At the time the citizen decides whether or not to buy the media product, the state is unknown and hence the utility from the endorsement is a random variable. Citizens know the media's policy and, therefore, can determine its expected utility. In addition, consuming the media yields a fixed and endorsement-independent utility α. The citizen consumes the media product if the expected utility from media consumption exceeds its price. For any real numbers x, β, we let

$$\langle x \rangle^\beta = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ -\beta & \text{otherwise.} \end{cases}$$

[8] More specifically, the argument in Lemma 1 ensures that an optimal endorsement strategy for a monopoly media outlet must be monotone. This implies that Propositions 1-3 hold even without the restriction to monotone strategies. Proposition 4 establishes the existence of an equilibrium in monotone strategies which, in particular, ensures existence in arbitrary strategies. Finally, Proposition 5 is also easy to extend to arbitrary equilibria.

We continue to write $\langle x \rangle$ instead of $\langle x \rangle^1$. We write $a = (p, z, q)$ for a policy pair p, endorsement plan z and price q. Given a, the random variable R_{ta} is the *readership utility* for citizen t:

$$R_{ta} = \alpha + \langle MV_{tp} \rangle^{\beta} - q$$

where $\alpha \geq 2$ is a constant. The assumption $\alpha \geq 2$ means that the endorsement-independent part of a citizen's utility is a relatively large part of the benefit from the media consumption.

A citizen who does not consume the media product enjoys zero readership utility while a citizen who consumes the media product enjoys the expected readership utility

$$ER_{ta} = \alpha + E \langle MV_{tp} \rangle^{\beta} - q$$

Thus, citizen t consumes the media product at a if and only if

$$ER_{ta} \geq 0 \tag{3}$$

Let $\mathcal{T}_a$ be the set of citizens that satisfy equation (4). At $a = (p, z, q)$ the media sells to (citizens in the set) $\mathcal{T}_a$. The media chooses (z, q) to maximize total revenue ρ_a where

$$\rho_a = q \cdot \int_{t \in \mathcal{T}_a} 1 dt \tag{4}$$

Since the maximum readership utility is $1 + \alpha$, we can restrict the media to prices in $Q = [0, 1 + \alpha]$. A *media strategy* is a function $\mu : \Omega^2 \to Z \times Q$ that associates a monotone endorsement policy and a price to every pair of policies. We identify a constant function μ with its constant value (z, q).

If citizen t votes for i, his utility is

$$U^i_{ta} = i \cdot E_t(V_{tp})$$

where the expectation E_t is conditional on citizen t's information at the time she casts her vote. Specifically, citizen t votes for party i if and only if $U^i_{ta} > 0$. This utility function implies that citizens vote for the party that has the higher *probability* of choosing a policy closer to their ideal points. An alternative specification would have citizens vote for the party that, *on average*, chooses a policy closer to their ideal point. Our specification simplifies the calculations but is not critical for our results.

Let N_a^i be party i's vote margin given policy action profile a. That is, for $i \in J$,

$$N_a^i = i \cdot \int_I \langle E_t(V_{tp}) \rangle \, dt$$

Party i wins the election with probability 1 if $N_a^i > 0$ and with probability $1/2$ if $N_a^i = 0$. Thus, the probability that party $i \in J$ wins the election is

$$\Pi_a^i = \text{Prob}\{N_a^i > 0\} + \text{Prob}\{N_a^i = 0\}/2$$

Parties are motivated only by policy considerations and derive no benefit from holding office. This extreme assumption simplifies the analysis below but is not essential. Adding an incumbency benefit would not alter the results as long as the policy motive remains sufficiently important. Party i gets payoff ip_i if it wins the election and implements policy p_i and gets payoff ip_{-i} if it loses the election and party $-i$ implements policy p_{-i}. Thus, the Democratic party has ideal policy $-1/2$ and the Republican party has ideal policy $1/2$. Then, party i's payoff at policy profile p is

$$w_a^i = ip_i \cdot \Pi_a^i + ip_{-i} \cdot (1 - \Pi_a^i) \tag{5}$$

The *monopoly media game*, G^1, is a sequential game with three players; the Democratic party, the Republican party and the media company. In the first stage, parties simultaneously choose policies $p = (p_1, p_2) \in \Omega^2$. In the second stage, the media company chooses $(z, q) \in Z \times Q$ knowing the parties' policy choices. Let $C_1 := \Omega^2 \times Z \times Q$ be the set of all action profiles for the monopoly game.

The proposition below shows that G^1 has a unique subgame perfect equilibrium.[9] In this equilibrium, there is no polarization, the media provides no information, sells to all citizens and always hedges; that is, $p_1 = p_{-1} = 0$ and μ is the constant function $(-1/2, 1/2, \alpha)$ and therefore $M = 0$ for all s.

[9] Henceforth, whenever we use the term *equilibrium* we mean a subgame perfect equilibrium.

Proposition 1: *The game G^1 has a unique equilibrium. In this equilibrium,*

(i) Parties choose $p = (0, 0)$;

(ii) The media chooses the constant strategy $\mu = (-1/2, 1/2, \alpha)$.

(iii) All citizens buy the media product.

For simplicity, Proposition 1 restricts parties and the media company to pure strategies. However, this restriction is unnecessary and the same result is true if we permit mixed strategies. The proof of Proposition 1 is easily adapted to deal with mixed strategies.

In the unique equilibrium of G^1, the media hedges no matter what the parties choose. Therefore, citizens' utility from media consumption is α and hence, the profit maximizing price is α. Since the media is unwilling to endorse a party, candidate competition becomes Downsian (Osborne (1995)) with a unique equilibrium at the ex ante median policy 0.

