Downs Meets d'Aspremont and Company: Convergence versus Differentiation in Politics and the Media

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Abstract. Media firms have incentives to differentiate their news products to soften price competition. When consumers value cognitive consistency between the news they read and the policies they support, politicians are induced to propose more polarized policies to conform to a polarized media landscape. A stronger commercial motive or a weaker preference for editorial neutrality in the media exacerbates this effect and causes party policies to become more extreme. We find that prices for news products are higher when consumers have a demand for cognitive consistency, despite the fact that maximal product differentiation does not hold for media firms.

JEL classification. D43, D72, L13, L82

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1. Introduction

The logic of electoral competition is different from that of market competition. In a two-party system, a party needs to secure a majority of the votes cast to win an election. When voters have single-peaked preferences over a one-dimensional policy space, competition to win a majority induces both parties to choose a policy platform that appeals to the median voter. Such policy convergence is the centerpiece of the theory of democracy proposed by Downs (1957),[1] and of much subsequent work in political economy. In a market setting, however, winning a fifty percent market share is not everything. Firms care about price as well as quantity. Indeed, many firms deliberately target niche markets because they can charge high prices in those markets. In a pioneering contribution, d'Aspremont, Gabszewicz and Thisse (1979) point out that firms can gain from softer price competition by product differentiation. In a one-dimensional product space with quadratic transport cost, they show that the equilibrium product locations of a duopoly exhibit maximal product differentiation.[2]

When markets and politics do not mix, the minimal differentiation result of Downs (1957) can sit comfortably together with the maximal differentiation result of d'Aspremont et al. (1979). In the news media market, however, the editorial positions chosen by media firms can potentially influence, and are potentially influenced by, the policy positions chosen by political parties. What happens when Downs meets d'Aspremont and company? In other words, how does polarization in the media and in politics interact? Does media polarization drive political polarization?[3]

In an influential study, Della Vigna and Kaplan (2007) find that the introduction of the conservative Fox News Channel increased the vote share in presidential elections for Republican candidates. It is useful to recall that mainstream American television news media had relatively homogeneous editorial positions before the entry of Fox News. Fox News perceived a vacuum of content targeted at conservative news consumers, and decided to position itself to serve this market segment. Needless to say, Fox News would have faced much keener competition from the incumbent firms had it chosen not to differentiate its news products. The entry of Fox News was later followed by MSNBC, which differentiated itself with a more liberal-leaning stance. Given that the news media landscape today

[1]See also Hotelling (1929) and Black (1948) for earlier expositions of this result.

[2]Economides (1986) provides further discussion on how different assumptions about transport costs affect the maximal differentiation result.

[3]See Prior (2013) for a survey on related empirical studies.

is much more polarized than it was before, and given that the news media can have a major influence on the beliefs and behavior of the voting public, politicians may respond by proposing more polarized policies to court endorsement (or at least coverage) by different media outlets.[4] Direct evidence establishing the linkage between polarized media positions and polarized policy positions is difficult to obtain, although such linkage is not inconsistent with the "agenda-setting power" (McCombs 2014) commonly attributed to media firms. We explore the linkage theoretically in this paper.

In our model two political parties have opposite policy preferences, but they are both motivated to win election to office. They choose policy platforms to balance a tradeoff between a higher chance of winning the election and implementing policies farther away from their ideal points. Absent the media, equilibrium policy platforms would converge to the median voter's ideal point if office rents are sufficiently high. Voters in the model also choose to consume news from one of two media firms. Each media firm chooses to position its news content along the one-dimensional policy space. Taking editorial positions as given, the firms then engage in price competition. A voter's media consumption decision depends on prices and on the distance between his policy ideal point and the editorial positions of the media firms. Absent the political process, equilibrium editorial positions would exhibit maximal differentiation as in d'Aspremont et al. (1979). In this model, the media do not care about the political parties, and the parties do not care about the media firms. The only connection between the two sets of players works through the preferences of voters. Our key assumption is that voters' utility is decreasing in the distance between the policy platform of the party they support and the editorial position of the news they read. A citizen who votes for a certain party may hold a favorable opinion of a media firm that supports that party's policies.[5] Likewise, an individual who consumes news from a certain media firm may view favorably a party which proposes the policies advocated by that firm, perhaps to avoid the internal discomfort due to inconsistency between the two. One may think of this as a behavioral assumption to capture the demand for cognitive consistency (Severin and Tankard 2000), or as a reduced-form way of modeling how the news one reads shapes preferences for (or beliefs about the efficacy of) different policy options.

[4]Robinson (1999) coins the term "the CNN effect," which refers to how media coverage of foreign affairs drives foreign policy.

[5]Oliveros and Várdy (2015) also discuss the idea that consumers demand media slant consistent with their supported candidates. Their model exhibits a continuum of media outlets, but they do not consider the location choices made by candidates.

A broader concept, cognitive dissonance, has been discussed in Akerlof and Dickens (1983), and has received some empirical support in the voting context (Mullainathan and Washington 2009). The main idea is that people avoid getting information or engaging in behavior that conflicts with their own beliefs. Our assumption is stronger: we assume that people also avoid conflict between the news they read and the votes they cast. In the media literature, Iyengar and Hahn (2009) show that media outlets know that Republicans preferred to read news from Fox News and avoid news from outlets upholding different positions. Any discrepancy between the media consumption sphere and the voting sphere drains one's mental resources to reconcile such difference and may put one in an uncomfortable position. From a more instrumental point of view, if the Fox channel criticizes the policy of the Republican administration, then Republican voters dislike it, as this may lower the electoral prospects of the Republican Party.

Once we introduce the demand for cognitive consistency, the voting decision and the news consumption decision are intertwined, which in turn affects the incentives of the parties in choosing their policies and the incentives of the media firms in choosing their editorial positions.

The demand for cognitive consistency leads to a strategic complementarity between policy platforms and editorial positions. If, for commercial reasons, media firms present their news in polarized positions, then political parties have an incentive to follow suit. We find that introducing commercial media in this environment leads to greater policy divergence than what would be predicted by Downs (1957). Moreover, policies move further away from the median as the commercial motive of media becomes more prominent. On the other hand, the political parties have a moderating influence on the editorial positions of the media firms: their editorial positions become less extreme than what would be predicted by d'Aspremont et al. (1979). Interestingly, we also find that the equilibrium prices chosen by media firms are higher in our model than in a model with no politics. This result cannot be explained by the logic of two-stage competition (indeed, price competition becomes tougher when the media choose less extreme positions), but is due to the fact that demand for a media firm's news becomes more inelastic, as its news consumers want to maintain cognitive consistency with the party they support.

Our work extends the earlier work by Mullainathan and Shleifer (2005), who study the pricing decision and the decision to slant the news by media firms when news consumers prefer to read news that conforms to their beliefs. We follow their assumption about news consumers' demand for cognitive consistency, but introduce electoral choice into the model and study the strategic interaction between media firms and political parties. The influence of the media's ideological positions on public choice has received much interest in economics. Chan and Suen (2008) use a decision-theoretic approach to justify the demand for news that conforms to one's beliefs, and study the general equilibrium implications for political parties and the media. Prices for news products are fixed (at zero) in their model. Duggan and Martinelli (2011) analyze how the media reduce multi-dimensional politics to a one-dimensional space, whereas our model simply assumes that the policy space and editorial positions are one-dimensional. Andina-Díaz (2006) considers candidates' charisma, which affects preferences of voters on ideology for exogenously fixed positions of media outlets. She shows that a candidate will locate at some point between the positions of a media outlet and the median voter. Our framework is also related to Schulz and Weimann (1989). Their model contains both a horizontal location dimension and a vertical quality dimension. The strategic interaction between media and politics comes from the assumption that the level of information a media outlet is able to supply depends on the level of information released by a political party.

Our model assumes voting is costless and all citizens vote. Recently, Piolatto and Schuett (2015) consider group utilitarianism of voters to examine the influences of competition and media slant on voter turnout. Gerardi et al. (2016) study the use of reward lotteries and abstention penalty to induce greater participation in voting.

In our model, the revenue of media firms is derived entirely from selling news products to consumers. Gabszewicz et al. (2001) point out that the concern for revenue from advertising may cause media firms to report news with less dispersed ideological positions. Baron (2006) suggests that journalists may write biased news stories because of career considerations.

Numerous empirical studies have investigated different aspects of the nexus between media and politics. In addition to the paper by Della Vigna and Kaplan (2007) mentioned above, Enikolopov et al. (2011) show that independent television in Russia decreases votes for the government party but increases the combined votes for major opposition parties. On the relationship between policy positions and media positions, Robinson (1999, 2002) discusses "the CNN effect" (the media affect political decisions) as well as the "manufacturing consent" theory (government guides the media) in the formation of foreign policy, especially in the context of humanitarian interventions in northern Iraq and in Somalia in the early 1990s. Hopmann et al. (2012) examine election campaigns in Denmark and find that party agendas affect the media's news agendas, but not vice versa. Durante and

Knight (2012) find that the public television network in Italy shifted its position to the right when the control of the government moved from center-left to center-right. Finally, Puglisi and Snyder (2011) and Larcinese et al. (2014) find evidence of partisan bias in newspapers' coverage of economic news and political scandals in the United States.

2. The Model

There are two political parties (indexed by $i = r, \ell$) and two media firms (indexed by $j = 1, 2$). Each party chooses a policy position such that $\alpha_r \in [0, 1]$ and $\alpha_\ell \in [-1, 0]$, and each media firm advocates a policy position such that $\beta_1 \in [0, 1]$ and $\beta_2 \in [-1, 0]$.[6] We follow the duopoly assumption employed in Mullainathan and Shleifer (2005) and many other models in the spirit of Hotelling (1929). This setting provides the simplest oligopoly framework which incorporates locations, prices, and strategic interactions.[7]

A fraction q of the citizens chooses their media consumption and vote for a political party based on the policy positions adopted by these media firms and political parties. For a citizen with ideological position x, his utility from voting for party i and getting news from media outlet j is:

$$U(i, j, x) = u - a(\alpha_i - x)^2 - b(\beta_j - x)^2 - c(\alpha_i - \beta_j)^2 - p_j, \quad i = r, \ell, \quad j = 1, 2. \tag{1}$$

where p_j is the price charged by media firm j. The term $-a(\alpha_i - x)^2$ describes the disutility from voting for platforms far away from one's ideal point. The term $-b(\beta_j - x)^2$ measures the disutility from reading news far away from one's ideal point. The term $-c(\alpha_i - \beta_j)^2$ reflects the demand for cognitive consistency: a citizen bears a utility cost if the party he chooses takes a position far away from that advocated by the news and editorials he reads. This is stronger than the usual assumption of cognitive dissonance (i.e., that a citizen does not like reading news from media that do not agree with him, and he does not like voting for a party that disagrees with him). We are assuming that people get lower utility if the news they consume and the party they vote for disagree with each other. We believe that the assumption is reasonable because people do not want to be reminded about uncomfortable discrepancies. Any time the media outlet and the political party chosen by a

[6] Our model can be extended to allow α_i and β_i to lie in $[-1, 1]$. However, checking for quasi-concavity in the location game becomes cumbersome without additional restrictions on parameter values. Because our model is symmetric, the case with both parties or both media firms leaning to the right, for example, does not offer much meaningful insight; and we make our assumption to simplify the proof in the Appendix.

