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ABSTRACT: We build a framework linking competition in the media market to political participation. Media outlets report on the ability of candidates running for office and compete for audience through their choice of slant. Citizens consume news only if the expected utility of being informed about candidates' ability is sufficiently large for their group collectively. Our results can reconcile seemingly contradictory empirical evidence showing that entry in the media market can either increase or decrease turnout. While information pushes up independent turnout, partisans adjust their turnout to the ability of their preferred candidate, and on average they vote less when informed.

JEL Codes: D72, L82

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1 Introduction

Both theory and evidence have identified information as a key determinant of whether people participate in elections (Feddersen and Pesendorfer, 1996; Lassen, 2005; Larcinese, 2007). Because the media are an important source of political information for many people, there is reason to believe that media markets play a role in shaping turnout. A string of recent empirical papers, highlighting the connection between media markets and political participation, supports this view (e.g., DellaVigna and Kaplan, 2007; Enikolopov et al., 2011; Gentzkow et al., 2011; George and Waldfogel, 2008). Yet, the theoretical literature on the media has glossed over the question of turnout, either assuming that everybody votes or abstracting from the voting decision altogether.

The aim of this paper is to take a first step toward filling this gap. We ask how competition in the media market affects political participation, and how this impacts the selection of politicians. To address these questions, we develop a parsimonious framework in which both the decision to consume political news and the decision to vote are endogenously determined. Our results are consistent with empirical findings for the United States according to which media entry leads to higher turnout: Strömberg (2004b) (studying radio penetration), Oberholzer-Gee and Waldfogel (2009) (access to Spanish language news and Hispanic voter turnout), and Gentzkow et al. (2011) (entries and exits in local newspaper markets) consistently report a positive effect of media entry on turnout.¹ Performing an analysis similar to Gentzkow et al. (2011), Drago et al. (Forthcoming) also report a positive effect for Italy.² Our model identifies one driving force for turnout to increase: entry allows some voters who are previously undecided between candidates, and hence abstain, to gather information helping them decide which candidate to vote for.

We also derive a second, more subtle force, however. For partisan voters, who know their preference over candidates and vote even when uninformed, information can in fact reduce turnout. We assume that, although partisan voters know which candidate they prefer, they do not know the intensity of their preference, which depends on the candidate's ability. Compared to the case where they remain uninformed about their preferred candidate, higher than expected ability increases partisan turnout, while lower than expected ability decreases it. The effect on average turnout can be negative. This result can explain contradictory evidence as to the effect of entry on turnout from other countries: Enikolopov et al. (2011)

¹Although Gentzkow (2006) finds that the introduction of television decreased turnout, he attributes this to a crowding out effect, whereby consumers substituted television for other media with more political coverage such as newspapers and radio. As discussed below, in our model this corresponds to an increase in the opportunity cost of consuming news.

²Barone et al. (2012) study the introduction of digital terrestrial television in Italy but do not find a significant effect on turnout.

show that exposure to an independent TV news channel decreased turnout in Russia, and Cagé (2014) finds that newspaper competition had a negative effect on voter participation in France.

Because the negative effect arises only for partisans, while the positive effect arises for independents, our model predicts that entry will be positively correlated with turnout in countries with little polarisation but negatively correlated in more polarised countries. Lindqvist and Östling (2010) measure polarisation using standard deviations in the responses to four questions from the World Values Survey (WVS), eliciting people’s views on equality, private ownership, government responsibility, and competition. Russia is more polarised than France, Italy, and the U.S. on all four dimensions. Moreover, while the three Western countries display very similar levels of polarisation on two dimensions (namely, views on private ownership and government responsibility), France is more polarised than Italy and the U.S. on the two others (views on equality and competition). These observations are in line with the results from our model.

In the model presented below, two candidates compete for election. Some citizens prefer candidate A, while others prefer candidate B (*partisans* of A and B, respectively). A third group of citizens cares only about the candidates’ ability (*independents*). Which candidate has higher ability depends on the state of the world. Although partisans know which candidate they prefer, the state of the world is relevant for them as well, as it determines the payoff they obtain when their preferred candidate is elected. Citizens are initially uninformed about the state of the world but can become informed by consuming news.

There is a market for news in which profit-maximising media outlets compete for audience. Media outlets receive a perfectly informative signal about the state of the world, which they can report either with or without slant. Citizens differ in their preferences over slant. Following Mullainathan and Shleifer (2005), we assume that partisans prefer news presented with a slant favourable to their preferred candidate, perhaps because they like to see their own beliefs confirmed. This demand-driven view of media slant has found empirical support (George and Waldfogel, 2003; Gentzkow and Shapiro, 2010; Hopkins and Ladd, 2012; Larcinese et al., 2011).³ Independents have no preferences over slant. All citizens are rational; hence, they can filter the reporting slant of the outlet they consume to recover the information contained in its news.⁴

³On a similar tone, Durante and Knight (2012) find that a change in the slant of Italian public television produced a shift in consumption, which can be interpreted as a desire of viewers to consume news with the same slant as before.

⁴An alternative approach would be to assume that media outlets suppress information, and that citizens cannot fully recover the suppressed information, as, for example, in Anderson and McLaren (2012). Appendix A provides an extension in which outlets do not always receive a signal about the state of the world and can decide not to publish it when they do.

Explaining why people demand information about politics is less than straightforward.⁵ In this paper, we employ a rule-utilitarian approach, pioneered by Harsanyi (1977, 1980) and developed into a theory of ethical voting by Coate and Conlin (2004) and Feddersen and Sandroni (2006a,b), to generate demand for political news. The electorate is divided into the three homogeneous groups mentioned above. Each citizen considers what would occur if all members of her group behaved according to the same rule. Ethical citizens derive a benefit from choosing the rule which, if followed by all other citizens in their group, produces the best outcome for the group, given the behaviour of the other groups of citizens. Because the group as a whole may benefit from its members being informed, this allows us to endogenously derive the demand for news and link it to the decision to vote. In our context, a rule of ethical behaviour comprises both a media outlet to consume and a cutoff on the voting cost below which citizens should cast their ballot. Citizens compare the merits of different rules of behaviour. Becoming informed is collectively optimal, and thus part of ethical behaviour, if the group's gain from being informed exceeds the opportunity cost of consuming news.

The effect of entry on turnout depends not only on how information affects each group's turnout, but also on which groups become informed, which, in turn, depends partly on the equilibrium reporting strategies of media outlets. We show that a group's gain from being informed and the probability that at least one outlet reports with a slant that is palatable to group members are both increasing in the size of the group. As a result, the relative size of partisans and independents determines the impact of entry on turnout. The larger the share of partisans, the more likely it is that entry leads partisans to become informed, reducing turnout; the larger the share of independents, the more likely it is that entry leads independents to become informed, raising turnout. If both partisans and independents become informed, the net effect is ambiguous but more likely to be positive when there are more independents.

We also show that competition in the media market often leads to more supply and consumption of slanted news, as additional media outlets try to grab market share by catering to specific groups of citizens. This is consistent with the Fox News effect reported by DellaVigna and Kaplan (2007). Despite the rise in slant that competition entails, it also enhances the probability that the more able candidate wins the election. Entry of additional outlets leads to greater overall news consumption, and when informed, both partisans and independents adjust their turnout in a way that favours the higher-ability candidate. Independents who cast their ballot always vote for the more able candidate. Partisans vote in greater numbers when their preferred candidate has high ability, and stay home more often when their

⁵ The instrumental benefit from becoming informed equals the gain from swinging the election in favour of the preferred candidate. Because in large electorates a single vote is unlikely to be pivotal, rational non-rule-utilitarian citizens have little incentive to become informed (Downs, 1957).

candidate has low ability.

Related literature. The paper contributes to a recent and rapidly developing literature that looks into the role of the media in providing information to the public and shaping political outcomes. A first strand of this literature focuses on identifying the sources of media bias, without investigating its impact on the political process (Mullainathan and Shleifer, 2005; Baron, 2006; Gentzkow and Shapiro, 2006; Ellman and Germano, 2009; Oliveros and Várdy, 2012; Sobbrío, forthcoming).⁶ Competition among media outlets is found to have ambiguous effects on the magnitude of bias, depending on its source; see Gentzkow and Shapiro (2008) for an overview.

Our paper is more closely related to a second strand of the literature which examines the effects of the media on political outcomes. Strömberg (2004a) shows that the media will deliver more information on topics that are of interest to larger groups in society, thus enabling these groups to better hold politicians accountable than smaller groups.⁷ Besley and Prat (2006) study media capture and show that competition decreases the government's ability to silence the media.⁸ Chan and Suen (2008) analyse the ideological positioning of media outlets in a setting where news reporting is constrained to be coarse and citizens choose the most informative outlet. They show that competition leads to less partisan policies being adopted and tends to increase voters' welfare. Bernhardt et al. (2008) and Anderson and McLaren (2012) allow media outlets to suppress information relevant to the voters' decision, which can adversely affect the electoral outcome. In Bernhardt et al., suppression occurs because consumers dislike hearing negative news about their preferred candidate. In Anderson and McLaren, suppression occurs because media owners have political motives in addition to profit motives. Duggan and Martinelli (2011) model media slant as a projection from a multi-dimensional policy space to a one-dimensional news space. They show that partisan media, whose aim is to get a particular candidate elected, can be better for voters than balanced media.

None of these papers allow for variation in turnout; they all assume that voting is costless

⁶The explanations put forward include preferences for confirmatory news on the part of consumers (Mullainathan and Shleifer, 2005), outlets seeking to build a reputation for accuracy (Gentzkow and Shapiro, 2006), journalists' lower wage demands when given the discretion to bias reporting (Baron, 2006), coarseness of news reporting making like-minded outlets more informative (Chan and Suen, 2008), advertisers' distaste for accurate reporting on sensitive topics (Ellman and Germano, 2009), and the endogenous information acquisition strategy of its citizen-editor (Sobbrío, forthcoming). In Oliveros and Várdy (2012), voters have heterogeneous priors on the state of the world. Although this creates a demand for slanted news, voters tend to demand news that is more centrist than they are.