To see why this media strategy is optimal, consider a strategy that always endorses the party that offers the median preferred policy. Assume that $p_{-1} \leq p_1 = -p_{-1}$. Then, the media endorses the Democratic party if $S < 0$ and the Republican party if $S > 0$. This new endorsement policy yields a higher utility for the median citizen ($t = 0$) and all citizen's around the median. But it implies a lower utility for citizens that are further away from median. More precisely, the utility for citizen t with $|t| \leq 1/2$ is

$$ER_{tx} = \alpha + 1 - |t|(\beta + 1) - q$$

and the utility for citizen t with $|t| > 1/2$ is

$$ER_{tx} = \alpha + (1 - \beta)/2 - q$$

Note that the revenue from this strategy is bounded above by $\max\{\alpha + 1, 2\alpha + 1 - \beta\}$. Since $\alpha \geq 2$ and $\beta > 1$, this is always less than 2α, the profit from staying neutral.

Proposition 1 relies on three ingredients. *First*, there is sufficient diversity of political dispositions among citizens. *Second*, all citizens prefer a newspaper that hedges to one that endorses their preferred candidate half of the time and the other candidate the rest of the time. Together, these two ingredients imply that any endorsement strategy that improves t's utility over the hedging strategy must lower the utility of some other citizen

t'. Thus, the diversity of political dispositions ensures that no endorsement strategy yields a higher utility to all citizens than what they would get with the hedging strategy. *Third*, the endorsement policy's utility effect is small compared to the overall utility of media consumption. Thus, the inverse demand is not too elastic with respect to changes in the endorsement policy. Our assumption that $\alpha \geq 2$ guarantees this feature. As a result, it is optimal for the monopoly media to serve a broad spectrum of political dispositions. In our model, the optimal pricing strategy ensures that all citizens consume the media product. These three ingredients ensure that a more informative media strategy could only increase the willingness-to-pay of some media consumers at the expense of lowering the willingness-to-pay of the marginal consumer and hence hedging (i.e., being uninformative) is optimal. Our model illustrates this in a very simple and stylized setting. However, similar results would emerge as long as the three ingredients described above are present.

Proposition 1 considers an extreme case in which voters' only source of information is the monopoly media. As a robustness check, we let a fraction θ of voters observe the state prior to voting whether or not they buy a newspaper. We let G^1_θ denote this modified version of the game. Proposition 2 below shows that this change does not affect the equilibrium media strategy; moreover, the equilibrium policy choice is a continuous function of θ: the Democratic party chooses the policy $-\theta/2$ while the Republican party chooses the policy $\theta/2$.

Proposition 2: *The game G^1_θ has a unique equilibrium. In this equilibrium,*

(i) Parties choose $p = (-\theta/2, \theta/2)$.

(ii) The media chooses the constant $\mu = (-1/2, 1/2, \alpha)$.

(iii) All citizens buy the media product.

If we assume that some citizens get information from alternative sources, then a version of our model with finite finitely many strategic voters would yield an information aggregation result as in Feddersen and Pesendorfer (1997). Hence, for Proposition 2, we need to take the assumption that there are a continuum of voters literally so that a single vote cannot affect the election outcome.

Next, we introduce a measure of how much relevant information citizen t has given $a = (p, z, q)$. Recall that E_t is the expectation given t's information at the time she casts her vote. The random variable $\langle E_t V_{tp} \rangle \in \{-1, 0, 1\}$ is t's best guess at which party to vote for given her actual information (where 0 indicates indifference) while $V_{tp} \in \{-1, 1\}$ is the party she would vote for given perfect information.[10] Thus, $|V_{tp} - \langle E_t(V_{tp}) \rangle\,| = 0$ implies that t votes for her ex post preferred party while $|V_{tp} - \langle E_t(V_{tp}) \rangle\,| = 2$ implies she does not. Then,

$$\iota_{ta} = 1 - \frac{E|V_{tp} - \langle E_t(V_{tp}) \rangle\,|}{2}$$

is the probability that t votes for her ex post preferred party. If t has no information and is equally likely to favor either party, then $\iota_{ta} = 1/2$ while $\iota_{ta} = 1$ if t has all relevant information.

Proposition 2 reveals that the media provides no information. For the median voter ($t = 0$) who gets all her information from the media this implies that $\iota_{ta} = 1/2$. On the other hand, for informed citizens (i.e., those who observe S), $\iota_{ta} = 1$. In section 4, we show how equilibrium under competitive media yields perfect relevant information (i.e., $\iota_{ta} = 1$) for all citizens.

3. Homogenous Electorates

Key ingredients in the no-polarization result of Propositions 1 are the combination of a monopoly media and a polarized electorate. In this section, we maintain the assumption of a monopoly media but consider a more homogenous electorate. We will show that with a homogenous electorate, the monopoly media provides some information and the electoral outcome are polarized. To make the electorate more homogenous, we replace, $I = [-1, 1]$, the support of the uniform distribution of voters with $I_d = [-d, d]$ for some d such that $0 < d \leq 1/4$. Other than this one change, the games G^1_d and G^1 are identical.

Proposition 3: *The game G^1_d has a unique equilibrium. In this equilibrium,*

(i) Parties choose $p = (-1/2, 1/2)$.

(ii) The media chooses $\mu(p) = (\bar{p} - d, \bar{p} + d, 1 + \alpha - d)$.

(iii) All citizens buy the media product.

[10] We can ignore $V_{tp} = 0$ since it can occur at most at a single state and therefore has probability 0.