[7] Our framework is restricted by a two-party setting following Downs (1957) and subsequent related studies such as Ellman and Wantchekon (2000). For the case of multiple firms, refer to Brenner (2005).

citizen disagree, he has to spend scarce mental resources to reconcile their discrepancies, which he dislikes doing.[8] The parameters a, b, and c are all positive.[9] The ideological position x among this group of citizens is uniformly distributed on $[-1, 1]$.[10]

A citizen who does not consume news gets utility $U(i, \emptyset, x) = v - a(\alpha_i - x)^2$, $i = r, \ell$. We assume that v is sufficiently large so that a citizen with any ideological position x will vote for one of the parties. Furthermore, we assume that the parameter u in equation (1) is sufficiently larger than v so that we can focus on an equilibrium in which a citizen with any ideological position x will buy news from one of the media firms.[11]

The remaining fraction $1-q$ of citizens make their voting decisions based on sentiments. These sentiments are summarized by a random variable Z, representing the fraction of these citizens who will vote for Party r when election time comes. We assume that Z is uniformly distributed on $[0, 1]$.[12] For simplicity, we also assume that these citizens do not consume any news.

Party r wins the election if at least half of the electorate vote for it, i.e., if $q\,\Pr[$chooses

[8] Although people also read news for other private reasons (say, weather reports, transportation news, and local events), we focus on political news throughout our discussion. In reality, the editorial positions of media are usually persistent over time, which provides a justification for modeling it as part of the "product characteristics" chosen by media firms.

[9] The cognitive consistency assumption is fundamentally important for our main results. We should mention that our setting is just one way to model cognitive consistency among various types of this concept in the psychological literature, such as Feldman (1966) and Simon et al. (2004). If $c = 0$, the symmetric equilibrium editorial positions β^* will degenerate to the maximal differentiation of d'Aspremont et al. (1979). However, the equilibrium policy positions α^* may still be affected by b, meaning that there exists a direct link between media and politics coming from b. In case of no policy preference for parties, the symmetric equilibrium α^* will be reduced to the minimal differentiation of Downs (1957).

[10] Anderson et al. (1997) analyze a location-then-price duopoly game under non-uniform consumer density and show that a unique pure-strategy equilibrium exists if the density is not too asymmetric and not too concave. Anderson et al. (1992) also consider non-uniformly distributed consumers and find that the equilibrium locations under one-stage (locations and prices) are closer to those in two-stage (location and then price) games.

[11] People may not participate in voting, especially in a large election. However, we follow most Hotelling-type models to assume full market coverage. If v is not high enough (see Feddersen and Sandroni 2006a, 2006b), some people may not vote. In product markets, if u is low and uniformly distributed among consumers, then there may exist infinite multiple equilibria, which may be neither maximal differentiation nor minimal differentiation (see Economides 1984, Hinloopen and van Marrewijk 1999).

[12] We use these voters as a modeling device to introduce probabilistic voting outcomes, which smooth out the discontinuity in the political parties' payoff functions. See, for example, Lindbeck and Weibull (1987).

Party $r] + (1-q)Z \geq 1/2$. Because Z is uniformly distributed,

$$\Pr[r \text{ wins}] = \frac{1}{2} + \frac{q}{1-q}\left(\Pr[\text{chooses Party } r] - \frac{1}{2}\right).$$

If Party r wins, it obtains an office rent of $\rho - \delta(\alpha_r - 1)^2$. To ensure the above probability is within 0 and 1, we assume $q \leq 1/2$.[13] Note that the office rent is increasing in the policy α_r it proposes, and reaches a maximum at $\alpha_r = 1$. This reflects the fact that Party r has policy preferences in addition to a pure office-winning motive. Its payoff from winning office is higher when the policy it adopts is closer to its ideal point at 1. Party r chooses α_r to maximize

$$\Phi_r = \Pr[r \text{ wins}]\left(\rho - \delta(\alpha_r - 1)^2\right).$$

Party ℓ has an opposite policy preference with the ideal point at -1. Its rent from winning the election is $\rho - \delta(\alpha_\ell + 1)^2$. Party ℓ chooses α_ℓ to maximize

$$\Phi_\ell = (1 - \Pr[r \text{ wins}])\left(\rho - \delta(\alpha_\ell + 1)^2\right).$$

Here we assume for simplicity that the party simply gets a payoff of zero when it loses the elections. This setting is a generalized form of Downs (1957), which allows us to have a direct comparison.[14]

The media firms have an ideal policy position equal to that of the median citizen ($x = 0$); they suffer a utility loss if they advocate a policy away from the ideal position. One may interpret this ideal position at 0 as a preference for unbiased reporting.[15] However, they are also motivated by profits. Because we assume that all citizens who vote according to

[13]If $q > 1/2$, the probability that r wins is not a differentiable function of the probability that the rational voters choose Party r. The analysis still applies, but we will have to consider kinks in the political parties' objective function. In equilibrium, it turns out that kinks in the objective function are binding only when $q > 6/7$. Therefore, it is sufficient to impose a weaker assumption, namely $q \leq 6/7$, for the conclusions of this paper to hold.

[14]Alternatively, the first-order conditions and main results are robust if the party experiences a utility loss given by the distance between its bliss point and the policy promised by the other party as the following alternative setting: $\Phi_r = \Pr[r \text{ wins}]\left(\rho - k\delta(\alpha_r - 1)^2\right) + \Pr[l \text{ wins}]\left(-\delta(\alpha_l - 1)^2\right)$, where $k > 1$ is sufficiently large. Our formulation amounts to the assumption that a political party cares more about the policy that it implements when it is in power than about the policy when it is not in power.

[15]We do not need this assumption, and the tendency for media firms to choose extreme locations would becomes even stronger if we assume that their ideal points are away from 0. Mullainathan and Shleifer (2005) interpret an editorial position at 0 (the median voter's ideal point) as unbiased reporting. The case where the two media firms have asymmetric ideal positions will be discussed in Section 5.

policy preferences (instead of sentiments) buy news products, the size of total readership for Firm j is $q\,\Pr[\text{chooses Firm } j]$. Media firm j wants to maximize

$$\Pi_j = wq\,\Pr[\text{chooses Firm } j]p_j - t\beta_j^2, \quad j = 1, 2, \tag{2}$$

where w is the weight that the firm puts on profits, and t is the weight on the utility loss from advocating biased policy positions. Without loss of generality, we normalize $w = 1$ for simplicity. Throughout this paper, we assume that t is small so that the media are primarily commercially motivated. Our result is robust when media firms only maximize profits and do not care about their locations, which is the special case $t = 0$.

Assumption 1. $t \in [0, qb/6]$.

We use this assumption to sufficiently ensure the existence of subgame perfect equilibrium. This assumption allows us to focus on the set of parameter values that is relevant.

We consider a three-stage game in which (1) media firms and political parties choose their positions (α_r, α_ℓ, β_1, β_2) simultaneously; (2) media firms then choose their prices (p_1, p_2) simultaneously; and (3) citizens make their news consumption and voting decisions.

3. Benchmarks

3.1. Politics only

Consider a politics-only case in which $b = c = 0$. Let $x^P = (\alpha_r + \alpha_\ell)/2$ represent the citizen who is indifferent between the two political parties (the superscript "P" represents "politics only"). Because x is uniform on $[-1, 1]$, we have $\Pr[\text{chooses Party } r] = (1-x^P)/2$. Therefore, Party r chooses α_r to maximize:

$$\Phi_r^P(\alpha_r, \alpha_\ell) = \left(\frac{1}{2} - \frac{q}{1-q}\frac{\alpha_r + \alpha_\ell}{4}\right)\left(\rho - \delta(\alpha_r - 1)^2\right). \tag{3}$$

Take the derivative with respect to α_r, and use the fact that $\alpha_r = -\alpha_\ell \equiv \alpha^P$ in a symmetric equilibrium; the first-order condition then reduces to:

$$\frac{\partial \Phi_r^P}{\partial \alpha_r} = \frac{-q}{4(1-q)}\left(\rho - \delta(1-\alpha^P)^2\right) + \delta(1-\alpha^P) \le 0. \tag{4}$$

The first term is the marginal cost of moving more to the right, which reduces the chance of winning the election. The second term is the marginal benefit from having a policy that is closer to the party's own position if it indeed wins.

The case of $\delta = 0$ corresponds to a pure Downsian model with no policy preference. In this case, the left-hand side of equation (4) is negative, and the equilibrium α^P is equal to 0 (the median voter's ideal point). More generally, there exists δ^* such that $\alpha^P = 0$ if $\delta \leq \delta^*$, and $\alpha^P \in (0,1)$ otherwise. In the latter case, α^P is uniquely pinned down by the first-order condition (4). The comparative statics are intuitive: (1) α^P increases in δ (policies are more extreme when parties are more ideologically oriented); (2) α^P decreases in ρ (policies are more moderate when parties are more office-motivated); and (3) α^P decreases in q (policies are more moderate when there are more rational voters).

3.2. Media only

Next, consider the case of media only, with $a = c = 0$. Let x^M represent the citizen who is indifferent between the two media outlets (the superscript "M" stands for "media only"), where the indifferent citizen x^M satisfies $b(\beta_1 - x^M)^2 + p_1 = b(\beta_2 - x^M)^2 + p_2$. We have

$$x^M = \frac{b(\beta_1^2 - \beta_2^2) + (p_1 - p_2)}{2b(\beta_1 - \beta_2)}.$$

Assuming full coverage at the pricing stage, the size of readership for Firm 1 is $q(1 - x^M)/2$. This firm chooses p_1 to maximize

$$\pi_1^M(\beta_1, \beta_2, p_1, p_2) = qp_1\left(\frac{1}{2} - \frac{p_1 - p_2}{4b(\beta_1 - \beta_2)} - \frac{\beta_1 + \beta_2}{4}\right) - t\beta_1^2.$$

Note that p_1 and p_2 are strategic complements. The Nash equilibrium prices are:

$$p_1^M = \frac{b}{3}(\beta_1 - \beta_2)(6 - (\beta_1 + \beta_2)),$$
$$p_2^M = \frac{b}{3}(\beta_1 - \beta_2)(6 + (\beta_1 + \beta_2)).$$

With these values of p_1 and p_2, the marginal type who is indifferent between the two news outlets is given by $x^M = (\beta_1 + \beta_2)/6$, and the reduced-form payoff function is:

$$\Pi_1^M(\beta_1, \beta_2) = \frac{qb}{36}(\beta_1 - \beta_2)(6 - (\beta_1 + \beta_2))^2 - t\beta_1^2.$$

Using the symmetric equilibrium condition $\beta_1 = -\beta_2 \equiv \beta^M$, the first-order derivative with respect to β_1 can be written as:

$$\frac{\partial \Pi_1^M}{\partial \beta_1} = \frac{qb}{3}(3 - 2\beta^M) - 2t\beta^M. \tag{5}$$

By Assumption 1, this derivative is positive for all $\beta_1 < 1$. Therefore, the equilibrium is a corner solution. With $\beta^M = 1$, the corresponding prices are $p_1 = p_2 \equiv p^M = 4b$. This corresponds to the maximal differentiation result of d'Aspremont et al. (1979) and Mullainathan and Shleifer (2005).