⁷See Snyder and Strömberg (2010) for evidence that media coverage enhances political accountability.

⁸Corneo (2006) and Petrova (2008) study media capture by interest groups. Fergusson et al. (2013) show that, conversely, free media are no guarantee of political accountability when other institutions are weak, so that candidates can coerce voters into supporting them.

and that everybody votes.⁹ Thus, they cannot explain the empirical evidence regarding the effect of media competition on turnout. Our analysis yields results that are consistent with the empirically observed relationship. It also highlights a different reason why accounting for turnout in models of the media market is important. We stress that media competition can enhance the likelihood that the better candidate is elected even in a world where everyone knows their preferred candidate and all media are biased. This relies on the modelling feature that each partisan group's turnout reacts to candidate ability.¹⁰

A separate literature examines the relationship between information and turnout, without modelling media markets. In a decision-theoretic framework, Matsusaka (1995) endogenises information acquisition and turnout by assuming that voters obtain positive utility from voting for the right candidate and negative utility from voting for the wrong one. Similarly, Degan (2006) models the cost of voting as increasing in the probability of making a mistake. Feddersen and Sandroni (2006a) apply the rule-utilitarian approach to information acquisition, but do not allow partisans to acquire information. In these models, voting is costly, and turnout is positively related to information both at an individual and aggregate level.

An alternative approach, due to Feddersen and Pesendorfer (1996), is to assume that voting is costless; yet in a game-theoretic framework voters may abstain strategically if they lack information. Building on this approach, McMurray (2013) and Oliveros (2013) identify mechanisms through which information can be negatively related to turnout (as it is for partisans in our model). In McMurray (2013), citizens differ in the quality of their information, and those with relatively low expertise abstain. Thus, increasing one citizen's quality of information makes other citizens more likely to abstain. In Oliveros (2013), voters share a common preference over candidates that depends on the state of nature but differ in the disutility from electoral mistakes. Some voters who know which candidate they prefer *ex ante* nevertheless abstain after collecting information that contradicts their *ex ante* preference. We provide an alternative rationale for a negative relationship between information and turnout, which is due to partisan voters adjusting their turnout to the importance of winning the election.¹¹

⁹Moreover, they assume that citizens' demand for news stems from consumption utility or a private-decision motive. Note that the private-decision motive can explain why media supply political news only if the information relevant for the private decision overlaps with the information relevant for the public decision (voting). An exception is Sobbrío (forthcoming), who assumes that voting is costless but that voters are willing to bear the cost of becoming informed because they behave as if they were pivotal.

¹⁰In a similar spirit, Oliveros and Várdy (2012) emphasise that allowing for abstention considerably changes the predictions generated by models of the media market.

¹¹Also in this vein is work by Cagé (2014) who, in addition to her empirical results, proposes a theoretical model in which the media compete on quality and price. Similarly to Matsusaka (1995), citizens' utility depends on whether they voted for the right candidate, hence voters abstain when they are not sufficiently well informed. Cagé shows that if consumers are homogeneous enough in their willingness to pay for quality news, competition pushes quality down, reducing the consumers' level of information and decreasing their

Structure of the paper. The remainder of the paper is organised as follows. Section 2 sets out the model. Section 3 derives the equilibrium, starting from citizens' decision to vote and working back to the media outlets' choice of reporting strategies. Section 4 characterises the effect of entry in the media market on turnout, slant, and selection of politicians. Finally, Section 5 concludes. All proofs are relegated to Appendix C.

2 The model

Two alternative candidates A and B compete for election. Their ability depends on the state of the world S , which can be either A or B . If $S = A$ then candidate A 's ability is $w_A = \bar{w}$ and candidate B 's ability is $w_B = \underline{w}$, while if $S = B$ then $w_A = \underline{w}$ and $w_B = \bar{w}$, with $\bar{w} > \underline{w} > 0$.¹² Both states are equally likely. Citizens do not observe the state of the world and have to consume political news to learn about it. Let $w^e \equiv (\bar{w} + \underline{w})/2$ denote the expected ability of a candidate.

The population, of unit mass, is composed of three types of citizens $i \in \{A, B, I\}$: partisans of candidate A , partisans of candidate B , and independents. Let ρ_i denote the fraction of the population that belongs to group i . Each group of partisans represents an equal fraction of the population: $\rho_A = \rho_B = (1 - \rho)/2$, with $\rho \in [0, 1]$. Independents represent the remainder of the population, $\rho_I = \rho$. We will refer to $1 - \rho$ as the degree of *polarisation* of society.

The election is decided by majority rule. The winning candidate is denoted $\theta \in \{A, B\}$, and the share of citizens of type i going to cast their ballot is denoted σ_i . A citizen of type i has a cost of voting $\tilde{c}(\rho_i \sigma_i)^\gamma$, where \tilde{c} is a cost parameter drawn independently from a uniform distribution on the support $[0, \bar{c}]$, and $\gamma \geq 0$. If $\gamma > 0$, then the individual cost of voting increases with the total number of citizens of a type going to vote. This captures the possibility of congestion at the ballot box, a phenomenon that is widespread even in developed countries.¹³

Suppose $S = A$, so that partisans of A and independents vote for candidate A while partisans of B vote for candidate B . Candidate A wins the election if and only if $\rho \sigma_I + (1 - \rho)(\sigma_A - \sigma_B)/2 \geq \varepsilon$, where ε is a mean-zero error distributed according to cdf F .¹⁴

motivation to vote. Whereas our model provides a rationale for political news consumption, in Cagé (2014) news consumption is a by-product of entertainment consumption.

¹² This information structure simplifies the exposition. We could alternatively assume that w_A and w_B are i.i.d.; our qualitative results would be largely unaffected.

¹³ For example, the Pew Research Center's post-election polls indicate that about 40% of voters had to wait in line at the 2004, 2008, and 2012 U.S. presidential elections; roughly half of these voters had to wait for more than half an hour (Pew Research Center, 2012). The assumption that the voting costs of a type- i citizen depend only on σ_i can be justified by the fact that people living in the same neighbourhood often share both the same polling station and the same political preferences. In Appendix B, we consider the case of general congestion.

¹⁴ The randomness might reflect various kinds of errors that may arise in the electoral process, such as

Assume that F is uniform on $\left[-\frac{1}{2\psi}, \frac{1}{2\psi}\right]$, with $\psi > 0$. The probability that candidate A wins is

$$\Pr(\theta = a) = F\left(\rho\sigma_I + \frac{1-\rho}{2}(\sigma_A - \sigma_B)\right) = \frac{1}{2} + \psi\left[\rho\sigma_I + \frac{1-\rho}{2}(\sigma_A - \sigma_B)\right]. \quad (1)$$

The market for political news consists of $M \geq 0$ profit-maximising media outlets. All outlets receive a perfectly informative signal about the state of the world, which they report in their news section.¹⁵ At the beginning of the game, each outlet commits to a political slant n . Commitment to a political slant is plausible because it can be achieved, e.g., by hiring an editor whose political views are publicly known. An outlet can report the news with a partisan slant ($n \in \{n_A, n_B\}$), in which case the information is presented in a way that caters to the tastes of the targeted group of partisans. Alternatively, it can report the news without slant ($n = n_I$), in which case the information is presented in a neutral way. The media's only source of revenue is advertising. We assume that advertising revenue is proportional to an outlet's audience, so that outlets maximise their expected audience. If an outlet is indifferent among several types of reporting slant, then it chooses the slant preferred by a majority of consumers.

Citizens derive utility from three sources: electoral outcomes, news consumption, and ethical behaviour. Utility (gross of the cost of voting) is separable in its three components and given by $U_i = u_i^V + u_i^N + u_i^D$, where u_i^V is the utility from the voting outcome, u_i^N is the utility from news consumption, and u_i^D is the utility from ethical behaviour. All three components depend on a citizen's type; moreover, the utility from the voting outcome depends on the state of the world S and on the winning candidate θ .

Specifically, for partisans of i ,

$$u_i^V = \begin{cases} w_i & \text{if candidate } i \text{ wins (i.e., } \theta = i) \\ 0 & \text{if candidate } j \neq i \text{ wins (i.e., } \theta \neq i), \end{cases} \quad i = A, B. \quad (2)$$

That is, if their candidate wins, partisans obtain a payoff equal to the ability of their candidate, and zero otherwise. A partisan's utility from consuming a news outlet with slant $n \in \{n_A, n_B, n_I\}$ is

$$u_i^N = \begin{cases} \bar{n} & \text{if } n = n_i \\ 0 & \text{if } n = n_I \\ \underline{n} & \text{if } n = n_j \text{ for } j \neq i, j \in \{A, B\}, \end{cases} \quad i = A, B, \quad (3)$$

where $\bar{n} > 0 > \underline{n}$. Thus, each partisan group has a preferred slant that corresponds to its own ideology and derives more utility from a news outlet that is closer to its preferred slant.

unexpected events preventing people from voting, voters' mistakes at the ballot box, and vote counting errors.

¹⁵ Appendix A develops an extension of the model in which media outlets do not always receive a signal about S , and partisan outlets suppress unfavourable signals. Unlike here, slant then causes a loss of information.

We assume $\bar{n} + \underline{n} < 0$, which implies that the marginal loss in utility from a different slant increases in the distance from the preferred slant.¹⁶

Independents' utility from the voting outcome is equal to the ability of the winning candidate, $u_I^V = w_\theta$. They have no utility *per se* from consuming news (they only care about the information that it conveys), regardless of its slant: $u_I^N(n) = 0$ for all n . When ethical behaviour calls for news consumption and citizens are indifferent between several of the available media outlets, we assume that each citizen chooses one of them at random, so that their demand is spread uniformly across the relevant outlets.