The equilibrium of Proposition 3 yields the following outcome: When $S < -d$, the media endorses the Democratic party. Conditional on this endorsment, the median citizen ($t = 0$) prefers $p_{-1} = -1/2$ to $p_1 = 1/2$ and hence the Democratic party wins the election. Similarly, when $S > d$, the media endorses the Republican party and the Republican party wins the election. When $S \in [-d, d]$, the media endorses neither party. In this case, the expected state is 0 and therefore the median citizen is indifferent between the two parties and each has an equal chance of winning.

Since the probability of a tie is strictly positive, it may seem that parties have an incentive to move to the center. After all, if party -1 changes its policy from $-1/2$ to $-.49$ and media does not change its endorsement policy, then party -1 would win the election whenever the state is in the interval $[-d, d]$. However, if a party deviates, the media endorsement policy changes. As a result, election probabilities change continuously with policies. For example, if the Democratic party deviates to $-.49$, then the media makes no endorsement if $S \in [-d + .005, d + .005]$, endorses the Democratic party if $S < -d + .005$ and the Republican party if $S > d + .005$. Thus, upon observing no endorsement, the median voter continues to be indifferent between the two parties. By deviating to $-.49$, party -1 would increase its probability of winning by one half percent and this increase is too small to make the deviation profitable.

The game G_d^1 holds fixed the parties preferences and narrows the range of political dispositions. This change leaves the median political disposition unaffected and allows the monopoly media to offer an informative endorsement strategy that offends no citizen. As a result, parties can choose partisan policies and still win elections (with some probability). Parties, in turn, take full advantage of this and choose the most partisan policies available.

Alternatively, we can interpret the model above as a situation in which parties' policy preferences are more extreme than the electorate's. Proposition 3 shows that when parties' policy preferences are sufficiently extreme, the moderating effect of a monopoly media breaks down. The extremeness of parties facilitates uncontroversial endorsements for the media. Paradoxically, rather than leading to moderation, these endorsements enable extreme behavior by parties.

4. Media Competition

In this section, we consider a competitive media market. We assume that there are n media outlets and analyze the equilibrium outcome as n becomes arbitrarily large. As in the previous sections, parties choose their policies then, after observing policy choices, each media company chooses an endorsement policy and a price. Citizens observe the parties and media outlets' actions and then make their choices. Each media outlet j chooses an editorial policy $z^j \in Z$ and a price $q^j \in Q$. Let $c = (p, (z^1, q^1), \ldots, (z^n, q^n))$ be an action profile and let C_n be the set of action profiles.

Next, we define payoffs for the media outlets: for $c \in C_n$, let R^j_{tc} be the readership utility that citizen t would derive from consuming outlet j's product. That is,

$$R^j_{tc} = \alpha + \left\langle M^j V_{tp} \right\rangle^\beta - q^j$$

Let

$$\mathcal{T}^j_c = \{t \in I \mid ER^j_{tc} \geq \max_k ER^k_{tc}; ER^j_{tc} \geq 0\}$$

be the set of citizens whose readership utility is maximal when purchasing from j. Let $\#A$ be the cardinality of the set A and define

$$n_{tc} = \#\{j \mid t \in \mathcal{T}^j_c\}$$

to be the number (between 1 and n) of media outlets that offer the highest readership utility to citizen t. Outlet j's payoff is

$$\rho^j_c = q^j \int_{t \in \mathcal{T}^j_c} \frac{1}{n_{tc}} dt \tag{6}$$

The payoff function (6) means that citizens break ties uniformly among media outlets. This particular tie breaking rule is unimportant for our results.

To ensure that equilibrium exists, we assume that policies are chosen from the finite set $\Omega_r = \left\{ {}^{j}\!/_{2r} \mid j = -r, \ldots, 0, \ldots, r \right\}$ where $r \geq 1$. Party payoffs are as in (5) above. The model with multiple media outlets may not have a pure strategy equilibrium. Therefore, we permit mixed strategies for all players – media outlets and parties. A mixed action σ^j

for media company j is a cumulative distribution function on $I\!R^3$ with support contained in $Z \times Q$. A strategy for outlet j associates with each policy profile p a mixed action σ^j. A strategy for party i is a probability distribution on the finite set Ω_r. Let G^{nr} be the media competition game with n outlets and policy space Ω_r.

Proposition 4: *For every $n \geq 1, \infty > r \geq 1$, G^{nr} has an equilibrium.*

There are two differences between the monopoly media game and the game with media competition. The competition game restricts parties' policy choices to a finite set and permits mixed strategies. These changes ensure that equilibrium exists but do not yield qualitatively different findings. In particular, we can incorporate the same changes into monopoly media games without altering the qualitative findings of Propositions 1-3. Even with mixed strategies, Propositions 1-3 hold exactly as stated. With a finite policy space, Ω^r *and* mixed strategies, Proposition 3 still holds without modification but Propositions 1 and 2 must be modified slightly: The equilibrium media strategy remains unchanged but the policy outcome is no longer unique. However, if r is large, then all equilibrium policy outcomes are close to those in Propositions 1 and 2. For example, when $\theta = 0$, all equilibrium policies are in the set $\{-{}^1\!/_{2r}, 0, {}^1\!/_{2r}\}$.

Next, we study the equilibrium outcomes as the number of media companies becomes arbitrarily large. Every strategy profile π of G^{nr} induces a probability distribution on the set C_n. Given any real valued function f on C_n, let $E_\pi(f)$ be the expected value of f with respect to this probability. Thus,

$$U_{t\pi} := E_\pi \left(\max_j E_t R^j_{tx} \right)$$

is the ex ante expected utility of a citizen with political disposition t in equilibrium.