4. Equilibrium Locations for Media Firms and Political Parties

4.1. Symmetric solution

In a symmetric solution, a voter who supports Party r will get news from the right-leaning Firm 1, and a voter who supports Party ℓ will get news from the left-leaning Firm 2. We do not have to worry about "cross-platform behavior" (e.g., voters who support Party r but get news from Firm 2). Let $\hat{x}$ represent the marginal type who is indifferent between $(r,1)$ and $(\ell,2)$ at stage 3 of the game. Solving $U(r,1,\hat{x}) = U(\ell,2,\hat{x})$ yields:

$$\hat{x}(p_1,p_2) = \frac{(a+c)\left(\alpha_r^2 - \alpha_\ell^2\right) + (b+c)\left(\beta_1^2 - \beta_2^2\right) - 2c\left(\alpha_r\beta_1 - \alpha_\ell\beta_2\right) + (p_1 - p_2)}{2\left(a\left(\alpha_r - \alpha_\ell\right) + b\left(\beta_1 - \beta_2\right)\right)}. \tag{6}$$

The probability that a rational citizen (i.e., one who is not influenced by sentiments) chooses to get news from Firm 1 is $\Pr[\text{chooses Firm 1}] = (1-\hat{x})/2$. Given such a demand function, Firm 1 chooses price p_1 to maximize profits in stage 2:

$$\pi_1(p_1,p_2) = q p_1 \frac{1-\hat{x}(p_1,p_2)}{2} - t\beta_1^2.$$

Similarly, Firm 2 chooses p_2 to maximize its profits. A Nash equilibrium of this subgame satisfies the first-order conditions, $\partial\pi_1/\partial p_1 = \partial\pi_2/\partial p_2 = 0$. Solving these conditions gives:

$$\hat{p}_1 = 2a(\alpha_r - \alpha_\ell) + 2b(\beta_1 - \beta_2) - \frac{(a+c)(\alpha_r^2 - \alpha_\ell^2) + (b+c)(\beta_1^2 - \beta_2^2) - 2c(\alpha_r\beta_1 - \alpha_\ell\beta_2)}{3}, \tag{7}$$

$$\hat{p}_2 = 2a(\alpha_r - \alpha_\ell) + 2b(\beta_1 - \beta_2) + \frac{(a+c)(\alpha_r^2 - \alpha_\ell^2) + (b+c)(\beta_1^2 - \beta_2^2) - 2c(\alpha_r\beta_1 - \alpha_\ell\beta_2)}{3}. \tag{8}$$

We note that these prices are finite. For $u - v$ which is sufficiently large, consuming news at such prices must be better than not consuming news. Therefore, full coverage is satisfied whenever we maintain the assumption that $u - v$ is large enough.

Substituting $\hat{p}_1$ and $\hat{p}_2$ from equations (7) and (8) into equation (6) for the marginal type, the reduced form of the marginal citizen, denoted $\tilde{x}$, can be expressed as:

$$\tilde{x} = \hat{x}(\hat{p}_1, \hat{p}_2) = \frac{(a+c)\left(\alpha_r^2 - \alpha_\ell^2\right) + (b+c)\left(\beta_1^2 - \beta_2^2\right) - 2c\left(\alpha_r\beta_1 - \alpha_\ell\beta_2\right)}{6\left(a\left(\alpha_r - \alpha_\ell\right) + b\left(\beta_1 - \beta_2\right)\right)}.$$

We can also express the reduced-form payoff of media Firm 1 in terms of the marginal type:

$$\Pi_1 = \pi_1(\hat{p}_1, \hat{p}_2) = q\left(a(\alpha_r - \alpha_\ell) + b(\beta_1 - \beta_2)\right)(1-\tilde{x})^2 - t\beta_1^2.$$

Note that this expression reduces to the benchmark case with only media when $a = c = 0$. Similarly, we can write the reduced-form payoff of Party r in terms of the marginal type:

$$\Phi_r = \left(\frac{1}{2} - \frac{q}{1-q}\frac{\tilde{x}}{2}\right)\left(\rho - \delta(\alpha_r - 1)^2\right).$$

This expression reduces to the benchmark case with only politics when $b = c = 0$.

In stage one of the game, each party $i = r, \ell$ chooses its location α_i and each firm $j = 1, 2$ chooses its location β_j simultaneously. Consider the decision of Firm 1. The effect of an increase in its editorial position on its payoff is:

$$\frac{\partial \Pi_1}{\partial \beta_1} = q(1-\tilde{x})\left(b(1-\tilde{x}) - (2a(\alpha_r - \alpha_\ell) + 2b(\beta_1 - \beta_2))\frac{\partial \tilde{x}}{\partial \beta_1}\right) - 2t\beta_1.$$

If the equilibrium locations are symmetric, we let $\alpha_r = -\alpha_\ell \equiv \alpha^*$ and $\beta_1 = -\beta_2 \equiv \beta^*$. In such a symmetric solution, we have $\tilde{x} = 0$, and the above equation reduces to:

$$\frac{\partial \Pi_1}{\partial \beta_1} = q\left(b - \frac{2(b+c)\beta^* - 2c\alpha^*}{3}\right) - 2t\beta^*. \tag{9}$$

Note that $\partial \Pi_1 / \partial \beta_1 > 0$ when evaluated at $\beta^* = 0$. Thus, choosing $\beta_1 = 0$ is never optimal for Firm 1 when its opponent firm chooses $\beta_2 = 0$. If $\partial \Pi_1 / \partial \beta_1 > 0$ when evaluated at $\beta^* = 1$, we let $\beta^* = 1$. Otherwise, let β_1^* be the solution to the first-order condition $\partial \Pi_1 / \partial \beta_1 = 0$. From equation (9), we then obtain:

$$\beta^* = \min\left\{\frac{q(3b + 2c\alpha^*)}{2q(b+c) + 6t}, 1\right\}. \tag{10}$$

Consider next Party r's decision. The effect of a higher policy position on its payoff is:

$$\frac{\partial \Phi_r}{\partial \alpha_r} = 2\delta(1-\alpha_r)\left(0.5 - \frac{q\tilde{x}}{2(1-q)}\right) - \left(\rho - \delta(1-\alpha_r)^2\right)\frac{q}{2(1-q)}\frac{\partial \tilde{x}}{\partial \alpha_r}.$$

In a symmetric solution, the first-order condition for Party r is given by:

$$\frac{\partial \Phi_r}{\partial \alpha_r} = \delta(1-\alpha^*) - \frac{q}{2(1-q)}\left(\rho - \delta(1-\alpha^*)^2\right)\frac{(a+c)\alpha^* - c\beta^*}{6(a\alpha^* + b\beta^*)} = 0. \tag{11}$$

A symmetric solution to the stage one location subgame simultaneously satisfies equations (10) and (11).

Proposition 1. *A solution to equations (10) and (11) exists and is unique. Moreover, in such a symmetric solution,*

$$0 \le \alpha^P < \alpha^* < \beta^* \le \beta^M = 1.$$

Proof. Let $f(\alpha)$ represent the right-hand side of equation (10). The function $f(\cdot)$ is continuous and is strictly increasing with a slope less than 1 for $\alpha < \overline{\alpha} \equiv 1-(qb-6t)/(2qc)$. For $\alpha < \overline{\alpha}$,

$$f(\alpha) - \alpha = \frac{q(3b-2b\alpha) - 6t\alpha}{2q(b+c)+6t},$$

which is positive by Assumption 1. For $\alpha \in (\overline{\alpha}, 1)$, we have $f(\alpha) - \alpha = 1-\alpha$, which again is positive.

When locations are symmetric, we can verify that $\partial\Phi_r(\alpha,\beta)/\partial\alpha_r$ decreases in α whenever $\partial\Phi_r(\alpha,\beta)/\partial\alpha_r = 0$. Moreover, $\partial\Phi_r(0,\beta)/\partial\alpha_r > 0 > \partial\Phi_r(1,\beta)/\partial\alpha_r$. Thus, for any β there exists a unique $\alpha \in (0,1)$ that solves the first-order condition (11). Let $g(\beta)$ represent such an implicit solution. Since $\partial\Phi_r(\alpha,\beta)/\partial\alpha_r$ strictly increases in β, it follows from the implicit function theorem that $g(\cdot)$ is strictly increasing.

The composite function $g(f(\cdot))$ is a continuous mapping from $[0,1]$ to $[0,1]$. Moreover, from equation (11), and from equation (4), which defines the equilibrium location α^P in the politics-only case, we can readily see that $\partial\Phi_r(\alpha^P,\alpha^P)/\partial\alpha_r > 0$. It follows that $g(\alpha^P) > \alpha^P$. Since $g(\cdot)$ is increasing, and $f(\alpha^P) > \alpha^P$, we obtain

$$g(f(\alpha^P)) > g(\alpha^P) > \alpha^P.$$

Furthermore, $g(f(1)) = g(1) < 1$. By the intermediate value theorem, there exists $\alpha^* \in (\alpha^P, 1)$ such that $\alpha^* = g(f(\alpha^*))$. Let $\beta^* = f(\alpha^*)$. Then, (α^*, β^*) is a solution to equations (10) and (11). Since $f(\alpha^*) - \alpha^* > 0$, we have $\beta^* > \alpha^*$.