All citizens have an opportunity cost R of consuming the news, which can be seen as a measure of the utility from alternatives to news consumption, particularly entertainment. We assume $R \geq \bar{n}$. Citizens' utility from ethical behaviour is

$$u_i^D = \begin{cases} d_i & \text{if the citizen behaves ethically} \\ 0 & \text{otherwise,} \end{cases} \quad (4)$$

where $d_i > 0$ is a civic-duty payoff or a payoff from doing one's part, as in Feddersen and Sandroni (2006b). Each citizen obtains a payoff of d_i if he behaves according to the rule that, if followed by all other citizens in his group, maximises the group's utility. A rule of ethical behaviour comprises both a media outlet to consume and a threshold for the voting cost, c_i^* , below which a citizen is supposed to cast his ballot. All citizens in a group understand what the rule is. They do not receive d_i unless they follow the ethical rule at both the news consumption and the voting stage.¹⁷

Because $R \geq \bar{n}$ and a single vote is never pivotal in this model, the only reason for a citizen to consume political news and vote is to secure the payoff d_i from behaving ethically.¹⁸ Citizens will only forego the outside option R (entertainment) and incur the cost of voting if (a) consuming news and participating in the election increases their group's collective payoff (making it ethical to behave in this way), and (b) the payoff d_i is sufficiently large to compensate them for the cost of voting and the foregone utility from consumption of entertainment. In what follows, we assume that, for all i , d_i is large enough for part (b) to be satisfied and focus on part (a).

The timing of the game is as follows. Nature draws the state of the world S . After media outlets announce their political slant n , they learn the state of the world and report it with the announced slant. Citizens decide whether and from which of the M available outlets

¹⁶ This would be the case, for example, with quadratic utility.

¹⁷ Note that receiving d_i is not tied to voting *per se*: a citizen whose cost is above the threshold c_i^* and who follows the rule by abstaining also obtains d_i . Notice also that our results could be generalised to the case where only a fraction of citizens are ethical, and that this fraction could differ across groups.

¹⁸ Our results would be unaffected if citizens also had other reasons to consume political news (for example, because they are interested in politics or because they want to participate in discussions with other people). We can think of this as being incorporated in the value of the outside option, R .

to consume news, and outlets receive advertising revenue proportional to the size of their audience. Citizens then learn their cost of voting and decide whether and for which candidate to vote. The candidate receiving the majority of votes wins the election. Finally, citizens' payoffs from the electoral outcome are realised.

3 Equilibrium in the market for political news

We solve the game backward starting from the voting stage.

3.1 The voting stage

At the voting stage, the rule of ethical behaviour consists in a cost threshold c_i^* such that a citizen of group i should vote if $\tilde{c} \leq c_i^*$ and abstain otherwise. The expected aggregate cost of voting of group i when it uses a cutoff rule c_i^* is C_i , given by

$$C_i = \int_0^{c_i^*} \frac{\tilde{c}}{\bar{c}} (\rho_i \sigma_i)^\gamma d\tilde{c}. \quad (5)$$

The cost \tilde{c} being uniform over the support $[0, \bar{c}]$, choosing a threshold c_i^* means that a fraction $\sigma_i = c_i^*/\bar{c}$ of citizens in group i votes. Hence, choosing a threshold c_i^* is equivalent to choosing the fraction σ_i directly.

Group i chooses the ethical voting rule that maximises its expected utility from the electoral outcome given its information about candidates' ability and net of the cost of voting. That is, σ_i solves

$$\max_{\sigma_i} E(u_i^V) - C_i. \quad (6)$$

Define $K_i \in \{0, 1\}$ as an indicator variable that takes value 1 when group i is informed about the state of the world S and value 0 when group i is uninformed. Moreover, let $c \equiv (2 + \gamma)\bar{c}/2$, and define the variation (in absolute value) in the expected voting utility of group i when one or the other candidate prevails as $\delta_i^V = |E(u_i^V | K_i, \theta = A) - E(u_i^V | K_i, \theta = B)|$.

Lemma 1. *If $c > \psi \rho_i^{1-\gamma} \delta_i^V$, then the ethical voting rule that solves (6) for group $i = A, B, I$ is*

$$\sigma_i(\delta_i^V) = \rho_i^{\frac{1-\gamma}{1+\gamma}} \left(\frac{\psi \delta_i^V}{c} \right)^{\frac{1}{1+\gamma}}. \quad (7)$$

The condition $c > \psi (\rho_i)^{1-\gamma} \delta_i^V$ ensures that voting costs are sufficiently high for the rule that maximises the group's payoff not to require all members to vote. When independents are uninformed ($K_I = 0$), then $\delta_I^V = 0$ and they do not vote ($\sigma_I(0) = 0$). The intuition is that both candidates are equally good in expectation, so voting for one of them does not change the independents' expected utility from the political outcome. When they are

informed ($K_I = 1$), then $\delta_I^V = \bar{w} - \underline{w}$, and a fraction of independents vote for the high-ability candidate ($\sigma_I(\bar{w} - \underline{w}) > 0$). The fraction that votes increases with the difference in ability between candidates. When partisans are uninformed ($K_i = 0$, $i = A, B$), then $\delta_i^V = w^e$. When informed ($K_i = 1$, $i = A, B$), then $\delta_i^V = \bar{w}$ if $S = i$, and $\delta_i^V = \underline{w}$ if $S \neq i$. By symmetry of A and B , we can define $\sigma_P(\delta) \equiv \sigma_A(\delta) = \sigma_B(\delta)$. Hence, the fraction of partisans that votes depending on δ_i^V is given by $\sigma_P(w^e)$, $\sigma_P(\bar{w})$, and $\sigma_P(\underline{w})$, respectively, with $\sigma_P(\underline{w}) < \sigma_P(w^e) < \sigma_P(\bar{w})$. Partisan turnout increases with the benefit from winning the election. The higher their candidate's expected ability, the larger the share of the partisan group that the ethical rule directs to vote.

A group's expected turnout is given by $ET_i^{K_i} \equiv \rho_i E[\sigma_i(\delta_i^V)]$. Again by symmetry of A and B , we can write, for $K \in \{0, 1\}$, $ET_P^K \equiv ET_A^K = ET_B^K$. Define ρ^* and ρ^{**} as the values of ρ that solve the following equations:¹⁹

$$\rho^* : ET_I^1 = ET_P^0 - ET_P^1 \quad (8)$$

$$\rho^{**} : ET_I^1 = 2(ET_P^0 - ET_P^1). \quad (9)$$

Proposition 1 characterises how turnout depends on each group's information.

Proposition 1. *The effect of information on expected turnout varies across groups:*

- (i) *Becoming informed strictly increases independent turnout.*
- (ii) *Becoming informed decreases partisan turnout (strictly if $\gamma > 0$).*
- (iii) *If independents and one (both) group(s) of partisans become informed, the net effect on turnout is negative if $\rho < \rho^*$ ($\rho < \rho^{**}$), and positive otherwise.*

Information has opposite effects on partisans and independents. When independents become informed, expected turnout always increases, because independents only vote when informed. By contrast, when partisans become informed, expected turnout decreases. This is because, under convex marginal costs of increasing the share of group members who vote ($\gamma > 0$), any increase in turnout by an additional percentage point is more costly when σ is high. This means that partisans increase turnout at a decreasing rate as w_i becomes larger: the increase in turnout when moving from \underline{w} to w^e is larger than the increase when moving from w^e to \bar{w} .

The result in proposition 1 applies to *expected* turnout. Because partisans' behaviour depends on the state of the world, if a single group of partisans becomes informed, the ex-post effect on turnout can be of either sign. Realized turnout will increase if the state of the world is favourable to the newly informed group and decrease otherwise.

¹⁹ The proof of Proposition 1 shows that ρ^* and ρ^{**} exist and belong to the interval $[0, 1)$.

Importantly, the result that information decreases partisan turnout does not hinge on congestion and extends beyond the simple setup adopted here. In Appendix B, we show that it holds with the Feddersen-Sandroni formulation of winning probabilities, which is based on randomness in the share of ethical citizens in each group, as well as with a contest success function à la Tullock (1980).²⁰ We also derive sufficient conditions under which the result holds for a general cost function that depends on both groups' turnout, $C_i = C(\sigma_i, \sigma_j)$.

When both independents and partisans become informed, the two opposing forces are both at work at the same time, so that the net effect is a priori ambiguous. Part (iii) of Proposition 1 shows that turnout decreases when the share of partisans in the population is large, while it increases if their share is small (and that of independents large). Consider a change that leads both the independents and one group of partisans to become informed (while previously they were not) and leaves the other partisan group's information unaffected. Then ρ^* defines the threshold such that the change increases expected turnout for $\rho > \rho^*$, decreases it for $\rho < \rho^*$, and leaves turnout constant for $\rho = \rho^*$. The other threshold, ρ^{**} , is defined analogously for a change that leads all three groups to become informed. Clearly, $\rho^{**} > \rho^*$ because when both groups of partisans decrease their turnout, the proportion of independents needs to be relatively larger for the overall effect on turnout to be positive.

Expected payoffs at the voting stage. For partisan group $i = A, B$, let us define $EU_i^P(K_i, K_j, K_I)$, $j \neq i$, as the group's expected payoff at the voting stage given its own information (K_i), the opposing partisan group's information (K_j), and the independents' information (K_I). Let $\Delta_P \equiv EU_i^P(1, K_j, K_I) - EU_i^P(0, K_j, K_I)$ denote a partisan group's gain from being informed. The following lemma derives an expression for this gain and shows that the value of information does not depend on the other groups' decision whether to become informed.