Recall that ι_{tc}, is the probability citizen t votes for his ex post preferred party given his optimal media consumption decision and action profile c. If, given c, t has multiple optimal media consumption choices, we let ι_{tc} be the average of her probabilities of an ex post correct vote over all of these choices. Finally, let

$$\iota_{t\pi} := E_\pi(\iota_{tc})$$

be the expected probability that citizen t votes for her ex post optimal party given strategy profile π.

In general, G^{nr} has multiple equilibria. However, the proposition below establishes that the limit outcome as the number of media outlets becomes large (i.e., as the media sector becomes competitive) is unique.

Proposition 5: *For every $\epsilon > 0$, there is N such that if $n > N$ and π is an equilibrium of G^{nr} then*

(i) Parties choose pure strategies $(-1/2, 1/2)$.

(ii) $U_{t\pi} \geq 1 + \alpha - \epsilon$ for all t.

(iii) $\iota_{t\pi} \geq 1 - \epsilon$ for all t.

Parts (ii) and (iii) of Proposition 5 assert that as the media industry becomes perfectly competitive, citizens' utility is nearly at its upper bound and every citizen gets all relevant information. Thus, the proliferation of media outlets ensures that virtually all citizens acquire perfect relevant information. An implication of (ii) and (iii) is that competition drives media profits to zero as n goes to infinity. Part (i) asserts that policy choices are maximally polarized: the Democratic party's policy is $-1/2$ and the Republican party's policy is $1/2$. Hence party platforms converge to party ideal points.

Proposition 5 does not rely on the finiteness of the policy space. The same result holds for equilibria of the game with the original policy space Ω. In particular, the mixed equilibrium strategy of party i converges weakly to a strategy that yields $i/2$ with probability 1. A finite policy space ensures existence but plays no other role.

Under competition media outlets specialize and cater to a narrow segment of political dispositions. Much like in the case of a homogenous electorate (analyzed in Proposition 3) this specialization lets media companies provide an informative endorsement strategy without offending any potential customers. As a result of this specialization, an electorate as a whole with many media companies behaves *as if* the state were observable. Note, however, that individual citizens remain poorly informed but receive all information needed to vote optimally ($\iota_{t\pi}$ is close to 1).

The party competition model with a fully informed electorate has a unique equilibrium in which each party chooses the most extreme policy. The equilibrium with many media outlets mimics this outcome and therefore leads to maximal polarization.

5. Conclusions

In this paper, we analyze the interaction of media and political parties and show how a competitive media market can lead to more polarized policy choices by parties. Citizens in our model seek media that share their ex post party preference and media choose their endorsement policies to meet this need. A media company that serves a diverse group of customers remains neutral; that is, it provides no endorsement. In contrast, a media company that serves customers with similar political dispositions provides informative endorsements. The extent of media competition determines the range of political dispositions that each media company serves and, indirectly, affects how informed the electorate is at the voting stage. With a better informed electorate, the median's ex post preference varies more and, as a result, parties' policy choices diverge.

The connection between media competition and polarization relies on three key hypotheses: first, citizens seek agreement between their own views and media positions; second, citizens prefer media that remain neutral to ones that get it right only half the time; third, voters get information only as a byproduct of their media consumption which provides utility even when it offers no information. Our paper shows how, under these assumptions, increased media competition generates greater polarization of parties' policy choices.

6. Appendix

Proposition 1 is an immediate corollary of Proposition 2 which we now prove:

Lemma 1: *The unique media best response to any p is $(z, q) = (-1/2, 1/2, \alpha)$.*

Proof: Let $a = (p, z, q)$ and assume $p_{-1} \leq p_1$. (If $p_{-1} > p_1$, a symmetric argument applies); let $\bar{t} = \sup \mathcal{T}_a, \underline{t} = \inf \mathcal{T}_a$ be the highest and the lowest types that buy the media product. Since $\min_{t \in \mathcal{T}_a} ER_{ta} \geq 0$ it follows that

$$q \leq \alpha + \min\{E \left\langle M_z V_{\bar{t}p} \right\rangle^\beta, E \left\langle M_z V_{\underline{t}p} \right\rangle^\beta\} \leq \alpha + \frac{E \left\langle M_z V_{\bar{t}p} \right\rangle^\beta + E \left\langle M_z V_{\underline{t}p} \right\rangle^\beta}{2}$$

Citizen $\bar{t}$ prefers party 1 if and only if $s \geq \bar{p} - \bar{t}$ while $\underline{t}$ prefers party -1 if and only if $s \leq \bar{p} - \underline{t}$. Define $l(\bar{t}) := \min\{\max\{\bar{p} - \bar{t}, -1/2\}, 1/2\}$, $h(\underline{t}) := \max\{\min\{\bar{p} - \underline{t}, 1/2\}, -1/2\}$. Then, the two types $\underline{t}, \bar{t}$ disagree at $s \in (l(\bar{t}), h(\underline{t}))$ and agree otherwise. Clearly, for any optimal endorsement strategy z, we must have $l(\bar{t}) \leq z_{-1} \leq z_1 \leq h(\underline{t})$. Moreover, for any z with this property

$$\frac{E \left\langle M_z V_{\bar{t}p} \right\rangle^\beta + E \left\langle M_z V_{\underline{t}p} \right\rangle^\beta}{2} = 1 + \frac{\beta - 1}{2}(z_1 - z_{-1}) - \frac{1 + \beta}{2}(h(\underline{t}) - l(\bar{t}))$$