Finally, it can be verified by implicit differentiation that the slope of $g(\cdot)$ is less than 1 whenever $\beta \ge \alpha$. It follows that $g(f(\cdot))$ intersects the 45-degree line once and from above. Thus, its fixed point α^* is unique. ■

Proposition 1 reveals that the presence of commercial media tends to pull the political parties toward more extreme policy positions (i.e., $\alpha^* > \alpha^P$). Note that in a symmetric solution,

$$\frac{\partial \tilde{x}}{\partial \alpha_r} = \frac{2(a+c)\alpha^* - 2c\beta^*}{6(2a\alpha^* + 2b\beta^*)} < \frac{1}{6} < \frac{1}{2} = \frac{\partial x^P}{\partial \alpha_r}.$$

This shows that it is less costly (in terms of reduced probability of winning the election) for Party r to move its policy to the right when voters are also consuming news from a right-biased media Firm 1, which is advocating a position β_1 even more to the right than α_r. When Party r raises α_r, other things equal, its chance of winning the election goes down. But the media firms' pricing decisions endogenously respond in such a way to make $\hat{p}_1 - \hat{p}_2$ go down. This makes news from Firm 1 more attractive. Because citizens who consume news from Firm 1 have a higher propensity to vote for Party r, this partially offsets the direct effect and results in a smaller overall reduction in winning probability. In this model, even when the pure office motive ρ is very large relative to the ideological motive δ, the political parties never converge to the median voter's ideal position.

For the media firms, the main motive for product differentiation is to soften price competition. In a symmetric solution, we have

$$\frac{\partial \hat{p}_2}{\partial \beta_1} = 2b + \frac{2(b+c)\beta^* - 2c\alpha^*}{3} < 3b < \frac{10}{3}b = \frac{\partial p_2^M}{\partial \beta_1},$$

where the first inequality uses the first-order condition (9) for Firm 1. Moreover,

$$\left|\frac{\partial \hat{x}}{\partial p_2}\right| = \frac{1}{4(a\alpha^* + b\beta^*)} < \frac{1}{4b\beta^*} = \left|\frac{\partial x^M}{\partial p_2}\right|.$$

These comparisons show that product differentiation is less effective as a means of softening competition in a model with both politics and media. Compared to a model with media only, product differentiation causes a smaller increase in the opponent's price, and an increase in the opponent's price causes a smaller expansion in the demand for the firm's news product. This explains why $\beta^* \le \beta^M$.

Minimal differentiation among political parties and maximal differentiation among media firms are not generally true in our model. Nevertheless, the basic insights of Downs (1957) on political competition and of d'Aspremont et al. (1979) on economic competition are still supported: the motive of obtaining office rents by winning an election causes political parties to locate closer to the median voter; while the motive to soften competition causes media firms to locate farther away from the median voter. Thus, despite our assumption that parties' ideal points are extreme (at 1 and -1), while the ideal positions of media firms are moderate (at 0), the equilibrium locations of the media are more polarized than those of the political parties; we have $\alpha^* < \beta^*$ by Proposition 1.[16] Cognitive consistency plays a key role to alleviate media polarization, where media firms react to readers' desire for cognitive consistency by moving toward the political center.

4.2. Equilibrium of the three-stage game

The symmetric solution identified in Proposition 1 is derived from first-order conditions. However, first-order conditions alone are not sufficient to establish the existence of subgame-perfect equilibrium. The main difficulty is that in the pricing subgame, the demand function of each media firm may exhibit kinks as consumers of news from Firm 1 may choose to vote for Party ℓ when the prices charged by the two media firms become sufficiently different.[17] This type of "cross-platform behavior" makes the profit function $\pi_1(\cdot)$ non-quasiconcave in p_1, and hence the best responses in this pricing subgame may not be continuous. A full characterization of all possible equilibria would entail many cases depending on the parameter values, and may involve mixed strategies. Although we cannot establish the non-existence of asymmetric equilibrium in this model, our numerical calculations do not find any asymmetric solution. In the following, we show that under some parameter restrictions the symmetric solution (α^*, β^*) is indeed a subgame-perfect equilibrium of the three-stage game.

Proposition 2. *Suppose $a \leq c \leq 3b$. Then the symmetric solution identified in Proposition 1 is the only symmetric subgame perfect equilibrium of the three-stage game.*

The proof of Proposition 2 is quite tedious, as it involves comparison between local maxima. Briefly, we show that when $\beta_1 = -\beta_2 = \beta^*$ and $\alpha_r = -\alpha_\ell = \alpha^*$, the prices ($\hat{p}_1$ and $\hat{p}_2$) are mutual best responses despite the fact that the profit functions are not quasiconcave. We then show that each media firm and each political party has no incentive to unilaterally deviate from the symmetric locations in stage 1 of the game. The details are provided in the Appendix.

[16]Our result can be compared with the case with a monopoly media firm, in which both the monopoly media and the two political parties would locate at the center (Downs 1957; Mullainathan and Shleifer 2005). That is, the entry of a second media firm leads to separated locations for media firms and parties.

[17]If u is not high enough, partial coverage may emerge without cross-platform behavior. For instance, *The New York Times* raising its price might merely cause a left-leaning voter to stop reading the news, rather than driving him to either watch Fox or vote Republican.

4.3. Discussion

Our framework is based on a symmetric setting. In an alternative setting, suppose Party r is more partisan than Party l (in the sense that $\delta_r > \delta_l$), then Party r has less incentive to move toward the center position and so does Firm 1. We can obtain an asymmetric equilibrium with $\alpha_r^* > -\alpha_l^* > 0$ and $\beta_1^* > -\beta_2^*$ by numerical calculations.

Our result is robust even when parties have no preference for locating at extreme points. In fact, when $\delta_r = \delta_l = 0$, we have symmetric equilibrium positions:

$$\beta_1^* = \frac{3(a+c)qb}{2\left(q(ab+c(a+b))+3t(a+c)\right)}, \tag{12}$$

$$\alpha_r^* = \frac{3cqb}{2\left(q(ab+c(a+b))+3t(a+c)\right)}. \tag{13}$$

This gives $0 < \alpha_r^* < \beta_1^*$, which is consistent with the results in Proposition 1.

However, our result may be affected by the sequential setting. Considering a four-stage game (media locations, party locations, media prices, and then voting and media purchase), the symmetric equilibrium locations are

$$\beta_1^* = \alpha_r^* = \frac{3(a+c)(ca+ab+bc)q}{2(a+c)(ca+ab+bc)q+3ta^2},$$

which yields $0 < \alpha_r^* = \beta_1^* \leq 1$, different from Proposition 1. Intuitively, given the decision of media locations, parties have incentive to move toward the media to reduce news consumers' cognitive inconsistency ($\partial\Phi_i(\alpha_i)/\partial\alpha_i$ increases in β_i).

In this paper we assume for simplicity that the objective functions of media firms have no direct link with parties. Alternatively, a setting allowing us to emphasize the relationship between party and supported media is

$$\Pi_1 = q\,\Pr[\text{chooses firm 1}]p_1 + t(\beta_1 - \alpha_r)^2,$$

where $(\beta_1 - \alpha_r)^2$ measures the position differences between Firm 1 and its favorite party. Numerical calculations suggest a similar result. In the special case when $\delta = 0$, we obtain explicit symmetric equilibrium locations:

$$\beta_1^* = \frac{3(a+c)qb}{2q(ab+(a+b)c)+6ta},$$

$$\alpha_r^* = \frac{3qbc}{2q(ab+(a+b)c)+6ta},$$

which again reveals that $0 < \alpha_r^* < \beta_1^*$, consistent with our main result.

Our results are based on single-homing of the news market. The current framework can be extended to allow multi-homing behavior as documented by Gentzkow, Shapiro and Sinkinson (2014) and Fan (2013), who suggest that news consumers in the U.S. often get their news from more than one outlet and often intentionally from an outlet that belongs to a distinct political camp. We may consider a setting for multi-purchasing readers in the spirit of Anderson et al. (2016):

$$U(i,j,x) = U + d \cdot U - a(\alpha_1 - x)^2 - b(\hat{\beta}_j - x)^2 - c(\alpha_i - \hat{\beta}_j)^2 - p_1 - p_2,$$

where $\hat{\beta}_j = \beta_1 + d\beta_2$, for $x \in [0,1]$ and $\hat{\beta}_j = \beta_2 + d\beta_1$ for $x \in [-1,0]$, where $d \in [0,1]$ is a discounted weight. Notably, the case $d = 1$ represents the argument of cross-checking in Mullainathan and Shleifer (2005). Further calculations lead to first-order conditions that are similar to (10) and (11). Readers close to the median point ($x = 0$) will purchase two newspapers, and others still read only one newspaper. We obtain the equilibrium locations $\alpha^* = 0.307$ and $\beta^* = 0.923$, and multi-homing citizen $x \in [-0.645, 0.645]$ by numerical calculation, using parameter values the same as those in Figure 1, and with $t = 0.1$, $d = 0.4$ and $U = 3$.

5. Equilibrium Prices and Comparative Statics

In a symmetric equilibrium, the equilibrium price charged by each media firm is equal to:

$$p^* = \hat{p}_1 = \hat{p}_2 = 4a\alpha^* + 4b\beta^*. \tag{14}$$

Because there is less product differentiation in this model, one might infer that price competition would be more intense and hence prices would be lower than in the media-only case. It turns out that such an inference would be wrong.

Proposition 3. *In a symmetric equilibrium, prices under media and politics are higher than prices with media only.*

Proof. With media only, the symmetric equilibrium price is equal to $p^M = 8b/3$. If $\beta^* = 1$, then we immediately obtain $p^* > p^M$. So assume that $\beta^* < 1$.

From the first-order condition (11), we have $a\alpha^* > c(\beta^* - \alpha^*)$. Because β^* is interior, the first-order derivative $\partial \Pi_1 / \partial \beta_1$ given in (9) is equal to 0. This implies

$$2c(\beta^* - \alpha^*) = 3b - 2b\beta^* - \frac{6t\beta^*}{q} \geq 2b - 2b\beta^*,$$

where the last inequality follows from Assumption 1. Therefore,

$$p^* > 4c(\beta^* - \alpha^*) + 4b\beta^* \geq 4b > p^M. \qquad \blacksquare$$

To see why prices for news are higher when politics is brought into the model, observe that

$$\frac{\partial \hat{x}}{\partial p_1} = \frac{1}{4(a\alpha^* + b\beta^*)} < \frac{1}{4b\beta^M} = \frac{\partial x^M}{\partial p_1}.$$

The introduction of political parties and the demand for cognitive consistency makes the demand for news from a particular media firm more inelastic. Moreover, because prices are strategic complements, the effect of greater inelasticity is magnified, resulting in higher prices for both firms.

A corollary to Proposition 3 is that the equilibrium payoff to news firms is higher in a symmetric equilibrium with both politics and media than in a symmetric equilibrium with media only. News firms are better off because prices are higher, but each firm retains the same market share of one-half in a symmetric equilibrium. Moreover, to the extent that $\beta^* < \beta^M$, each firm is producing news that is closer to its preferred position.