Lemma 2. *Being informed increases a partisan group's payoff at the voting stage by*

$$\Delta_P(\rho) = \mu \left(\frac{1 - \rho}{2} \right)^{\frac{2}{1+\gamma}} \left[\frac{w^{\frac{2+\gamma}{1+\gamma}} + w^{\frac{2+\gamma}{1+\gamma}}}{2} - (w^e)^{\frac{2+\gamma}{1+\gamma}} \right] \geq 0, \quad (10)$$

where $\mu \equiv \frac{1+\gamma}{2+\gamma} \left(\frac{\psi^{2+\gamma}}{c} \right)^{\frac{1}{1+\gamma}}$, with strict inequality for $\rho < 1$. The gain does not depend on the behaviour of the opposing partisan group or the independents.

Intuitively, information is valuable for partisans because it enables them to fine-tune turnout according to the ability of their preferred candidate. When the candidate is of high

²⁰ More generally, Appendix B derives conditions under which the result holds when the probability of winning is not separable in σ_i and σ_j , but instead takes the form $P_i = p(\sigma_i/\sigma_j)$ for some increasing function p .

ability, so that the stakes are high, partisans can increase σ . This increases the probability of winning when it matters most. When the candidate is of low ability, partisans can decrease σ , which saves on voting costs when winning does not matter as much.

For independents, define $EU^I(K_A, K_B, K_I)$ as the group's expected payoff at the voting stage given their own information (K_I) as well as the two partisan groups' information (K_A and K_B), and let $\Delta_I \equiv EU^I(K_A, K_B, 1) - EU^I(K_A, K_B, 0)$ denote the independents' gain from being informed. The following lemma characterises the gain and shows that it does not depend on the information of the partisan groups.

Lemma 3. *Being informed increases the independents' payoff at the voting stage by*

$$\Delta_I(\rho) = \mu\rho^{\frac{2}{1+\gamma}} (\bar{w} - \underline{w})^{\frac{2+\gamma}{1+\gamma}} \geq 0, \quad (11)$$

with strict inequality for $\rho > 0$. The gain does not depend on the partisan groups' behaviour.

The independents benefit from being informed because information allows them to tilt the balance in favour of the candidate who secures them a larger post-election payoff.

The result in both Lemma 2 and 3 that the value of information does not depend on the other groups' behaviour can be explained as follows. Although the information held by other groups does affect each group's expected payoff (because information changes turnout), the *difference* in expected payoffs is unaffected. This is due to the probability of winning being separable in σ_A , σ_B , and σ_I . Separability implies, first, that a group's optimal turnout does not depend on the other groups' turnout. Second, it implies that the effect of group j 's turnout on i 's probability of winning cancels out when we take differences over group i 's information, holding group j 's information constant.²¹

Lemmas 2 and 3 also reveal that the gains from being informed are increasing in group size: $\Delta_P(\rho)$ increases with $(1 - \rho)/2$ (and thus decreases with ρ), while $\Delta_I(\rho)$ increases with ρ . This is because the larger the size of group i , the greater is the impact of a given change in σ_i on the probability that group i 's preferred candidates wins the election. By contrast, when the size of a group is close to zero, it cannot hope to have much of an effect on the electoral outcome, and the value of information is correspondingly small.

3.2 The news consumption stage

Figure 1 shows how $\Delta_P(\rho)$ and $\Delta_I(\rho)$ divide the (ρ, R) space into different regions of ethical news consumption.²² Lemma 3 implies that independents' optimal ethical news-consumption

²¹ For a general probability of winning $P_i = P(\sigma_i, \sigma_j)$, this does not need to be the case. For example, letting $\sigma_i^{K_i}$ denote the fraction of group i that votes given information K_i , the difference $P(\sigma_i^1, \sigma_j^{K_j}) - P(\sigma_i^0, \sigma_j^{K_j})$ could depend on K_j even if, for all i , σ_i depends only on K_i .

²² In addition, it depicts the two critical values ρ^* and ρ^{**} , defined respectively by equations (8) and (9).

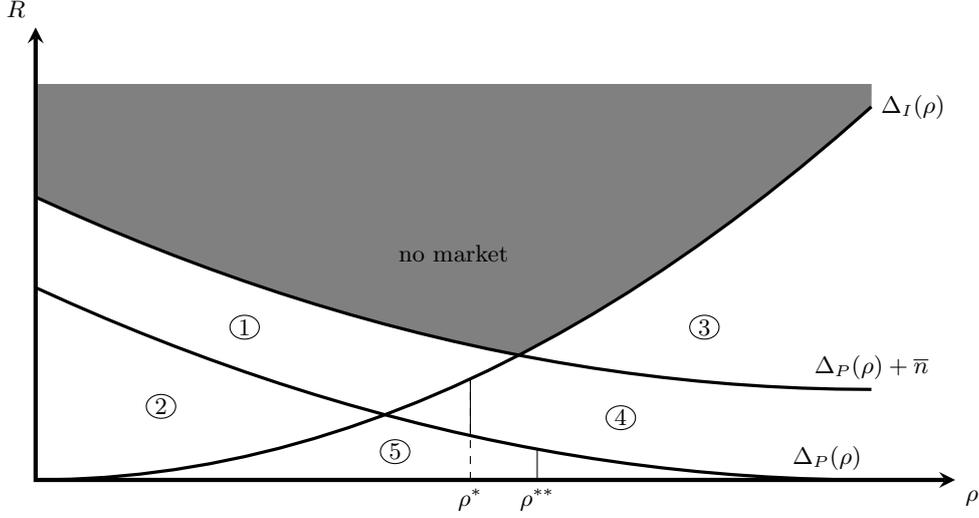


Figure 1: Regions of news consumption for each group, as a function of the share ρ of independents and the opportunity cost R

rule does not depend on the other groups' behaviour (i.e., there is a dominant strategy). Independents gain collectively from being informed if and only if $\Delta_I(\rho) \geq R$. They are indifferent between available outlets because they do not care about slant. Thus, if $\Delta_I \geq R$ (regions 3, 4, and 5 in Figure 1), they consume any available outlet, while if $\Delta_I < R$ (regions 1 and 2) they do not consume any news.

Similarly, Lemma 2 implies that a partisan group's optimal ethical rule at the news consumption stage also does not depend on whether the other groups consume news. Letting \mathcal{N} denote the set of slants among available media outlets, partisans of group i are collectively better off consuming the news if and only if

$$\Delta_P(\rho) + \max_{n \in \mathcal{N}} u_i^N \geq R. \quad (12)$$

This allow us to derive regions of ethical news consumption (in figure 1) as a function of the available slants and the value of the outside opportunity R :

- If $R > \Delta_P + \bar{n}$, partisans never consume political news (region 3).
- If $\Delta_P < R \leq \Delta_P + \bar{n}$, partisans only consume news with their most preferred slant, i.e., they consume their own partisan outlet, if available, but not the opposing partisan outlet or an independent outlet (regions 1 and 4).
- If $R \leq \Delta_P$, partisans also consume news with a slant that is different from their preferred one (regions 2 and 5).²³

²³ To be more precise, we can distinguish between the case $\Delta_P + \underline{n} < R \leq \Delta_P$, where partisans consume

Table 1: Equilibrium reporting strategies of media outlets

		$R > \Delta_P(\rho) + \bar{n}$	$\Delta_P(\rho) < R \leq \Delta_P(\rho) + \bar{n}$	$R \leq \Delta_P(\rho)$
$R > \Delta_I(\rho)$	$M = 1$	\emptyset	n_A	n_I
	$M = 2$	\emptyset	n_A, n_B	n_A, n_B
$R \leq \Delta_I(\rho)$	$M = 1$	$n \in \{n_A, n_B, n_I\}$	n_A	n_I
	$M = 2$	$(n, n') \in \{n_A, n_B, n_I\}^2$	n_A, n_B	n_A, n_B

We assume, without loss of generality, that the first partisan slant chosen is n_A .

3.3 Positioning of media outlets: the optimal slant

Since the size of each group of citizens, their preferences over slant, and their gains from being informed are common knowledge, media outlets correctly anticipate consumers' behaviour. Each outlet chooses the reporting strategy (i.e., slant) that attracts the largest audience given the reporting strategies of the other outlets present in the market. By assumption, if several outlets report with the same slant, they share the consumers for who this slant is weakly preferred to the other available slants; furthermore, if there are multiple equilibria that are payoff equivalent from the point of view of media outlets, we select the one which is most preferred by consumers.

Lemma 4. *Suppose, without loss of generality, that the first partisan slant chosen is n_A . The equilibrium reporting strategies of media outlets depend on the opportunity cost of consuming news (R), on the share of independents in society (ρ), and on the number $M \in \{1, 2\}$ of outlets available as described in Table 1.*

The table summarises the equilibrium strategies of outlets for the different regions in Figure 1, depending on whether there are one or two outlets in the market. As soon as there are at least two outlets, all citizens who are potentially interested in consuming news (conditional on a specific slant being available) find an outlet with a slant that suits their tastes. As the number of outlets increases further, there are no changes in the set of available slants, and therefore no changes in the set of citizens consuming news.

An important implication of this result is that, as the size of a group increases, so does the likelihood that the group finds a media outlet reporting the news with a slant its members deem “palatable,” in the sense that consuming news from this outlet is ethical. This is straightforward in the case of independents. For low values of ρ , no slant is palatable to them; but as soon as $\Delta_I(\rho) \geq R$, they always find an active outlet reporting with a palatable news without slant but not news with the opposing partisan slant, and the case $R \leq \Delta_P + \underline{n}$, where partisans always consume news, even if it has their least preferred slant (i.e., the opposing partisan slant). The distinction turns out to be irrelevant for our purposes.

slant. To see that this also applies in the case of partisans, note that as the size of their group (given by $(1 - \rho)/2$) increases, and holding everything else constant, we tend to move from the left to the right of the table. In the left column, no slant is palatable to them. In the middle column, their own partisan slant is palatable, and there is at least a 50% chance they find an outlet reporting with this slant (depending on the number of active outlets). In the right column, independent reporting is palatable as well, and they always find an outlet reporting with either independent or their own partisan slant.