Since $\beta > 1$, the optimal endorsement strategy satisfies $z_1 = h(\underline{t}), z_{-1} = l(\bar{t})$. If $(z_{-1}, z_1) = (l(\bar{t}), h(\underline{t}))$, then $E \left\langle M_z V_{tp} \right\rangle^\beta = 1 - (h(\underline{t}) - l(\bar{t}))$ for all $t \in \mathcal{T}_a$ and, therefore, $q = \alpha + 1 - (h(\underline{t}) - l(\bar{t}))$ is the optimal price. The media's revenue is

$$\rho_a = [\alpha + 1 - (h(\underline{t}) - l(\bar{t}))](\bar{t} - \underline{t})$$

Since $\alpha \geq 2$ and the slopes of $|h|$ and $|l|$ are bounded above by 1, revenue is maximal when $\underline{t} = -1, \bar{t} = 1$ and, therefore, $z_{-1} = l(1) = -1/2; z_1 = h(-1) = 1/2$ as desired. $\square$

Lemma 2: *The unique equilibrium policies are $p_{-1} = -\theta/2, p_1 = \theta/2$.*

Proof: Recall that each citizen learns the state with probability θ and receives no information with probability $1 - \theta$. Fix p_{-1} and consider the choice of $p_1 \geq p_{-1}$. Then,

$$\frac{N_a^i}{2} = (1 - \theta) \cdot (-\bar{p}) + \theta \left(S - \bar{p}\right)$$

and hence 1 wins with probability

$$W_1 := \min\left\{\max\left\{0, \frac{1}{2} - \frac{\bar{p}}{\theta}\right\}, 1\right\}$$

The payoff of party 1 is $W_1 p_1 + (1 - W_1)p_{-1}$. A straightforward calculation shows that party 1 has a dominant strategy $p_1 = \theta/2$. The Lemma then follows from a symmetric argument for party 2. $\square$

Proof of Propositions 2: By Lemma 1, $z = (-1/2, 1/2), q = \alpha$ is the dominant strategy for the media. Given this media strategy, Lemma 2 shows that $p_i = i\theta/2$ is the unique equilibrium strategy for party i. $\square$

6.1 Proof of Proposition 3

Let $a = (p, z, q)$ and define $\bar{t}, \underline{t}$, l, h as in Lemma 1. Repeating the same arguments here establishes that the optimal $\underline{t}, \bar{t}$ satisfy $l(\underline{t}) = \underline{t} = -d$, $h(\bar{t}) = \bar{t} = d$ and the optimal price is $q = 1 + \alpha - 2d$.

It is straightforward to verify that $p_i = i/2$ is an equilibrium policy choice given the media strategy. Next, we show that $p_i = i/2$ is the unique equilibrium. If $p_{-1} \geq 0$, then $p_1 \geq 0$ since it is a best response; if $p_{-1} < 0$, then party 1 gets payoff 0 by choosing $p_1 = -p_{-1}$ and a negative payoff by choosing $p_1 < 0$. Hence, $p_1 \geq 0$ and, by a symmetric argument $p_{-1} \leq 0$. We conclude that $i \cdot p_{-i} \leq 0$ and $\bar{p} \in [-1/4, 1/4]$. It follows from equation (5) that Party i's payoff function, w_i, is

$$w_i(p_{-1}, p_1) = i \cdot [(1/2 - \bar{p})\, p_1 + (1/2 + \bar{p})\, p_{-1}]$$

Verifying that the unique maximizer of $w_i(p_{-i}, \cdot)$ is $p_i = i/2$ whenever $ip_{-i} \leq 0$ is straightforward. $\square$

6.2 Proof of Propositions 4

Let $G^n(p)$ be the game among media outlets with policies fixed at $p = (p_{-1}, p_1) \in \Omega_r \times \Omega_r$ such that $p_{-1} \leq p_1$. Let $\mathcal{D}$ be the set of all (Borel) probability measures on $Z \times Q \subset I\!R^3$. Note that $\mathcal{D}$ is compact in the weak topology. Hence, the set of mixed strategies for any media outlet is $\mathcal{D}$. We extend the players' payoffs to mixed strategies in the usual way. We let $\sigma = (\sigma^1, \ldots, \sigma^n)$ denote a generic mixed strategy profile and u^j be media outlet j's utility function. Recall that ρ_c^j is player (media outlet) j's payoff given action profile c. For any $\pi = (p, \sigma)$, let ν_π be the measure over C_n that the strategy $\pi = (p, \sigma)$ induces. Player j's payoff in $G^n(p)$ is

$$u^j(\sigma) = \int \rho_c^j d\nu_\pi$$

We write $((z^j, q^j), \sigma^{-j})$ for the strategy profile σ such that j plays the pure strategy (z^j, q^j) and players $k \neq j$ choose $(\sigma_k)_{k \neq j}$.

Next, we define a perturbed game $G_\epsilon^n(p)$. The only difference between $G_\epsilon^n(p)$ and $G^n(p)$ are the payoff functions. In $G_\epsilon^n(p)$, the payoffs are as follows: For $0 < \epsilon < 1$, let f_ϵ be the cumulative of a random variable that is uniformly distributed on $[-\epsilon/2, \epsilon/2]$ and $g_\epsilon^j(c,t) := f_\epsilon(\min\{R_{tc}^j - \max_{k \neq j} R_{tc}^k, R_{tc}^j\})$. For $j \in \{1, \ldots, n\}$, let u_ϵ^j be such that

$$u_\epsilon^j(\sigma) = \int_{C_n} \left(q^j \int_I g_\epsilon^j(c,t) dt \right) d\nu_{(p,\sigma)}$$

Hence, with this new payoff functions, citizen t buys from j at c with probability $g_\epsilon^j(c,t)$. By a straightforward application of the Glicksberg-Fan fixed point theorem, the game $G_\epsilon^n(p)$ has a Nash equilibrium. Let σ_ϵ be a Nash equilibrium of $G_\epsilon^n(p)$. Consider a sequence $\epsilon_i \to 0$. Since $\mathcal{D}$ is a compact metric space it follows that σ_{ϵ_i} has a convergent subsequence. Let σ_* be its limit. We will prove that σ_* is a Nash equilibrium of $G^n(p)$.