We analyze next the comparative statics of the symmetric equilibrium. Consider the effects of more highly commercialized media. This can be captured by a decrease in the value of t (the weight they put on preference for a neutral editorial position) relative to w (the weight media firms put on profits). By Propositions 1 and 2, the symmetric equilibrium locations can be identified by the solution to equations (10) and (11). As in the proof of Proposition 1, we use $\beta = f(\alpha)$ to represent equation (10) and $\alpha = g(\beta)$ to represent (11). These two relationships are depicted in Figure 1.

The key feature of Figure 1 is that both $f(\cdot)$ and $g(\cdot)$ are upward sloping. This reflects a complementarity in editorial location and policy location induced by the demand for cognitive consistency. When media editorial positions become more extreme (β_1 increases and $\beta_2 = -\beta_1$ decreases), political parties find it more attractive to choose more extreme policies. Likewise, when political parties choose more extreme policies (α_1 increases and $\alpha_2 = -\alpha_1$ decreases), media firms find it more attractive to further differentiate the news products. In Figure 1, an increase in the weight on the profit motive is represented by an upward shift of $f(\alpha)$. In equilibrium, the media firms choose to advocate more extreme policies because of the greater incentive to soften competition to maximize profits. When the media advocate extreme policies, political parties are less likely to lose votes if

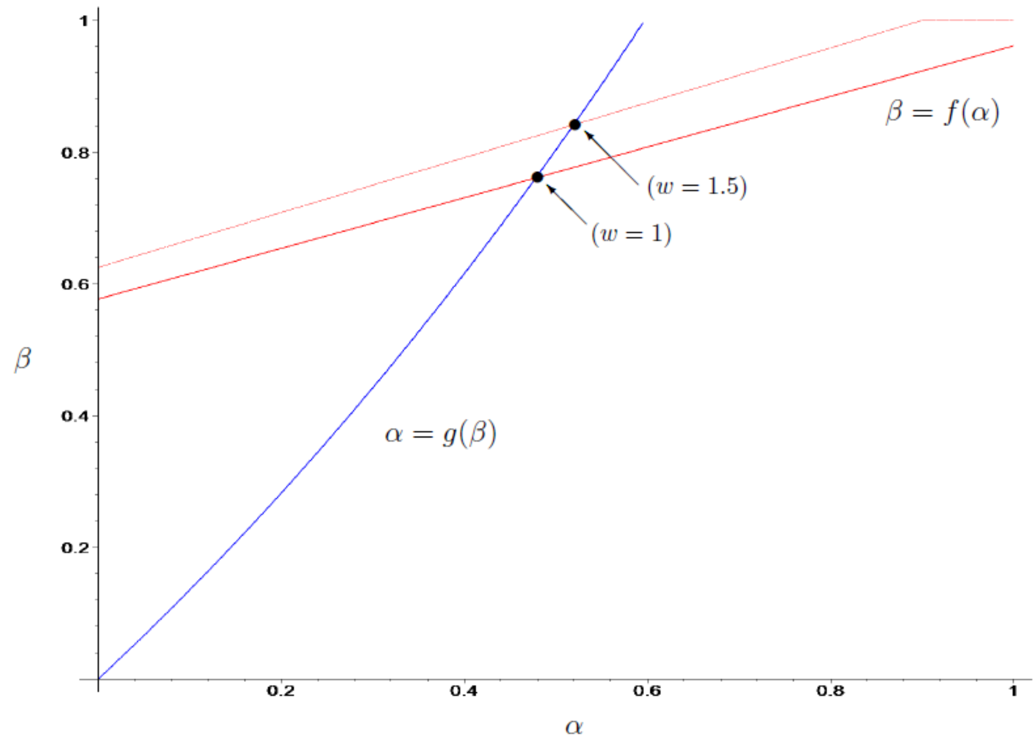

Figure 1. *Equilibrium locations are indicated by the intersection of the curves f and g. A decrease in t shifts $f(\alpha)$ upward and increases both α^* and β^*. This figure is drawn using the parameter values $a = b = c = 2$, $q = 0.5$, $\rho = 4$, $\delta = 0.1$, and t is either* 0.2 *(solid curve) or* 0.133 *(dotted curve).*

they propose extreme policies. As a result, the political parties respond by choosing more extreme policies in equilibrium.

Our model therefore predicts that a lower preference for editorial neutrality (lower t) or a greater commercial motive (higher w) produces more extreme news and more extreme politics. Moreover, because p^* increases in α^* and β^*, equilibrium prices for media products also increase.

We may also consider the effect of an increase in the office motive ρ. This tends to shift the $g(\beta)$ curve to the left. Greater policy convergence by the political parties in turn will cause the media firms to advocate more moderate policies to maintain cognitive consistency. As a result, both α^* and β^* will decrease. The price of news products also falls.

For the comparative statics of the preference parameters, suppose a increases. As voters incur greater cost of voting for policies they do not like, the cost of proposing extreme policies increases. From equation (11), we can see that the optimal response is for parties to propose more moderate policies, i.e., $g(\beta)$ shifts to the left. The equilibrium response is that both α^* and β^* will fall.

An increase in the parameter b has two effects. First, as the disutility from reading news that does not suit one's own position rises, the demand for news from a particular firm becomes more inelastic. This strengthens the softening competition effect. From equation (10), we see that $f(\alpha)$ shifts up. This is consistent with the result in Mullainathan and Shleifer (2005). Second, an increase in b also makes voters less responsive to changes in the parties' policy positions (i.e., $\partial \tilde{x}/\partial \alpha_r$ decreases when b increases). This lowers the incentive for political parties to propose moderate policies. As a result, $g(\beta)$ shifts to the right. The upward shift in $f(\cdot)$ and the rightward shift in $g(\cdot)$ make the symmetric equilibrium locations of both the parties and the media firms more extreme.

Parameter c represents the strength of the demand for cognitive consistency. When c increases, voters are less bothered by more extreme policies proposed by political parties (because media positions are even more extreme). Thus, political parties respond by proposing more extreme policies, resulting in a rightward shift of $g(\beta)$. On the other hand, news consumers react negatively to media firms that advocate extreme positions (because policies proposed by parties are less extreme). Thus, an increase in c causes $f(\alpha)$ to shift down. The overall effect on equilibrium locations cannot be determined by a graphical analysis. Nevertheless, a direct calculation establishes unambiguous comparative statics results.[18]

Proposition 4. *In a symmetric equilibrium, the locations of political parties become more extreme (α^* increases) while the locations of media firms become less extreme (β^* decreases) as the demand for cognitive consistency c rises.*

Proof. Recall that the equilibrium location α^* of political parties satisfies the fixed-point condition,

$$g(f(\alpha^*; c); c) = \alpha^*.$$

Because both $\partial g/\partial \beta$ and $\partial f/\partial \alpha$ are positive and less than 1, by the implicit function

[18]In the case $\delta = 0$, the comparative statics with respect to c can be obtained directly from equations (12) and (13): when c increases, both α_r^* and β_1^* become more extreme.

theorem we find that $\partial\alpha^*/\partial c$ has the same sign as:

$$\begin{aligned}\frac{\partial g}{\partial \beta}\frac{\partial f}{\partial c}+\frac{\partial g}{\partial c} &= \frac{-1}{\frac{\partial \phi}{\partial \alpha}}\left(\frac{\partial \phi}{\partial \beta}\frac{\partial f}{\partial c}+\frac{\partial \phi}{\partial c}\right)\\ &= \frac{-1}{\frac{\partial \phi}{\partial \alpha}}\frac{q(\rho-\delta(1-\alpha^*)^2)(\beta^*-\alpha^*)}{12(1-q)(a\alpha^*+b\beta^*)}\left(\frac{6t(a\alpha^*+b\beta^*)+2qb(b\beta^*+c(\beta^*-\alpha^*))}{(a\alpha^*+b\beta^*)(2q(b+c)+6t)}\right)\\ &> 0,\end{aligned}$$

where we use ϕ to represent the left-hand side of the first-order condition (11), and $\partial\phi/\partial\alpha$ is negative. Similarly, the equilibrium location β^* of the media satisfies the fixed-point condition $f(g(\beta^*;c);c)=\beta^*$. The sign of $\partial\beta^*/\partial c$ is the same as

$$\begin{aligned}&\frac{\partial f}{\partial \alpha}\frac{\partial g}{\partial c}+\frac{\partial f}{\partial c}\\ &=\frac{-1}{\frac{\partial \phi}{\partial \alpha}}\frac{2q}{2q(b+c)+6t}\left(c\frac{\partial \phi}{\partial c}+(\beta^*-\alpha^*)\frac{\partial \phi}{\partial \alpha}\right)\\ &<\frac{-1}{\frac{\partial \phi}{\partial \alpha}}\frac{2q}{2q(b+c)+6t}\\ &\quad\times\left(c\frac{q(\rho-\delta(1-\alpha^*)^2)(\beta^*-\alpha^*)}{12(a\alpha^*+b\beta^*)(1-q)}-(\beta^*-\alpha^*)\frac{q(\rho-\delta(1-\alpha^*)^2)(ab+bc+ac)\beta^*}{12(1-q)(a\alpha^*+b\beta^*)^2}\right)\\ &=\frac{-1}{\frac{\partial \phi}{\partial \alpha}}\frac{2q}{2q(b+c)+6t}\frac{q(\rho-\delta(1-\alpha^*)^2)(\beta^*-\alpha^*)}{12(a\alpha^*+b\beta^*)(1-q)}\left(\frac{-a(b\beta^*+c(\beta^*-\alpha^*))}{a\alpha^*+b\beta^*}\right),\end{aligned}$$

which is negative. ■

Proposition 4 shows that an increase in c draws the political parties away from the center but draws the media outlets closer to the center. Intuitively, when citizens are more concerned about the dissonance between the media and parties, the media firm and the political party on each side are induced to move closer to each other.

So far, we have looked at symmetric changes in parameters. We may also consider the effect of changes in one of the firms (or one of the parties) on equilibrium locations. However, because the game is not supermodular in $(\alpha_1,\beta_1,-\alpha_2,-\beta_2)$, qualitative comparative statics results are difficult to obtain. We illustrate an asymmetric change in media preference using a numerical example.