4 The effect of entry on turnout, slant, and selection of politicians

Having derived the equilibrium in the media market, we are now ready to state our results on the effects of entry on electoral politics. Proposition 2 describes how entry affects expected turnout. It shows that the impact of entry is a function of the opportunity cost of consuming news (R), the polarisation of society (ρ), and the number of outlets present in the market prior to entry. There are cases in which the entry of an additional outlet has no effect on which groups of citizens are informed (e.g., when entry only leads citizens to switch outlets). To simplify exposition, the proposition focuses on those cases where entry changes at least one group's decision to become informed.

Proposition 2. *Suppose entry modifies some citizens' decision whether or not to consume news.*

- (i) *If independents never consume news ($R \in (\Delta_I(\rho), \Delta_P(\rho) + \bar{n}]$, i.e., regions 1 and 2), entry decreases expected turnout (strictly if $\gamma > 0$).*
- (ii) *If partisans never consume news ($R \in (\Delta_P(\rho) + \bar{n}, \Delta_I(\rho)]$, i.e., region 3), entry strictly increases expected turnout.*
- (iii) *If partisans consume only news with their own slant ($R \in (\Delta_P(\rho), \min\{\Delta_P(\rho) + \bar{n}, \Delta_I(\rho)\}]$, i.e., region 4), entry of the first outlet decreases expected turnout if $\rho < \rho^*$, and increases it otherwise. Entry of a second outlet decreases turnout (strictly if $\gamma > 0$). Further entry has no effect on turnout.*
- (iv) *If partisans also consume news with a slant different from their own ($R \leq \min\{\Delta_P(\rho), \Delta_I(\rho)\}$ i.e., region 5), entry strictly decreases turnout if $\rho < \rho^{**}$, and increases it otherwise.*

To interpret these results, recall from Proposition 1 that when $\gamma = 0$ partisans' expected turnout is unaffected by information, so changes in turnout depend solely on the behaviour of independents. Note also that entry can never deter independents from consuming news. If

it is ethical for independents to consume news when M outlets are available, it will also be ethical when $M' > M$ outlets are available.

According to Proposition 2, entry has a monotonic effect on turnout in all regions of Figure 1 except region 4. In regions 1 and 2, independents do not consume news, so expected turnout depends only on partisans' behaviour. Since entry never leads to the disappearance of a slant palatable to partisans, and sometimes leads to the appearance of one (see Table 1), expected turnout can only decrease. In region 3, partisans do not consume news, so only independents can have an impact on turnout. The first outlet to enter leads them to become informed and thus induces an increase in turnout. In region 5, partisans are willing to consume both independent and their own partisan news (with a preference for the latter, when available). The first entrant can thus capture the entire market by choosing independent reporting. This leads all groups to consume news and adapt their turnout. By construction, the effect on partisans dominates the effect on independents if and only if $\rho < \rho^{**}$. Further entry does not affect turnout.

In region 4, partisans do not consume news unless it is presented with their own preferred slant, while independents consume news regardless of its slant. The first entrant chooses a partisan slant to attract both the independents and one of the partisan groups. This implies that entry of the first outlet decreases expected turnout if and only if $\rho < \rho^*$. If a second outlet enters the market, it will opt for serving the group of partisans currently excluded, which entails a decrease in expected turnout (the equilibrium becoming (n_A, n_B)).²⁴ Further entry affects neither news consumption nor, *a fortiori*, turnout.

Proposition 2 identifies polarisation as the crucial factor shaping the effect of entry on turnout. Suppose $\gamma > 0$ and fix R . Then, the proposition implies that there exists a threshold on ρ below which the effect of entry on turnout is strictly negative. That is, if society is sufficiently polarised, media entry reduces turnout. Similarly, there exists a threshold on ρ above which entry has a strictly positive effect on turnout, provided there is not yet another outlet present in the market.²⁵ In other words, if society's polarisation is sufficiently low, media entry raises turnout. The intuition is that a group's gains from being informed and the probability that at least one outlet reports with a slant that is palatable to the group's members both increase with the size of the group (see Lemmas 2, 3 and 4). Hence, the larger the group, the higher the chance that entry in the media market leads its members to become

²⁴ Strictly speaking, we have $\lim_{\gamma \rightarrow 0} \rho^* = 0$, and the decrease in turnout due to the entry of a second outlet is $\Upsilon = \left(\frac{\psi}{4c} (1 - \rho)^2\right)^{\frac{1}{1+\gamma}} \left[\frac{w^{\frac{1}{1+\gamma}} + \bar{w}^{\frac{1}{1+\gamma}}}{2} - (w^e)^{\frac{1}{1+\gamma}} \right]$, where the term in square brackets becomes zero for $\gamma = 0$ (and hence $\Upsilon = 0$). This means that if $\gamma = 0$, then entry of the first outlet induces an increase in turnout, while further entry is without consequence for turnout.

²⁵ Entry that occurs when there is already another outlet present in the market either has no effect or, in region 4, a negative one, irrespective of ρ .

Table 2: Political polarisation: standard deviations in responses to WVS questions.

	Russia	USA	France	Italy
Equality	3.006	2.567	2.978	2.729
Private	2.763	2.239	2.219	2.214
Government	2.905	2.697	2.511	2.675
Competition	2.692	2.396	2.699	2.487
Average	2.842	2.475	2.602	2.526

Source: Lindqvist and Östling (2010) and own calculations.

informed, producing the effects on turnout derived in Proposition 1.²⁶

As noted in the introduction, the result on the role of polarisation is consistent with the empirical evidence on the impact of entry on turnout. For the U.S. (Gentzkow et al., 2011) and Italy (Drago et al., Forthcoming), the literature reports positive effects, whereas for Russia (Enikolopov et al., 2011) and France (Cagé, 2014), it reports negative effects. For each of these countries, Table 2 reproduces the four measures of polarisation used by Lindqvist and Östling (2010) and computes the average. According to this measure, Russia and France are more polarised than Italy and the U.S.

We now turn to the effect of entry on slant and selection. The extent of media slant can be defined as the number of outlets reporting news with a partisan slant.²⁷ As the following proposition shows, entry of new outlets increases media slant. The intuition behind this result is that entrants typically try to occupy niches in the market by catering to the tastes of a specific group of citizens.

Proposition 3.

- (i) *Entry increases slant (the number of partisan outlets).*
- (ii) *Entry increases the high-ability candidate’s chances of winning the election.*

Although entry typically raises the supply and consumption of news with partisan slant, this does not have to be detrimental to the selection of politicians. A by-product of the increase in slant caused by competition is that more citizens can find an outlet that reports news in a way that is palatable to them. Therefore, the number of citizens who become informed increases with the level of competition in the media market. This has a positive

²⁶ From Proposition 2 we conclude that only entry of the first two outlets can affect turnout. This is an artefact of the assumption that the population is composed of only two different groups of partisans. If we allowed for more than two groups of partisans, the driving forces would remain the same, but outlets would start to tailor their slant to the various partisan tastes. Therefore, we would observe changes in turnout as long as entry induces a new group of partisans to become informed.

²⁷ This captures the supply side of media slant. Because slant is demand-driven in this model, more supply of slanted news also implies (weakly) more consumption of slanted news.

impact on the probability that the high-ability politician is elected.²⁸ There are two reasons. The first is that independents who become informed vote for the high-ability candidate. This effect is only at work for the initial outlet that enters, however, as subsequent entrants do not change the independents’ decision to become informed. The second is that partisans who become informed increase their turnout when their candidate is of high ability and decrease it when their candidate is of low ability.

An interesting implication of this result is that news consumption by any given group of citizens creates positive externalities for the other groups. Independents benefit from partisans being informed because it improves the election chances of the better politician. More interestingly, partisans also benefit from independents being informed. They obtain additional support at the ballot box when their candidate is of high ability. Although they face stronger opposition when their candidate is of low ability, the first effect dominates because it occurs when the outcome of the election matters more.

Finally, we can also use the model to examine how turnout is affected by a change in the value of the outside option R , as it might be brought about by new technologies or new types of content. For example, Gentzkow (2006) finds that the introduction of television – arguably associated with improved quality of entertainment – explains a large part of the reduction in turnout observed in the U.S. since the 1950s. Our model predicts that an increase in R reduces turnout if it discourages independents from consuming news while leaving partisans’ news consumption unchanged. In general, however, the effect of an increase in R is ambiguous: it might discourage either independents or partisans, or both, from consuming news, and could therefore result in either increased or decreased turnout.

5 Conclusion

We develop a theoretical framework in which we study the relationship between media markets and large democratic elections. The demand for political news is endogenous, and voters bear the cost of becoming informed because they want to make a better-informed voting decision. We assume that voters are group rule-utilitarian, in the sense of Harsanyi (1977, 1980), which allows us to overcome the “rational ignorance” argument by Downs (1957), according to which in large elections the probability of being pivotal is so small that rational voters would not gather costly information about candidates.

We build a model with two kinds of voters: independents and partisans. Independents

²⁸In a spatial model of media bias, Chan and Suen (2008) make a similar point, noting: “Since voters only consume news from media outlets whose editorial positions are sufficiently similar to their own, media outlets with more partisan positions may still serve a useful social function by engaging voters who would not consume more mainstream news” (p. 701). The mechanism in their paper is very different from ours, however.

would like the higher-ability candidate to win the election. Partisans have a preference for one candidate but are interested in the ability of their candidate as it determines the gain from defeating the opposing candidate (so that it influences their optimal turnout). Media outlets maximise the size of their audience by choosing the slant that attracts the most consumers. Partisans prefer the news to be slanted in favour of the candidate they support, whereas independents only care about the information provided and not about the slant it is presented with.