Claim 1: There is $\delta > 0$ such that $u_\epsilon^j(\sigma_\epsilon) > \delta$ for all j, ϵ.

Proof: The claim is immediate if $n = 1$. Hence, assume $n > 1$ and consider the following strategy for player j: randomly choose x according to a uniform distribution on $[-1/4, 1/4]$, set $z^j = (z_{-1}^j, z_1^j)$ such that $z_{-1}^j = x - q, z_1^j = x + q$ and set the price equal to $q = 1/(64(n-1))$. It is straightforward to verify that if all $k \neq j$ choose endorsement plans z^k such that $z_{-1}^k, z_1^k \notin [x - 4q, x + 4q]$ then $g_\epsilon^j(c,t) > 1/2$ for all $t \in (\bar{p} - x - q, \bar{p} - x + q)$ and hence the profit of j is at least q^2. It is equally straightforward to verify that for all $(z^k)_{k \neq j}$ the probability of choosing x such that $z_{-1}^k, z_1^k \notin [x - 4q, x + 4q]$ for all $k \neq j$ is at least $1/2$. $\square$

For $d \in [0,1]$, define

$$\begin{aligned}
\mathcal{T}_c^{jd} &:= \{t \in I | d \geq \min\{R_{tc}^j - \max_{k \neq j} R_{tc}^k, R_{tc}^j\} \geq -d\} \\
\mathcal{T}_c^{jd-} &:= \{t \in I | 0 \geq \min\{R_{tc}^j - \max_{k \neq j} R_{tc}^k, R_{tc}^j\} \geq -d\} \\
\rho_\sigma^{jd} &:= \int \left(\int_{\mathcal{T}_c^{jd}} dt \right) d\nu_{(p,\sigma)} \\
\rho_\sigma^{jd-} &= \int \left(\int_{\mathcal{T}_c^{jd-}} dt \right) d\nu_{(p,\sigma)}
\end{aligned}$$

Claim 2: (i) There is $A > 0, \bar{d} > 0$ such that $\rho_{\sigma_\epsilon}^{jd} \leq Ad$ for all $\epsilon > 0, \bar{d} \geq d \geq \epsilon$ and for all j. (ii) There is $A > 0, \bar{d} > 0$ such that $\rho_{\sigma_*}^{jd} \leq Ad$ for all $\bar{d} \geq d > 0$ for all j.

Proof: To prove part (i), let (q^j, z^j) be in the support of σ_ϵ^j. Define $\sigma = ((z^j, q^j), \sigma_\epsilon^{-j})$ and $\sigma' = ((z^j, q^j - 2d), \sigma_\epsilon^{-j})$. If $c = (p, (z^j, q^j), (z^{-j}, q^{-j})), c' = (p, (z^j, q^j - 2d), (z^{-j}, q^{-j}))$ and $t \in \mathcal{T}_d^{j-}(c)$ then $g_\epsilon(c, t) \leq 1/2$ and $g_\epsilon(c', t) = 1$. By claim 1 above, $q^j \geq \bar{q}$ for some $\bar{q} > 0$ (independent of ϵ). Since (z^j, q^j) is a best response, it follows that $0 \leq u_\epsilon^j(\sigma) - u_\epsilon^j(\sigma') \leq -2d + \frac{\bar{q}-d}{2} \rho_{\sigma_\epsilon}^{jd-}$. Setting $\bar{d} = \bar{q}/4$ this inequality yields $\rho_{\sigma_\epsilon}^{jd-} \leq 8d/\bar{q}$ for all $d \leq \bar{d}$. Since this holds for every element in the support of σ_ϵ^j, it follows that $\rho_{\sigma_\epsilon}^{jd-} \leq 8d/\bar{q}$ for all j. Since $\rho_{\sigma_\epsilon}^{jd} \leq \sum_{k=1}^n \rho_{\sigma_\epsilon}^{jd-}$, the assertion follows.

To prove part (ii), let h_d be a continuous and decreasing function such that $h_d(0) = h_d(d) = 1$ and $h_d(t) = 0$ for all $t \geq 2d$. Then, $H_d : C^n \to [0,1]$ defined as $H_d(c) = h_d(|\min\{R_{tc}^j - \max_{k \neq j} R_{tc}^k, R_{tc}^j\}|)$ is continuous with $\int_{C^n} H_d d\nu_{(p,\sigma_*)} \geq \rho_{\sigma_*}^{jd}$. Consider a convergent subsequence $\sigma_{\epsilon_i} \to \sigma_*$ with $\epsilon_i < d$ for all i and let $\pi_i = (p, \sigma_{\epsilon_i})$. The definition of H_d and part (i) imply $\int_{C^n} H_d d\nu_{\pi_i} \leq 2\rho_{\sigma_i}^{jd} \leq 2dA$. Since ν_{π_i} weakly converges to $\nu_{(p,\sigma_*)}$ part (ii) follows. $\square$

Claim 3: $u_{\epsilon_i}^j(\sigma_{\epsilon_i}) \to u^j(\sigma_*)$ for all j.