Suppose the payoff to Firm 1 is

$$\Pi_1 = q\,\Pr[\text{choose Firm 1}]p_1 + t(\beta_1-m_1)^2, \tag{15}$$

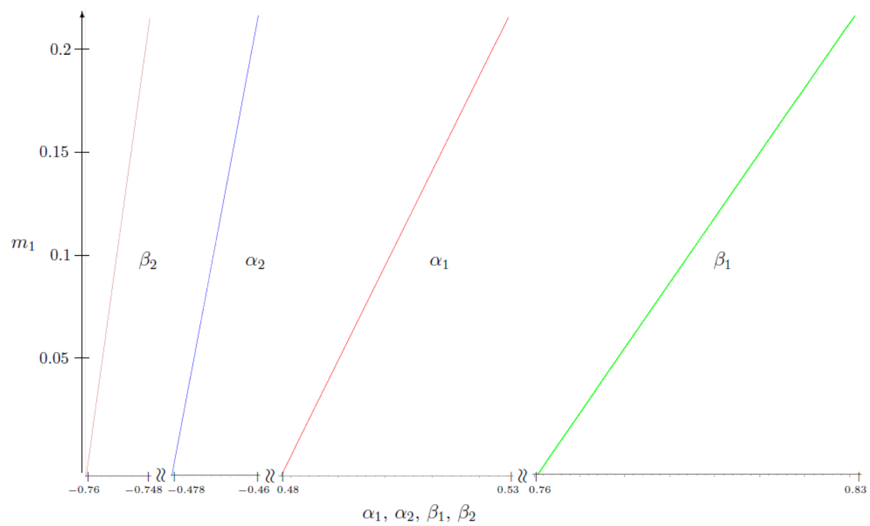

Figure 2. *Equilibrium locations of both media firms and of both political parties all shift to the right as Firm 1 becomes more biased to the right.*

where m_1 stands for the preferred editorial position for this firm. All other parameters of the model are the same as before (in particular, the preferred editorial position for Firm 2 remains at $m_2 = 0$). Figure 2 shows the effect of changes in m_1 on equilibrium locations. Not surprisingly, the equilibrium location of Firm 1 moves to the right as its ideal position m_1 moves to the right. Interestingly, Firm 2 also moves to the right even though its own ideal position has not changed. This occurs because Firm 2 has more incentive to position itself to attract news consumers near the center as Firm 1 moves away from the center. Because consumers demand consistency between the news they read and the party they support, the two political parties also move to the right in response.

Moreover, equilibrium prices rise as m_1 moves to the right. The rise of prices is due to the increase of the location difference between media firms. In Figure 2, we see that the distance between β_1 and β_2 widens as m_1 increases. This softens price competition between the two media firms, allowing both to charge higher prices in equilibrium. Indeed the increase in p_2 is greater than the increase in p_1, because consumers have higher willingness to pay for news from Firm 2, which is much closer to the center of the market, than news from Firm 1.

6. Conclusion

The demand for cognitive consistency brings d'Aspremont and company and Downs closer to each other. We show that product differentiation is less effective as a means of softening competition when politics matters. As a result, media firms are induced to choose editorial positions closer to the mainstream. Despite tougher price competition due to less product differentiation, media firms charge higher prices in equilibrium because their demand for media products becomes more inelastic due to the demand for cognitive consistency with the parties they support. On the other hand, voters become less sensitive to extreme policies when the media are highly polarized to target niche markets. In response, political parties are induced to choose policies farther away from the median voter's ideal point. Our comparative statics analysis suggests that the tendency for media polarization is stronger when media firms have strong commercial profit motives (or a weaker preference for editorial neutrality). The complementarity between media location and policy location in our model introduces the possibility that a more commercial media market may bring about more polarized politics.

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Appendix

We prove Proposition 2 in this Appendix. A sufficient (but not necessary) condition for the symmetric solution identified in Proposition 1 to be an equilibrium is that $a \leq c \leq 3b$, which we assume to hold in the proof. The following preliminary result is useful.

Lemma 1. *If $a \leq c \leq 3b$, then $c\beta^*/a \geq 1/3$.*

Proof. Because the function $f(\cdot)$ defined in the proof of Proposition 1 is increasing, we have

$$\beta^* = f(\alpha^*) \geq f(0) = \frac{3qb}{2q(b+c)+6t},$$

Use Assumption 1 to obtain

$$\beta^* \geq \frac{3b}{3b+2c}.$$

Therefore,

$$\frac{c\beta^*}{a} - \frac{1}{3} \geq \frac{9bc-3ab-2ac}{3a(3b+2c)} = \frac{9-3a/c-2a/b}{3abc(3b+2c)},$$

which is non-negative if $a/c \leq 1$ and $a/b \leq 3$. ■

Pricing subgame

We want to show that both media firms charging $\hat{p}_1 = \hat{p}_2 = 4a\alpha^* + 4b\beta^*$ is an equilibrium in the pricing subgame when the positions are $(\alpha_1, \alpha_2, \beta_1, \beta_2) = (\alpha^*, \beta^*, -\alpha^*, -\beta^*)$.

Define $\hat{y}$ such that $U(r, 2, \hat{y}) = U(\ell, 2, \hat{y})$. At the symmetric equilibrium positions, we have $\hat{y} = c\beta^*/a$. Similarly, define $\tilde{y}$ such that $U(r, 1, \tilde{y}) = U(\ell, 1, \tilde{y})$. We have $\tilde{y} = -c\beta^*/a$. If $c\beta^*/a \geq 1$, then choosing "cross platform" (i.e., voting for one party but consuming news from the opposing media) is always dominated by choosing either $(r, 1)$ or $(\ell, 2)$. In this case, because π_i is concave in p_i (holding p_j fixed), the first-order condition characterizes the best response in the pricing subgame. Thus, $(\hat{p}_1, \hat{p}_2)$ is indeed a Nash equilibrium of the subgame.

When $c\beta^*/a < 1$, the analysis is more complicated. Assuming that citizens choose either $(r, 1)$ or $(\ell, 2)$, the marginal type is $\hat{x}(p_1, p_2)$, as given by equation (6). If $\hat{x} \in [\tilde{y}, \hat{y}]$, then the demand function for firm 1 is $(1-\hat{x})/2$. If $\hat{x} > \hat{y}$, however, type $\hat{x}$ actually prefers

$(r,2)$ to $(\ell,2)$. Thus, the relevant market for Firm 1 is determined by the indifferent type $\hat{z}$ such that $U(r,1,\hat{z}) = U(r,2,\hat{z})$, which gives

$$\hat{z}(p_1,p_2) = \frac{(b+c)(\beta_1^2-\beta_2^2) - 2c\alpha_r(\beta_1-\beta_2) + p_1 - p_2}{2b(\beta_1-\beta_2)}.$$

At the symmetric equilibrium with $p_2 = \hat{p}_2$, we have

$$\hat{z}(p_1) = \frac{-4c\alpha^*\beta^* + p_1 - 4a\alpha^* - 4b\beta^*}{4b\beta^*}.$$

Similarly, if $\hat{x} < \tilde{y}$, type $\hat{x}$ actually prefers $(\ell,1)$ to $(r,1)$. Thus the relevant market for Firm 1 is determined by the indifferent type $\tilde{z}$ such that $U(\ell,1,\tilde{z}) = U(\ell,2,\tilde{z})$. At a symmetric equilibrium with $p_2 = \hat{p}_2$, we have

$$\tilde{z}(p_1) = \frac{4c\alpha^*\beta^* + p_1 - 4a\alpha^* - 4b\beta^*}{4b\beta^*}.$$

The demand for Firm 1's news products, taking p_2 fixed at $\hat{p}_2$, has two kinks:

$$D_1(p_1) = \begin{cases} \frac{1-\tilde{z}(p_1)}{2} & \text{if } p_1 < \tilde{q}_1, \\ \frac{1-\hat{x}(p_1,\hat{p}_2)}{2} & \text{if } p_1 \in [\tilde{q}_1, \hat{q}_1], \\ \frac{1-\hat{z}(p_1)}{2} & \text{if } p_1 > \hat{q}_1, \end{cases}$$

where $\tilde{q}_1$ and $\hat{q}_1$ satisfy $\hat{x}(\tilde{q}_1,\hat{p}_2) = \tilde{y}$ and $\hat{x}(\hat{q}_1,\hat{p}_2) = \hat{y}$, respectively.

Because $\pi_1(\cdot,\hat{p}_2)$ is locally concave on $[\tilde{q}_1,\hat{q}_1]$, firm 1 has no incentive to deviate to any $p_1' \neq \hat{p}_1$ in this range. Firm 1 has no incentive to deviate to $p_1' > \hat{q}_1$ either, because the demand $(1-\hat{z}(p_1'))/2$ is even lower than $(1-\hat{x}(p_1',\hat{p}_2))/2$. However, it may have an incentive to deviate to some $p_1' < \tilde{q}_1$. To consider this type of deviation, note that p_1' must be within the feasible range:

$$\mathscr{P} = [4a\alpha^*(1-c\beta^*/a), 4(a\alpha^* + b\beta^*)(1-c\beta^*/a)],$$

because $\tilde{z}(p_1')$ would exceed $-c\beta^*/a$ or fall below -1 otherwise. Let

$$p_1' = \arg\max_{p_1 \in \mathscr{P}} \frac{p_1(1-\tilde{z}(p_1))}{2}.$$

Because the maximization problem is concave, we have

$$p_1' = \begin{cases} 4a\alpha^*(1-c\beta^*/a) & \text{if } a\alpha^*(1-c\beta^*/a) > 2b\beta^*, \\ 4b\beta^* + 2a\alpha^*(1-c\beta^*/a) & \text{if } a\alpha^*(1-c\beta^*/a) \in [2b\beta^*(c\beta^*/a), 2b\beta^*], \\ 4(a\alpha^* + b\beta^*)(1-c\beta^*/a) & \text{if } a\alpha^*(1-c\beta^*/a) < 2b\beta^*(c\beta^*/a). \end{cases}$$

We note that $p_1' < \hat{p}_1$.

The associated level of profit is:

$$\pi_1^{cp}(p_1', \hat{p}_2) = \begin{cases} 4a\alpha^*(1-c\beta^*/a) & \text{if } a\alpha^*(1-c\beta^*/a) > 2b\beta^*, \\ \frac{(2b\beta^*+a\alpha^*(1-c\beta^*/a))^2}{2b\beta^*} & \text{if } a\alpha^*(1-c\beta^*/a) \in [2b\beta^*(c\beta^*/a), 2b\beta^*], \\ 2(a\alpha^*+b\beta^*)(1-c\beta^*/a)^2 & \text{if } a\alpha^*(1-c\beta^*/a) < 2b\beta^*(c\beta^*/a), \end{cases}$$

where we use the superscript "cp" to indicate that some consumers are engaging in cross-platform behavior.

We now show that the equilibrium profits,

$$\pi_1(\hat{p}_1, \hat{p}_2) = 2(a\alpha^* + b\beta^*),$$

always exceed $\pi_1^{cp}(p_1', \hat{p}_2)$.

Case (i). $a\alpha^*(1-c\beta^*/a) > 2b\beta^*$. By Lemma 1, $c\beta^*/a \geq 1/3$. Therefore, $a\alpha^*(1-c\beta^*/a) \leq 2a\alpha^*/3 < 2a\beta^*/3 \leq 2b\beta^*$, where the last inequality follows from $a \leq 3b$. Hence, this case never arises under the assumed conditions.