We use our framework to analyse the impact of competition in the media market on a number of political variables. In particular, we study how it affects turnout and derive predictions compatible with the contrasting empirical evidence in Gentzkow et al. (2011), indicating a positive effect, and Enikolopov et al. (2011), indicating a negative effect. According to our model, the main factor that matters for the sign of the effect is the composition of the population. If the share of independents is small, turnout tends to decrease when more media outlets are available. If the share of independents is large, turnout increases. The forces that drive these results are that independents have, by construction, no preference *a priori* for one candidate, hence they vote only when they are informed about who is the high-ability candidate. On the other hand, partisans tend to vote less, on average, when they are informed, as they reduce their turnout heavily when they become aware that their preferred candidate is of low ability, and they do not increase it as much when they discover that the candidate is of high ability. Finally, independents' interest in becoming informed, and hence in voting, increases with their relative size. When they are few, the expected utility of being informed is lower (as they have little chance of being able to affect the result of the election). Therefore, it is more likely that they decide not to become informed and abstain. Conversely, when they are many, they have a greater interest in becoming informed and voting.

Our analysis relies on the polarisation of society being exogenously given, rather than a product of people's media exposure. The literature on persuasion is mixed. Prior (2013) concludes that there is no firm evidence of a causal link from media bias to the polarisation of society. Campante and Hojman (2013) suggest a possible non-negligible link between partisan messages and the intensity of ideological extremism. Hopkins and Ladd (2012) suggest that media bias may reinforce the loyalty of aligned partisans but has little or no effect on independents and out-partisans.

If we interpret the model less narrowly, we can derive some conclusions on how the impact of entry in the media market would differ according to the type of media that we consider. We can expect consumers to self-select into different media (namely, newspapers, television, news websites, blogs, etc.). Self-selection implies that the polarisation of the audience is likely to vary across different types of media. Indeed, Gentzkow and Shapiro (2011) show that online

news is more polarised than most offline news, which suggests (if bias is demand-driven) that consumers of online news have more extreme views. According to our model it would thus be possible that entry in offline media, whose audience is less polarised, increases turnout, while entry in the more polarised online media reduces turnout. As a matter of fact, both Falck et al. (2012) and Campante et al. (2013) observe a negative impact of the internet on turnout, although Campante et al. argue that the effect is likely to be short-lived.

Our model also makes predictions on the impact of competition on media slant. Consistent with the observations in DellaVigna and Kaplan (2007), we find that when the number of media outlets increases, there is a tendency for more slanted reporting and a larger share of the population consuming slanted news. Perhaps surprisingly, this effect generally increases the probability that the candidate with high ability wins. The intuition behind these two results is that (a) competition in the media market pushes editors to serve a wide variety of consumers by tailoring their product to their specific tastes, and (b) having access to slanted news increases the appeal of consuming news to partisans, who are then more likely to become informed. Being informed not only enables independents to vote for the high-ability candidate, but also enables partisans to adjust turnout to the ability of their preferred candidate. Both effects improve the high-ability candidate's chances of winning the election.

In Appendix A we study an extension where media outlets are not perfectly informed about the state of the world, but instead receive information only part of the time. In such a world, partisan outlets may have an incentive to suppress unfavourable information, as consumers cannot easily distinguish suppression from absence of information. We show that our results on turnout are unaffected by this alternative modeling approach. The same may not be true for our results on the selection of politicians. When slant is associated with lower informativeness, the fact that competition can lead to more slant is likely to be less benign than in our framework. There would then be a tradeoff between engaging consumers through the provision of their preferred slant and informing them accurately. We leave it to future research to investigate this.

Appendix A Information suppression

Our assumption that outlets always receive a perfect signal about the state of the world implies that they are always perfectly informative. Even if we allowed partisan outlets to omit information about the state of the world when it is unfavourable to the supported candidate, a rational consumer could nevertheless indirectly recover the information (no news would mean bad news). By contrast, when media outlets are not always informed about the state of the world, then a partisan media outlet that does not report any news would leave consumers in doubt whether the outlet genuinely did not receive any information or suppressed it because it was not consonant with its audience's preferences. In this section we analyse the case of media outlets receiving information on S only with probability $q < 1$. In particular, we extend the result of Proposition 1 to the case in which partisan outlets suppress news and consumers cannot entirely recover the information, because outlets do not always obtain a signal about the state of the world. We show that information suppression does not affect our result on the relationship between information and turnout. That is, information increases independent turnout while it decreases partisan turnout.

Suppose media outlets receive a signal \hat{s} such that

$$\hat{s} = \begin{cases} S & \text{with probability } q \\ \emptyset & \text{with probability } 1 - q. \end{cases} \quad (13)$$

They can either publish \hat{s} or \emptyset (hence, we exclude the case of fabricating false news). Define by t_i the information on the state of the world transmitted by an outlet of slant n_i . If partisan outlets suppress information that is unfavourable to their candidate, then when observing $t_i = \emptyset$, consumers of partisan news do not know whether there is no news or whether news was unfavourable. By Bayes' rule, if an outlet partisan of A does not reveal the state of the world (i.e., $t_A = \emptyset$), then the probability that the state of the world is B is $\Pr(S = B | t_A = \emptyset) = 1/(2 - q)$.

One may wonder whether our result on the reduction in partisan turnout survives in this case, since partisans who consume their own partisan outlet no longer get confronted explicitly with unfavourable news. In our basic model, finding out that their preferred candidate has low ability is what drives down expected partisan turnout; this no longer happens under information suppression. As the next proposition shows, however, Bayesian voters' belief updating when the outlet reports no news suffices to reduce expected partisan turnout below the uninformed level here as well.

Proposition 4. *Suppose that media outlets receive an imperfect signal ($0 < q < 1$) about the state of the world, and that partisan outlets suppress news unfavourable to their supported candidate. Consuming a media outlet:*

(i) increases independents' expected turnout.

(ii) decreases partisans' turnout.

When independents consume an outlet reporting no signal, their optimal strategy is to choose (see the proof of Proposition 4):

$$\sigma_I = \begin{cases} \rho^{\frac{1-\gamma}{1+\gamma}} \left(\frac{q}{2-q} \frac{(\bar{w} - \underline{w})\psi}{c} \right)^{\frac{1}{1+\gamma}} & \text{if } c > \frac{q}{2-q} (\bar{w} - \underline{w}) \psi \rho^{1-\gamma} \\ 1 & \text{if } c \leq \frac{q}{2-q} (\bar{w} - \underline{w}) \psi \rho^{1-\gamma}. \end{cases} \quad (14)$$

This result is a generalisation of the result in Subsection 3.1: notice that evaluating equation (14) at $q = 1$, we obtain equation (23). Notice, furthermore, that σ_I in equation (14) is increasing in q , meaning that the more informative media outlets are, the larger the independents' participation in elections.

Partisans choose

$$\sigma_i = \begin{cases} \left(\frac{1-\rho}{2} \right)^{\frac{1-\gamma}{1+\gamma}} \left(\frac{w(q)\psi}{c} \right)^{\frac{1}{1+\gamma}} & \text{if } c > w(q)\psi \left(\frac{1-\rho}{2} \right)^{1-\gamma} \\ 1 & \text{if } c \leq w(q)\psi \left(\frac{1-\rho}{2} \right)^{1-\gamma}, \end{cases} \quad (15)$$

where $w(q) = \frac{\underline{w}}{2-q} + \frac{(1-q)\bar{w}}{2-q}$. Notice that $w(q)$ is decreasing in q , and for $q \in [0, 1]$, we have $w(q) \in [\underline{w}, w^e]$. When we compare this result to the one in Subsection 3.1, therefore, we notice that equation (15) evaluated at $q = 0$ and $q = 1$ correspond to equation (21) for the cases respectively of $w = w^e$ and $w = \underline{w}$.

Appendix B Information and partisan turnout

A key result of the paper is that information decreases partisan turnout. In this appendix, we show that this result is not merely an artefact of the simplifying assumptions adopted in the main text but holds in a broader range of settings. We begin by considering a setup in which group i 's optimal turnout depends on group j 's, and we derive sufficient conditions on each group's best-response function for information to reduce turnout. We then use these conditions to determine the properties of the voting cost function that are needed for the result to apply when we relax the assumption that congestion depends only on voters of the same type, and assume instead that congestion depends on all voters. Finally, we also show that congestion is not essential to our results by considering a model without congestion but in which the probability of winning is not separable in each group's turnout. To isolate the

effect of information on partisan turnout, we restrict attention to a setup with two symmetric partisan groups and no independents throughout this appendix.

Let $\sigma(s, w)$ denote group i 's best response to $j \neq i$ choosing turnout s given that candidate i has expected ability w . The following proposition derives sufficient conditions on the best-response functions for information to decrease partisan turnout.

Proposition 5. *Suppose $\sigma(\cdot)$ is twice continuously differentiable, monotonic in s , and satisfies $\sigma_2 > 0$, $\sigma_{11} \leq 0$, $\sigma_{22} \leq 0$, and $\sigma_{12} \geq 0$. Suppose moreover that the boundary conditions ensure that a unique interior solution always exists for the relevant parameter range. Then, in a symmetric equilibrium, partisan turnout is lower when both groups are informed than when neither group is informed.*

We now translate this result into conditions on the voting cost function, assuming that the cost of voting for partisans of i depends on both groups' turnout. That is, we examine under what conditions each group's calculus of ethical behaviour results in best-response functions that satisfy the properties identified in Proposition 5.