Proof: For $\epsilon' < \epsilon$ Claim 2 implies that

$$\begin{aligned}
|u_{\epsilon'}^j(\sigma_{\epsilon_i}) - u_\epsilon^j(\sigma_{\epsilon_i})| &\leq (\alpha + 1 + \epsilon) A\epsilon \\
|u_\epsilon^j(\sigma_*) - u^j(\sigma_*)| &\leq (\alpha + 1 + \epsilon) A\epsilon
\end{aligned}$$

(This follows, because the maximal utility of a citizen is $1+\alpha$ and hence any price above $\alpha+1+\epsilon$ leads to a zero probability of a sale.) Therefore, for $\epsilon_i \leq \epsilon$,

$$\begin{aligned}|u^j_{\epsilon_i}(\sigma_{\epsilon_i}) - u^j(\sigma_*)| &\leq |u^j_\epsilon(\sigma_{\epsilon_i}) - u^j_\epsilon(\sigma_*)| + |u^j_{\epsilon_i}(\sigma_{\epsilon_i}) - u^j_\epsilon(\sigma_{\epsilon_i})| + |u^j_\epsilon(\sigma_*) - u^j(\sigma_*)| \\ &\leq |u^j_\epsilon(\sigma_{\epsilon_i}) - u^j_\epsilon(\sigma_*)| + 4A\epsilon(\alpha+1+\epsilon)\end{aligned}$$

Since u^j_ϵ is continuous, $u^j_\epsilon(\sigma_{\epsilon_i}) \to u^j_\epsilon(\sigma_*)$. Since ϵ was arbitrary the claim follows. □

Finally, we prove that σ_* is a Nash equilibrium. Fix any $j, (q^j, z^j)$ and choose δ such that

$$u^j((z,q), \sigma_*^{-j}) = u^j(\sigma_*) + \delta$$

Fix $\epsilon > 0$. Then, $u^j_\epsilon((z, q-\epsilon), \sigma_*^{-j}) > u^j(\sigma_*) + \delta - 2\epsilon$. Let $\sigma_{\epsilon_i}^{-j}$ be a subsequence converging to σ_*^{-j} with $\epsilon_i < \epsilon$. Then, for i sufficiently large, $u^j_\epsilon((z, q-\epsilon), \sigma_{\epsilon_i}^{-j}) > u^j(\sigma_*) + \delta - 3\epsilon$ which, by Claim 2, implies that

$$u^j_{\epsilon_i}((z, q-\epsilon), \sigma_{\epsilon_i}^{-j}) > u^j(\sigma_*) + \delta - 3\epsilon - (\alpha+1+\epsilon)A\epsilon$$

By Claim 3 $u^j_{\epsilon_i}(\sigma_{\epsilon_i}) \to u^j(\sigma_*)$ and, since the above inequality holds for all $\epsilon > 0$, the fact that σ_{ϵ_i} is a Nash equilibrium of $G^n_{\epsilon_i}(p)$ implies that $\delta \leq 0$. This, in turn, implies that σ_* is a Nash equilibrium. Since $G^n(p)$ has a Nash equilibrium for every p and since Ω_r is finite, Proposition 4 follows from the fact that every finite game has a Nash equilibrium.□

6.3 Proof of Proposition 5

Fix p with $p_{-1} \leq p_1$, let σ be an equilibrium strategy profile of the game $G^n(p)$ (as described in the proof of Proposition 4 above) and let $\pi = (p, \sigma)$. Let ν_π be the corresponding probability measure on the set C_n. We write Σ_π for the support of ν_π and Σ^j_π for the support of σ^j.

Claim 1: *For $\epsilon > 0$, there is N such that $n > N$, σ is an equilibrium of $G^n(p)$ and $\pi = (p, \sigma)$ implies $U_{t\pi} \geq 1 + \alpha - \epsilon$ for all t.*

Proof: Let $u^* = \min_I U_{t\pi}$ and let $t^* \in \arg\min U_{t\pi}$. Let $u^* < 1+\alpha$ and choose $\delta > 0$ so that $u^* + 5\delta \leq 1 + \alpha$. Note that $|U_{t\pi} - U_{t'\pi}| \leq (1+\beta)|t - t'|$ and therefore, $U_{t\pi} \leq u^* + \delta$ for any $t \in [t^* - \delta/(1+\beta), t^* + \delta/(1+\beta)]$.

Let (z_{-1}, z_1, q) be such that $z_{-1} = \max\{\bar{p} - t^* - \delta, -1\}, z_1 = \min\{\bar{p} - t^* + \delta, 1\}$ and $q = 1+\alpha-u^*-5\delta$. Let π' be the strategy profile where media outlet j chooses (z_{-1}, z_1, q), all other players choose their equilibrium strategy, and the policy is fixed at p. For any $c \in \Sigma_{\pi'}$ we have $R^j_{t^*c} \geq u^* + 3\delta$ and, therefore, $R^j_{tc} \geq u^* + 2\delta$ for $t \in [t^* - \delta/(1+\beta), t^* + \delta/(1+\beta)] \cap I$.