Case (ii). $a\alpha^*(1-c\beta^*/a) \in [2b\beta^*(c\beta^*/a), 2b\beta^*]$. In this case,

$$\begin{aligned} \pi_1(\hat{p}_1, \hat{p}_2) - \pi_1^{cp}(p_1', \hat{p}_2) &= \frac{a\alpha^*}{2b\beta^*}\left(4b\beta^*(c\beta^*/a) - a\alpha^*(1-c\beta^*/a)^2\right) \\ &\geq \frac{(a\alpha^*)^2(1-c\beta^*/a)}{2b\beta^*}\left(2c\beta^*/a - (1-c\beta^*/a)\right) \geq 0, \end{aligned}$$

where the first inequality follows from the condition for case (ii) to apply, and the second inequality follows from Lemma 1.

Case (iii). $a\alpha^*(1-c\beta^*/a) < 2b\beta^*(c\beta^*/a)$. In this case,

$$\pi_1(\hat{p}_1, \hat{p}_2) - \pi_1^{cp}(p_1', \hat{p}_2) = 2(a\alpha^* + b\beta^*)\left(1-(1-c\beta^*/a)^2\right) > 0.$$

Hence, Firm 1 has no incentive to deviate from its equilibrium price $\hat{p}_1$.

Media firms' location

Consider the symmetric equilibrium with positions $(\alpha^*, \beta^*, -\alpha^*, -\beta^*)$. We study the incentive of Firm 1 to unilaterally deviate to some other position Q.

In order to do this, we need to derive the payoff in the pricing subgame when the positions are $(\alpha^*, Q, -\alpha^*, -\beta^*)$. Assuming that the equilibrium in the pricing subgame involves pure strategies, there are three possibilities. (a) The two media firms charge prices such that there is no cross-platform behavior, with citizens between $[-1, \tilde{x}]$ choosing $(\ell, 2)$ and those between $[\tilde{x}, 1]$ choosing $(r, 1)$. (b) Firm 1 is "aggressive" and prices are such that, in equilibrium, citizens between $[-1, \tilde{z}]$ choose $(\ell, 2)$, while those between $[\tilde{z}, 1]$ choose either $(\ell, 1)$ or $(r, 1)$. (c) Firm 2 is "aggressive" and prices are such that citizens between $[-1, \hat{z}]$ choose either $(\ell, 2)$ or $(r, 2)$, and citizens between $[\hat{z}, 1]$ choose $(r, 1)$.

Case (a). For this case to occur, we must have $U(r, 2, \tilde{x}) < U(\ell, 2, \tilde{x})$ and $U(\ell, 1, \tilde{x}) < U(r, 1, \tilde{x})$. This requires

$$-\frac{cQ}{a} < \tilde{x} < \frac{c\beta^*}{a}.$$

If the prices in the subgame are interior, the cutoff consumer is given by

$$\tilde{x}(Q) = \frac{(b+c)(Q^2 - (\beta^*)^2) - 2c\alpha^*(Q - \beta^*)}{6(2a\alpha^* + b(Q + \beta^*))}.$$

Note that

$$\tilde{x}'(Q) = \frac{(b+c)Q - c\alpha^* - 3b\tilde{x}}{3(2a\alpha^* + b(Q + \beta^*))},$$

$$\tilde{x}''(Q) = \frac{4\alpha(ab + ac + bc)(a\alpha^* + b\beta^*)}{3(2a\alpha^* + b(Q + \beta^*))^3}.$$

Thus, the function $\tilde{x}(Q)$ is convex. Furthermore, $\tilde{x}(\beta^*) = 0$ and $\tilde{x}'(\beta^*) > 0$. The convexity of $\tilde{x}(Q)$ then implies that $\tilde{x}(Q) > 0$ and $\tilde{x}'(Q) > 0$ for all $Q > \beta^*$.

Firm 1's payoff in this case is

$$\Pi_1(Q) = q(2a\alpha^* + b(Q + \beta^*))(1 - \tilde{x})^2 - tQ^2.$$

Take the derivative of this objective function, and use the first-order condition (9) that characterizes β^* to obtain:

$$\Pi_1'(Q) = \frac{Q - \beta^*}{3}\left[qH(Q) - 6t\right],$$

where

$$H(Q) \equiv \frac{\tilde{x}(Q)}{Q - \beta^*}(2(b+c)Q - 2c\alpha^* - 3b\tilde{x}(Q)) - 2(b+c).$$

We establish the following result.

Lemma 2. *For all $Q \geq 0$ and $Q \neq \beta^*$, $H(Q) < 0$.*

Proof. (i) Suppose $Q > \beta^*$. Let

$$h(Q) \equiv 2(b+c)Q - 2c\alpha^* - 3b\tilde{x}(Q) = 6(2a\alpha^* + b(Q+\beta^*))\tilde{x}'(Q) + 3b\tilde{x}(Q),$$

which is positive because $\tilde{x}'(Q) > 0$ and $\tilde{x}(Q) > 0$. Furthermore,

$$\frac{\tilde{x}(Q)}{Q-\beta^*} = \frac{(b+c)(Q+\beta^*) - 2c\alpha^*}{6(2a\alpha^* + b(Q+\beta^*))} < \frac{b+c}{6b}.$$

Therefore,

$$H(Q) < \frac{b+c}{6b}(2(b+c)Q - 2c\alpha^* - 3b\tilde{x}(Q)) - 2(b+c) < \frac{2(b+c)}{6b}((b+c)Q - 6b),$$

which is negative because $Q \leq 1$ and $c \leq 3b$.

(ii) Suppose $Q < [Q_1, \beta^*)$, where $\tilde{x}'(Q_1) = 0$. The term $h(Q) = 2(b+c)Q - 2c\alpha^* - 3b\tilde{x}(Q)$ is concave in Q and its derivative is positive at $Q = \beta^*$. Thus, $h(Q)$ is monotone increasing for all $Q \in [Q_1, \beta^*)$. Moreover, $h(\beta^*) = 6(2a\alpha^* + b(Q+\beta^*))\tilde{x}'(\beta^*) > 0$ and $h(Q_1) = 3b\tilde{x}(Q_1) < 0$. Therefore, there exists $\hat{Q}$ such that $h(Q) > 0$ for $Q \in (\hat{Q}, \beta^*)$ and $h(Q) < 0$ for $Q \in [Q_1, \hat{Q})$.

For $Q \in [\hat{Q}, \beta^*)$, we have $0 < h(Q) < h(\beta^*)$. Therefore,

$$H(Q) < \frac{\tilde{x}(Q)}{Q-\beta^*}h(\beta^*) - 2(b+c) < \frac{2(b+c)}{6b}((b+c)\beta^* - 6b) < 0.$$

For $Q \in [Q_1, \hat{Q})$, we have $\tilde{x}(Q) < 0$ and $h(Q) < 0$. Therefore, $H(Q) = \tilde{x}(Q)h(Q)/(Q - \beta^*) - 2(b+c) < 0$.

(iii) Suppose $Q \in [Q_2, Q_1)$, where $\tilde{x}(Q_2) = 0$. In this region, we have $\tilde{x}(Q) \leq 0$ and $h(Q) < 0$. Therefore, $H(Q) < 0$ as before.

(iv) Suppose $Q \in [0, Q_2)$. In this case, $\tilde{x}(Q) > 0$ and $h(Q) < 0$. Since $\tilde{x}(Q)$ is decreasing in this region,

$$\tilde{x}(Q) \leq \tilde{x}(0) = \beta^* \frac{2c\alpha^* - (b+c)\beta^*}{6(2a\alpha^* + b\beta^*)} < \beta^* \frac{c\alpha^* - b\beta^*}{6(2a\alpha^* + b\beta^*)} < \frac{\beta^*}{3},$$

because $c \leq 3b$ and $\alpha^* < \beta^*$. Therefore,

$$\begin{aligned} H(Q) &= \frac{1}{\beta^* - Q} \left(\tilde{x}(Q) \left(2c\alpha^* + 3b\tilde{x}(Q) - 2(b+c)Q\right) - 2(b+c)(\beta^* - Q) \right) \\ &< \frac{1}{\beta^* - Q} \left(\frac{\beta^*}{3} (2c\alpha^* + b\beta^* - 2(b+c)Q) - 2(b+c)(\beta^* - Q) \right) \\ &< 2(b+c)\left(\frac{\beta^*}{3} - 1 \right) < 0 \end{aligned}$$

■

From Lemma 2, it follows that $\Pi_1'(Q) > 0$ for $Q \in [0, \beta^*)$ and $\Pi_1'(Q) < 0$ for $Q > \beta^*$. Thus, the profit function is quasiconcave in Q and reaches a maximum at $Q = \beta^*$. Firm 1 has no incentive to deviate to any Q for which case (a) applies.

Case (b). For this case to arise, we require $U(\ell, 1, \tilde{z}) \geq U(r, 1, \tilde{z})$, which is equivalent to

$$\tilde{z} \leq -cQ/a.$$

In case (b), the marginal news consumer is determined by the condition $U(\ell, 1, z) = U(\ell, 2, z)$, which gives

$$z(p_1, p_2) = \frac{(b+c)(Q^2 - (\beta^*)^2) + 2c\alpha^*(Q + \beta^*) + p_1 - p_2}{2b(Q + \beta^*)}.$$

If the prices in the subgame are interior, the Nash equilibrium prices are

$$\begin{aligned} \tilde{p}_1 &= 2b(Q + \beta^*) \left(1 - \frac{(b+c)(Q - \beta^*) + 2c\alpha^*}{6b} \right), \\ \tilde{p}_2 &= 2b(Q + \beta^*) \left(1 + \frac{(b+c)(Q - \beta^*) + 2c\alpha^*}{6b} \right). \end{aligned}$$

Substituting these values into the marginal news consumer gives

$$\tilde{z}(Q) = \frac{(b+c)(Q - \beta^*) + 2c\alpha^*}{6b}.$$

The deviation payoff to Firm 1 is:

$$\tilde{\Pi}_1^{cp}(Q) = qb(Q + \beta^*)(1 - \tilde{z}(Q))^2 - tQ^2,$$

whereas its equilibrium payoff is $\Pi_1^* = q(2a\alpha^* + 2b\beta^*) - t\beta^{*2}$.

Whenever $Q \geq \beta^*$, we have $\tilde{z}(Q) > -cQ/a$, which means that case (b) does not apply. Therefore, we only need to consider deviations for which $Q \in [0, \beta^*)$. Furthermore, if

$\tilde{z}(0) > 0$, then $\tilde{z}(Q) > -cQ/a$ for all $Q \in [0, \beta^*)$, which violates the condition for this case to be valid. We therefore assume that $\tilde{z}(0) \le 0$. Given this assumption, there exists $\hat{Q} < \beta^*$ such that $\tilde{z}(Q) \le 0$ if and only if $Q \le \hat{Q}$. We therefore further restrict our attention to the region $Q \in [0, \hat{Q}]$.