Proposition 6. *Suppose $C_i = C(\sigma_i, \sigma_j)$ with $C_1 \geq 0$, $C_{11} > 0$ (convexity), and $C_{12} > 0$ (general congestion). A sufficient condition for $\sigma_{11} \leq 0$, $\sigma_{22} \leq 0$, and $\sigma_{12} \geq 0$ is that $C_{111} \geq 0$, $C_{112} \leq 0$, and $C_{122} \geq 0$.*

Thus, under some conditions, the negative effect of information on turnout can arise also when congestion depends both on a group's own turnout and on the other group's turnout.

A final robustness check shows that congestion is not necessary for the impact of information on partisan turnout to be negative. To establish this, we assume that there is no congestion, i.e., each voter's cost is given by $\tilde{c} \in [0, \bar{c}]$. Instead, we adopt a more general probability function relating each group's turnout to their candidate's chances of being elected. Specifically, let candidate i 's probability of winning be given by $P(\sigma_i, \sigma_j) = p(\sigma_i/\sigma_j)$, where $p : [0, \infty) \rightarrow [0, 1]$.

Proposition 7. *Suppose $p' \geq 0$ and $p(\sigma_i/\sigma_j) = 1 - p(\sigma_j/\sigma_i)$ (symmetry). A sufficient condition for information to decrease partisan turnout is $p'(x) + xp''(x) \leq 0$ for $x \geq 1$.*

The condition on p identified in the proposition can be restated as

$$-\frac{xp''(x)}{p'(x)} \geq 1 \quad \text{for } x \geq 1. \quad (16)$$

This is a property related to the curvature of the function p . It is satisfied in two particular cases of interest: (1) if, as in Feddersen and Sandroni (2006b), the fraction of ethical voters in each group is uniformly distributed on $[0, 1]$, so that

$$p'(x) = \begin{cases} 1 & \text{for } x \leq 1 \\ 1/x^2 & \text{for } x > 1, \end{cases} \quad (17)$$

(2) if $p(x) = x/(1+x)$, so that $p(\sigma_i/\sigma_j) = \sigma_i/(\sigma_i + \sigma_j)$ is a standard contest success function à la Tullock (1980). Note that such a contest success function would arise in the election context if one were to assume that the relative size of each of the two groups is a random variable, unknown to each voter, and uniformly distributed on $[0, 1]$.

Appendix C Proofs

Throughout this appendix, we assume without loss of generality that if only one partisan outlet is available, its slant is n_A . Moreover, we sometimes refer specifically to partisans of A and B although by symmetry both groups of partisans are interchangeable.

Proof of Lemma 1. From the definition of δ_i^V we obtain

$$\delta_i^V = \begin{cases} \bar{w} & \text{if } i = A, B, K_i = 1 \text{ and } S = i \\ \underline{w} & \text{if } i = A, B, K_i = 1 \text{ and } S \neq i \\ w^e & \text{if } i = A, B \text{ and } K_i = 0 \\ \bar{w} - \underline{w} & \text{if } i = I \text{ and } K_I = 1 \\ 0 & \text{if } i = I \text{ and } K_I = 0. \end{cases} \quad (18)$$

Moreover, we have, for $i = A, B, I$,

$$C_i = (\rho_i \sigma_i)^\gamma \left[\frac{\tilde{c}^2}{2\bar{c}} \right]_0^{\bar{c}\sigma_i} = \frac{c}{2+\gamma} \rho_i^\gamma \sigma_i^{2+\gamma}. \quad (19)$$

In what follows, let $\bar{\sigma}(K)$ denote a partisan group's turnout when the state of the world is favourable and its information is $K \in \{0, 1\}$ (i.e., for group i , when $S = i$ and $K_i = K$). Similarly, let $\underline{\sigma}(K)$ denote a partisan group's turnout when the state of the world is unfavourable. Finally, let $\hat{\sigma}(K)$ denote the independents' turnout when $K_I = K$.

Partisans. Partisan group i chooses σ_i to solve (6). We have

$$E(u_i^V) = \begin{cases} \bar{w} \left[\frac{1}{2} + \psi \left(\frac{1-\rho}{2} (\sigma_i - \underline{\sigma}(K_j)) + \rho \hat{\sigma}(K_I) \right) \right] & \text{if } K_i = 1 \text{ and } S = i \\ \underline{w} \left[\frac{1}{2} + \psi \left(\frac{1-\rho}{2} (\sigma_i - \bar{\sigma}(K_j)) - \rho \hat{\sigma}(K_I) \right) \right] & \text{if } K_i = 1 \text{ and } S = j \neq i \\ w^e \left[\frac{1}{2} + \psi \left(\frac{1-\rho}{2} \sigma_i - \Lambda \right) \right] & \text{if } K_i = 0. \end{cases} \quad (20)$$

where $\Lambda = \frac{1-\rho}{2} \frac{\bar{\sigma}(K_j)\underline{w} + \underline{\sigma}(K_j)\bar{w}}{2w^e} - \rho \hat{\sigma}(K_I) \frac{\bar{w}-\underline{w}}{2w^e}$. The first order condition (F.O.C.) for an interior solution is $w_i \psi \left(\frac{1-\rho}{2} \right)^{1-\gamma} = c \sigma_i^{1+\gamma}$, where $w_i \in \{\underline{w}, \bar{w}, w^e\}$, with a slight abuse of notation.

The solution to (6) is

$$\sigma_i = \begin{cases} \left(\frac{1-\rho}{2}\right)^{\frac{1-\gamma}{1+\gamma}} \left(\frac{w_i\psi}{c}\right)^{\frac{1}{1+\gamma}} & \text{if } c > w_i\psi \left(\frac{1-\rho}{2}\right)^{1-\gamma} \\ 1 & \text{if } c \leq w_i\psi \left(\frac{1-\rho}{2}\right)^{1-\gamma}. \end{cases} \quad (21)$$

Independents. Independents choose σ_I to solve (6). If they are uninformed, they expect each candidate to be of ability \bar{w} with probability 1/2, and we suppose without loss of generality that any vote cast is in support of candidate A. If they are informed, any vote cast will be in support of the candidate with ability \bar{w} . Hence,

$$E(u_I^V) = \begin{cases} w^e + (\bar{w} - \underline{w})\psi \left(\rho\sigma_I + \frac{1-\rho}{2}(\bar{\sigma}(K_A) - \underline{\sigma}(K_B)) \right) & \text{if } K_I = 1 \text{ and } S = A \\ w^e + (\bar{w} - \underline{w})\psi \left(\rho\sigma_I + \frac{1-\rho}{2}(\bar{\sigma}(K_B) - \underline{\sigma}(K_A)) \right) & \text{if } K_I = 1 \text{ and } S = B \\ w^e + (\bar{w} - \underline{w})\frac{\psi}{2} \left(\frac{1-\rho}{2} \sum_{i=A,B} (\bar{\sigma}(K_i) - \underline{\sigma}(K_i)) \right) & \text{if } K_I = 0. \end{cases} \quad (22)$$

When $K_I = 0$, $E(u_I^V)$ does not depend on σ_I , and because voting is costly, the solution to (6) is $\sigma_I = 0$. When $K_I = 1$, the F.O.C. for an interior solution is $(\bar{w} - \underline{w})\psi\rho^{1-\gamma} = c\sigma_I^{1+\gamma}$. The solution to (6) when $K_I = 1$ is thus

$$\sigma_I = \begin{cases} \rho^{\frac{1-\gamma}{1+\gamma}} \left(\frac{(\bar{w} - \underline{w})\psi}{c}\right)^{\frac{1}{1+\gamma}} & \text{if } c > (\bar{w} - \underline{w})\psi\rho^{1-\gamma} \\ 1 & \text{if } c \leq (\bar{w} - \underline{w})\psi\rho^{1-\gamma}. \end{cases} \quad (23)$$

Using (18) and noting that $\rho_i = (1-\rho)/2$ for $i = A, B$ and $\rho_I = \rho$, it is immediate that equations (21) and (23) can be rewritten as in (7). \square

Proof of Proposition 1. Using the definitions of ET_P^K and ET_I^K as well as Lemma 1, we have

$$ET_P^0 = \frac{1-\rho}{2}\sigma_P(w^e) = \left(\frac{\psi}{c} \left(\frac{1-\rho}{2}\right)^2 \frac{\bar{w} + \underline{w}}{2}\right)^{\frac{1}{1+\gamma}} \quad (24)$$

$$ET_P^1 = \frac{1-\rho}{2} \left(\frac{\sigma_P(\underline{w}) + \sigma_P(\bar{w})}{2}\right) = \left(\frac{\psi}{c} \left(\frac{1-\rho}{2}\right)^2\right)^{\frac{1}{1+\gamma}} \left[\frac{\underline{w}^{\frac{1}{1+\gamma}}}{2} + \frac{\bar{w}^{\frac{1}{1+\gamma}}}{2}\right] \quad (25)$$

$$ET_I^0 = \rho\sigma_I(0) = 0 \quad (26)$$

$$ET_I^1 = \rho\sigma_I(\bar{w} - \underline{w}) = \left(\frac{\psi\rho^2(\bar{w} - \underline{w})}{c}\right)^{\frac{1}{1+\gamma}}. \quad (27)$$

We now show that equations (8) and (9) uniquely define ρ^* and ρ^{**} . From equations (24) through (27), equation (8) can be rewritten as

$$\left(\frac{\psi\rho^2(\bar{w}-\underline{w})}{c}\right)^{\frac{1}{1+\gamma}} = \left(\frac{\psi}{c}\left(\frac{1-\rho}{2}\right)^2 w^e\right)^{\frac{1}{1+\gamma}} - \left(\frac{\psi}{c}\left(\frac{1-\rho}{2}\right)^2\right)^{\frac{1}{1+\gamma}} \left[\frac{w^{\frac{1}{1+\gamma}}}{2} + \frac{\bar{w}^{\frac{1}{1+\gamma}}}{2}\right]. \quad (28)$$

After some algebra, we obtain the following implicit function defining ρ^* :

$$\frac{\rho}{1-\rho} = \sqrt{\frac{2^{\gamma-1}}{\bar{w}-\underline{w}} \left((w^e)^{\frac{1}{1+\gamma}} - \frac{1}{2} \left(w^{\frac{1}{1+\gamma}} + \bar{w}^{\frac{1}{1+\gamma}} \right) \right)^{1+\gamma}}. \quad (29)$$

Similarly, equation (9) can be rewritten to obtain expression (30), implicitly defining ρ^{**} :

$$\frac{\rho}{1-\rho} = \frac{1}{2} \sqrt{\frac{1}{\bar{w}-\underline{w}} \left((w^e)^{\frac{1}{1+\gamma}} - \frac{1}{2} \left(w^{\frac{1}{1+\gamma}} + \bar{w}^{\frac{1}{1+\gamma}} \right) \right)^{1+\gamma}}. \quad (30)$$

The left hand side of both (29) and (30) is increasing in ρ , and the right hand side is a non-negative constant. Therefore, the equations always have unique solutions ρ^* and ρ^{**} . Notice that $\lim_{\rho \rightarrow 0} \rho/(1-\rho) = 0$ and $\lim_{\rho \rightarrow 1} \rho/(1-\rho) = +\infty$; hence, for any value of the right hand side, ρ^* and ρ^{**} exist and belong to the interval $[0, 1)$.