We have $0 \leq \max_{k \neq j}\{R^k_{tc}, 0\}$ and $E_{\pi'}\left(\max_{k \neq j}\{R^k_{tc}, 0\}\right) \leq u^* + \delta$ for all $t \in [t^* - \delta/(1+\beta), t^* + \delta/(1+\beta)] \cap I$. Let $\eta_{\pi'}$ be the probability measure on C_n induced by π'. A straightforward calculation shows that

$$\eta_{\pi'}(\{c \in \Sigma_{\pi'} | \max_{k \neq j}\{R^k_{tc}, 0\} < u^* + 2\delta\}) \geq \frac{\delta}{u^* + 2\delta} \geq \frac{\delta}{1 + \alpha + 2\delta}$$

It follows that at profile π' the probability that j sells to all $t \in [t^* - \delta/(1+\beta), t^* + \delta/(1+\beta)] \cap I$ is at least $\delta/(1+\alpha+2\delta)$. We conclude that the expected payoff of (z_{-1}, z_1, q) is at least

$$\frac{\delta}{1+\alpha+2\delta} q \int_{\max\{t^* - \delta/(1+\beta), 0\}}^{\min\{t^* + \delta/(1+\beta), 1\}} dt \geq \frac{\delta^2}{(1+\beta)(1+\alpha+2\delta)}(1+\alpha-u^*-5\delta)$$

Total profits of all media outlets are bounded above by $2(1+\alpha)$ and, since π is an equilibrium profile, it follows that (z, q) cannot be a profitable deviation for any j and any δ. Therefore, $\frac{n\delta^2}{(1+\beta)(1+\alpha+2\delta)}(1+\alpha-u^*-5\delta) \leq 2(1+\alpha)$ for all $\delta > 0$. Rearranging this inequality yields that $u^* - (1+\alpha-5\delta)$ converges to zero as n goes to infinity and since δ was arbitrary Claim 1 follows. □

Claim 2: *For $\epsilon > 0$ there is N such that $n > N$ implies $\iota_{t\pi} \geq 1 - \epsilon$ for all t.*

Proof: If $U_{t\pi} \leq \alpha + 1 - \epsilon$ then $\Pr\{\langle MV_{t\beta}\rangle = 1\} \geq 1 - \epsilon$ and, therefore, $\Pr\{|V_{ct} - \langle E_t(V_{ct})\rangle| = 2\} \leq \epsilon$ which, in turn, implies $\iota_{t\pi} > 1 - \epsilon$. □

Let $U_{tc} = \max_j R^j_{tc}$ and let $C^\epsilon_n := \{c \in \Sigma_\pi | \min_{t \in I} U_{tc} \geq 1 + \alpha - \epsilon\}$.

Claim 3: *For $\epsilon > 0$ there is N such that $n > N$ implies $\nu_\pi(C^\epsilon_n) \geq 1 - \epsilon$.*

Proof: By claim 1, $U_{t\pi} \to 1 + \alpha$ for all t. Since $U_{t\pi}$ is continuous in t and I is compact it follows that $\min_{t \in I} U_{t\pi} \to 1 + \alpha$ and hence there is N such that $\min_{t \in I} U_{t\pi} > 1 + \alpha - \epsilon^2$ for all $n > N$. Then, $U_{tc} \leq 1 + \alpha$ implies $\nu_\pi\left(\{c \in \Sigma_\pi | \min_{t \in I} U_{tc} \geq 1 + \alpha - \epsilon\}\right) \geq 1 - \epsilon$ and, therefore, Claim 3 follows. □

Proof of Proposition 5: Claim 1 proves part (ii) for any realized policy profile such that $p_{-1} \leq p_1$. If $p_{-1} > p_1$ then the same argument holds if we reverse the role of the two parties. Therefore, claim 1 proves part (ii) and claim 2 proves part (iii).

If $R_{tc} > 1 + \alpha - \epsilon$ it follows that type t buys from media company j such that j supports t's preferred party with probability no smaller than $1 - \epsilon$. If $p_{-1} \leq p_1$ then this implies that $z_{-1}^j \leq z_1^j$ such that $z_{-1}^j + \epsilon \geq \bar{p} - t \geq z_1^j - \epsilon$ and hence t votes for -1 if $S < \bar{p} - t - \epsilon$ and votes 1 if $S > \bar{p} - t + \epsilon$. For $c \in C_n^\epsilon$ this implies that the median type ($t = 0$) votes for -1 if $S < \bar{p} - \epsilon$ and for 1 if $S > \bar{p} + \epsilon$ and, therefore, -1 wins the election if $S < \bar{p} - \epsilon$ while 1 wins the election if $S > \bar{p} + \epsilon$.

Consider party 1 and assume party 2 chooses some p_{-1}. By claim 3, for any $\epsilon > 0$ we may choose N so that for $n > N$ the payoff of party 1 from choosing $p_1 \geq p_{-1}$ is at least

$$\begin{aligned} L_\epsilon(p_1, p_{-1}) =& (1-\epsilon)\left(p_{-1} \Pr\{S < \bar{p} + \epsilon\} + p_1 \Pr\{S > \bar{p} + \epsilon\}\right) + \epsilon p_{-1} = \\ & (1-\epsilon)\left(p_{-1}\left(\frac{1}{2} + \epsilon + \bar{p}\right) + p_1\left(\frac{1}{2} - \epsilon - \bar{p}\right)\right) + \epsilon p_{-1} \end{aligned}$$

and at most

$$\begin{aligned} L^\epsilon(p_1, p_{-1}) =& (1-\epsilon)\left(p_{-1} \Pr\{S < \bar{p} - \epsilon\} + p_1 \Pr\{S > \bar{p} - \epsilon\}\right) + \epsilon p_1 = \\ & (1-\epsilon)\left(p_{-1}\left(\frac{1}{2} - \epsilon + \bar{p}\right) + p_1\left(\frac{1}{2} + \epsilon - \bar{p}\right)\right) + \epsilon p_1 \end{aligned}$$

If ϵ is small then $L_\epsilon(1/2, p_{-1}) > L^\epsilon(p_1, p_{-1})$ for all $p_1 \in \Omega_r, p_1 \neq 1/2$. Thus, $p_1 = 1/2$ is the unique equilibrium strategy if ϵ is small. Since parties are in symmetric situations, this proves the part (i) of Theorem 5. $\square$

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