Because $Q \le \hat{Q}$ and $0 \ge \tilde{z}(Q) \ge \tilde{z}(0)$, we have

$$\tilde{\Pi}_1^{cp}(Q) \le qb(\hat{Q} + \beta^*)(1 - \tilde{z}(0))^2,$$

Further, because the first-order condition (11) implies $a\alpha^* > c(\beta^* - \alpha^*)$,

$$\tilde{z}(0) = \frac{2c\alpha^* - (b+c)\beta^*}{6b} > \frac{-b\beta^* + c\alpha^* - a\alpha^*}{6b} \ge \frac{-\beta^*}{6},$$

where the last inequality follows from $a \le c$. Moreover, $\tilde{z}(Q) \le -cQ/a$ implies

$$Q \le \frac{a\left((b+c)\beta^* - 2c\alpha^*\right)}{a(b+c) + 6bc} \le \frac{ab\beta^*}{a(b+c) + 6bc} \le \frac{b\beta^*}{7b + c} \le \frac{\beta^*}{7},$$

where the second and third inequalities both follow because $a \le c$. Combining these results gives

$$\tilde{\Pi}_1^{cp}(Q) \le qb\left(\frac{8}{7}\right)\left(\frac{7}{6}\right)^2 \beta^{*2} = \frac{56}{36} qb\beta^{*2}.$$

On the other hand, Assumption 1 implies that

$$\Pi_1^* \ge q(2b\beta^*) - \frac{qb}{6}\beta^* = \frac{66}{36} qb\beta^*.$$

Hence, the equilibrium payoff is greater than the deviation payoff.

Case (c). For this case to be valid, we must have $U(r, 2, \hat{z}) \ge U(\ell, 2, \hat{z})$ for the marginal news consumer $\hat{z}$. This is equivalent to

$$\hat{z} \ge \frac{c\beta^*}{a}.$$

The cutoff type z is determined by the condition that $U(r, 2, z) = U(r, 1, z)$. The demand function is given by

$$z(p_1, p_2) = \frac{(b+c)(Q^2 - (\beta^*)^2) - 2c\alpha^*(Q + \beta^*) + p_1 - p_2}{2b(Q + \beta^*)}.$$

If the prices in the subgame are interior, the Nash equilibrium prices are

$$\hat{p}_1 = 2b(Q + \beta^*) - \frac{(b+c)(Q^2 - \beta^{*2}) - 2c\alpha^*(Q + \beta^*)}{3},$$

$$\hat{p}_2 = 2b(Q + \beta^*) + \frac{(b+c)(Q^2 - \beta^{*2}) - 2c\alpha^*(Q + \beta^*)}{3}.$$

Substituting these values into the demand function gives

$$\hat{z}(Q) = \frac{(b+c)(Q-\beta^*) - 2c\alpha^*}{6b}.$$

We note that $\hat{z}(Q)$ is increasing in Q, with $\hat{z}(\beta^*) < c\beta^*/a$. Therefore, for case (c) to be valid, we must have $Q > \beta^*$.

Firm 1's payoff is:

$$\hat{\Pi}_1^{cp}(Q) = qb(Q+\beta^*)(1-\hat{z}(Q))^2 - tQ^2.$$

Because $\beta^* < Q \leq 1$ and $\hat{z}(Q) \geq c\beta^*/a \geq 1/3$ (by Lemma 1), we have

$$\hat{\Pi}_1^{cp}(Q) \leq qb(1+\beta^*)\left(\frac{2}{3}\right)^2 - tQ^2.$$

On the other hand,

$$\Pi_1^* > qb(2\beta^*) - t\beta^{*2}.$$

Since $Q > \beta^*$ implies $-tQ^2 < -t\beta^{*2}$, it suffices to show that

$$2\beta^* \geq (1+\beta^*)\frac{4}{9},$$

which is equivalent to $\beta^* > 2/7$. But we have already established in Lemma 1 that $\beta^* \geq 3b/(3b+2c)$. So $c \leq 3b$ implies $\beta^* \geq 1/3 > 2/7$. This proves that $\Pi_1^* > \hat{\Pi}_1^{cp}(Q)$ for any Q, in which case (c) is valid.

Political parties' location

Consider the symmetric equilibrium with positions $(\alpha^*, \beta^*, -\alpha^*, -\beta^*)$. We study the incentive for Party r to unilaterally deviate to some other position R.

In order to do this, we need to derive the payoff in the pricing subgame when the positions are $(R, \beta^*, -\alpha^*, -\beta^*)$. Assuming that the equilibrium in the pricing subgame involves pure strategies, there are three possibilities. (a) The two media firms charge prices such that there is no cross-platform behavior, with citizens between $[-1, \tilde{x}]$ choosing $(\ell, 2)$ and those between $[\tilde{x}, 1]$ choosing $(r, 1)$. The cutoff voter who supports Party r is $\tilde{x}$. (b) Firm 1 is "aggressive" and prices are such that, in equilibrium, citizens between $[-1, \tilde{z}]$ choose $(\ell, 2)$, while those between $[\tilde{z}, 1]$ choose either $(\ell, 1)$ or $(r, 1)$. The cutoff voter is determined by the type $\tilde{y}$ such that $U(\ell, 1, \tilde{y}) = U(r, 1, \tilde{y})$. Note that $\tilde{y} > \tilde{z}$. (c) Firm 2 is "aggresive" and prices are such that citizens between $[-1, \hat{z}]$ choose either $(\ell, 2)$ or $(r, 2)$, and citizens between $[\hat{z}, 1]$ choose $(r, 1)$. The cutoff voter is determined by the type $\hat{y}$ such that $U(\ell, 2, \hat{y}) = U(r, 2, \hat{y})$. Note that $\hat{y} < \hat{z}$.

Case (a). For this case to occur, we must have $U(r, 2, \tilde{x}) < U(\ell, 2, \tilde{x})$ and $U(\ell, 1, \tilde{x}) < U(r, 1, \tilde{x})$. This requires

$$\frac{(a+c)(R-\alpha^*)-2c\beta^*}{2a} < \tilde{x} < \frac{(a+c)(R-\alpha^*)+2c\beta^*}{2a}.$$

If the prices in the subgame are interior, then the marginal citizen is

$$\tilde{x}(R) = \frac{(a+c)(R^2-(\alpha^*)^2)-2c\beta^*(R-\alpha^*)}{6\left(a(R+\alpha^*)+2b\beta^*\right)}.$$

Note that

$$\tilde{x}'(R) = \frac{2(a+c)R-2c\beta^*-6a\tilde{x}}{6(a(R+\alpha^*)+2b\beta^*)},$$
$$\tilde{x}''(R) = \frac{2\beta^*(2a\alpha^*+b\beta^*)((a+c)b+ac)}{3(a(R+\alpha^*)+2b\beta^*)^3}.$$

Thus, $\tilde{x}(R)$ is convex.

The payoff to Party r is

$$\Phi_r(R) = \left(\rho-\delta(1-R)^2\right)\left(\frac{1}{2}-\frac{q\tilde{x}(R)}{2(1-q)}\right).$$

Therefore,

$$\Phi_r'(R) = -\left(\rho-\delta(1-R)^2\right)\frac{q}{2(1-q)}\tilde{x}'(R)+2\delta(1-R)\left(0.5-\frac{q\tilde{x}(R)}{2(1-q)}\right),$$
$$\Phi_r''(R) = -\left(\rho-\delta(1-R)^2\right)\frac{q}{2(1-q)}\tilde{x}''(R)-4\delta(1-R)\frac{q}{2(1-q)}\tilde{x}'(R)-2\delta\left(0.5-\frac{q\tilde{x}(R)}{2(1-q)}\right).$$

Note that $\tilde{x}'(R) > 0$ when $\Phi_1'(R) = 0$. Moreover, because $\tilde{x}(R)$ is convex, we have $\Phi_1''(R) < 0$ when $\Phi_1'(R) = 0$. This means that $\Phi_r(R)$ is quasi-concave in R. Since we have already established that $R = \alpha^*$ is a stationary point, this implies $\Phi_r(\alpha^*) > \Phi_r(R)$ for any R in the relevant region. Thus, Party r has no incentive to deviate from its policy platform whenever case (a) is valid.

Case (b). The cutoff voter type $\tilde{y}$ satisfies $U(r, 1, \tilde{y}) = U(\ell, 1, \tilde{y})$, which gives

$$\tilde{y}(R) = \frac{(a+c)(R-\alpha^*)-2c\beta^*}{2a}.$$

Since $\tilde{x}(\alpha^*) > \tilde{y}(\alpha^*)$ and $\tilde{x}'(\alpha^*) < \tilde{y}'(\alpha^*)$, the convexity of $\tilde{x}(R)-\tilde{y}(R)$ implies that $\tilde{x}(R) > \tilde{y}(R)$ for all $R \le \alpha^*$. There are two possible cases. (i) If $\tilde{x}(1) > \tilde{y}(1)$, then case (b) is never relevant. (ii) If $\tilde{x}(1) \le \tilde{y}(1)$, then there exists $\tilde{R} \in (\alpha^*, 1]$ such that case (b) is valid for $R \ge \tilde{R}$. Since $\tilde{x}(R)$ crosses $\tilde{y}(R)$ from above, we have $\tilde{x}(\tilde{R}) \le \tilde{y}(\tilde{R})$ for $R \ge \tilde{R}$. This implies that, for $R \ge \tilde{R}$, we have $\tilde{\Phi}_1^{cp}(R) \le \Phi_r(R) < \Phi_r(\alpha^*)$. Therefore, Party r cannot gain by deviating to any policy platform $R \in [\tilde{R}, 1]$.

Case (c). The cutoff voter type $\hat{y}$ satisfies $U(\ell, 2, \hat{y}) = U(r, 2, \hat{y})$, which gives

$$\hat{y}(R) = \frac{(a+c)(R-\alpha^*) + 2c\beta^*}{2a}.$$

We can verify that $\hat{y}(1) - \tilde{x}(1) > 0$. Furthermore, note that

$$\hat{y}(0) = \frac{2c\beta^* - (a+c)\alpha^*}{2a},$$
$$\tilde{x}(0) = \alpha^* \frac{2c\beta^* - (a+c)\alpha^*}{6(a\alpha^* + 2b\beta^*)}.$$

Because $a \le c$, we have $\hat{y}(0) > \tilde{x}(0) > 0$. The concavity of $\hat{y}(R) - \tilde{x}(R)$ then implies that $\hat{y}(R) - \tilde{x}(R) > 0$ for all $R \in [0, 1]$. Therefore, case (c) does not apply.