We now prove the three claims made in the proposition.

- (i) By equation (27), independents' turnout is strictly positive when they are informed, while it is zero when they are not. Hence, information increases independent turnout.
- (ii) The claim is that $ET_P^0 \geq ET_P^1$ (with strict inequality for $\gamma > 0$). Using equations (24) and (25) and simplifying, this inequality becomes

$$\left(\frac{\underline{w} + \bar{w}}{2}\right)^{\frac{1}{1+\gamma}} \geq \frac{\underline{w}^{\frac{1}{1+\gamma}} + \bar{w}^{\frac{1}{1+\gamma}}}{2}. \quad (31)$$

For $\gamma \geq 0$, Jensen's inequality implies that the left-hand side of (31) exceeds the right-hand side, and hence $ET_P^0 \geq ET_P^1$. The inequality holds strictly if $\gamma > 0$, while $ET_P^0 = ET_P^1$ for $\gamma = 0$.

- (iii) If the independents and one group of partisans become informed, the total effect on turnout is positive if and only if $ET_I^1 - ET_I^0 + ET_P^1 - ET_P^0 \geq 0 \Leftrightarrow ET_I^1 \geq ET_P^0 - ET_P^1$. If the independents and both groups of partisans become informed, the total effect on turnout is positive if and only if $ET_I^1 - ET_I^0 + 2(ET_P^1 - ET_P^0) \geq 0 \Leftrightarrow ET_I^1 \geq 2(ET_P^0 - ET_P^1)$. By construction, ρ^* and ρ^{**} are such that the effects on independent and partisan turnout cancel out. The result in the proposition directly follows.

□

Proof of Lemma 2. From Lemma 1 we have

$$\bar{\sigma}(K_i) = \begin{cases} \sigma_P(w^e) & \text{if } K_i = 0 \\ \sigma_P(\bar{w}) & \text{if } K_i = 1 \end{cases} \quad i = A, B, \quad (32)$$

$$\underline{\sigma}(K_i) = \begin{cases} \sigma_P(w^e) & \text{if } K_i = 0 \\ \sigma_P(\underline{w}) & \text{if } K_i = 1 \end{cases} \quad i = A, B. \quad (33)$$

$$\hat{\sigma}(K_I) = \begin{cases} 0 & \text{if } K_I = 0 \\ \sigma_I(\bar{w} - \underline{w}) & \text{if } K_I = 1. \end{cases} \quad (34)$$

The expected payoff of partisan group i as a function of the information held by all the groups can thus be written as

$$\begin{aligned} EU_i^P(K_i, K_j, K_I) &= \frac{\bar{w}}{2} \left[\frac{1}{2} + \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_i) - \underline{\sigma}(K_j)) \right) \right] \\ &\quad + \frac{\underline{w}}{2} \left[\frac{1}{2} - \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_j) - \underline{\sigma}(K_i)) \right) \right] \\ &\quad - \frac{c}{2+\gamma} \left(\frac{1-\rho}{2} \right)^\gamma \left[\frac{\bar{\sigma}(K_i)^{2+\gamma}}{2} + \frac{\underline{\sigma}(K_i)^{2+\gamma}}{2} \right], \quad i, j = A, B, j \neq i. \end{aligned} \quad (35)$$

From (32) and (33), we have

$$\begin{aligned} EU_i^P(0, K_j, K_I) &= \frac{\bar{w}}{2} \left[\frac{1}{2} + \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\sigma(w^e) - \underline{\sigma}(K_j)) \right) \right] \\ &\quad + \frac{\underline{w}}{2} \left[\frac{1}{2} - \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_j) - \sigma(w^e)) \right) \right] - \frac{c}{2+\gamma} \left(\frac{1-\rho}{2} \right)^\gamma (\sigma(w^e))^{2+\gamma}, \end{aligned} \quad (36)$$

which can be simplified to

$$\begin{aligned} EU_i^P(0, K_j, K_I) &= w^e \left(\frac{1}{2} + \psi \frac{1-\rho}{2} \sigma(w^e) \right) - \frac{c}{2+\gamma} \left(\frac{1-\rho}{2} \right)^\gamma (\sigma(w^e))^{2+\gamma} \\ &\quad + \frac{\psi}{2} \left[\rho \hat{\sigma}(K_I) (\bar{w} - \underline{w}) - \frac{1-\rho}{2} (\bar{w} \underline{\sigma}(K_j) + \underline{w} \bar{\sigma}(K_j)) \right]. \end{aligned} \quad (37)$$

Using the first-order condition of the partisans' voting problem (6), implying that

$$w^e \psi \frac{1-\rho}{2} - \frac{c}{2+\gamma} \left(\frac{1-\rho}{2} \right)^\gamma (\sigma(w^e))^{1+\gamma} = \frac{w^e \psi (1-\rho)(1+\gamma)}{2(2+\gamma)}, \quad (38)$$

as well as the definition of $\sigma_P(w^e)$, we obtain finally

$$\begin{aligned} EU_i^P(0, K_j, K_I) &= \frac{w^e}{2} + \mu \left(\frac{1-\rho}{2} \right)^{\frac{2}{1+\gamma}} (w^e)^{\frac{2+\gamma}{1+\gamma}} \\ &\quad + \frac{\psi}{2} \left[\rho \hat{\sigma}(K_I) (\bar{w} - \underline{w}) - \frac{1-\rho}{2} (\bar{w} \underline{\sigma}(K_j) + \underline{w} \bar{\sigma}(K_j)) \right]. \end{aligned} \quad (39)$$

Similarly, we have

$$\begin{aligned}
EU_i^P(1, K_j, K_I) &= \frac{\bar{w}}{2} \left[\frac{1}{2} + \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\sigma(\bar{w}) - \underline{\sigma}(K_j)) \right) \right] \\
&\quad + \frac{\underline{w}}{2} \left[\frac{1}{2} - \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_j) - \sigma(\underline{w})) \right) \right] \\
&\quad - \frac{c}{2+\gamma} \left(\frac{1-\rho}{2} \right)^\gamma \left[\frac{(\sigma(\bar{w}))^{2+\gamma}}{2} + \frac{(\sigma(\underline{w}))^{2+\gamma}}{2} \right], \tag{40}
\end{aligned}$$

which can be simplified in an analogous way to obtain

$$\begin{aligned}
EU_i^P(1, K_j, K_I) &= \frac{w^e}{2} + \mu \left(\frac{1-\rho}{2} \right)^{\frac{2}{1+\gamma}} \left[\frac{\bar{w}^{\frac{2+\gamma}{1+\gamma}} + \underline{w}^{\frac{2+\gamma}{1+\gamma}}}{2} \right] \\
&\quad + \frac{\psi}{2} \left[\rho \hat{\sigma}(K_I) (\bar{w} - \underline{w}) - \frac{1-\rho}{2} (\bar{w} \underline{\sigma}(K_j) + \underline{w} \bar{\sigma}(K_j)) \right]. \tag{41}
\end{aligned}$$

Subtracting (39) from (41) yields (10). Because $(2+\gamma)/(1+\gamma) > 1$ for any $\gamma \geq 0$, the term in square brackets is positive by Jensen's inequality. It follows that $\Delta_P(\rho) \geq 0$, with strict inequality for $\rho < 1$. \square

Proof of Lemma 3. Using the notation introduced in the proof of Lemma 2, the independents' expected payoff as a function of the information held by all the groups can be written as

$$\begin{aligned}
EU^I(K_A, K_B, K_I) &= \frac{1}{2} \left[w^e + (\bar{w} - \underline{w}) \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_A) - \underline{\sigma}(K_B)) \right) \right] \\
&\quad + \frac{1}{2} \left[w^e + (\bar{w} - \underline{w}) \psi \left(\rho \hat{\sigma}(K_I) + \frac{1-\rho}{2} (\bar{\sigma}(K_B) - \underline{\sigma}(K_A)) \right) \right] - \frac{c}{2+\gamma} \rho^\gamma \hat{\sigma}(K_I)^{2+\gamma}. \tag{42}
\end{aligned}$$

From (34), we obtain after simplifying

$$EU^I(K_A, K_B, 0) = w^e + (\bar{w} - \underline{w}) \frac{\psi(1-\rho)}{2} \left(\frac{\bar{\sigma}(K_A) - \underline{\sigma}(K_B)}{2} + \frac{\bar{\sigma}(K_B) - \underline{\sigma}(K_A)}{2} \right) \tag{43}$$

and

$$\begin{aligned}
EU^I(K_A, K_B, 1) &= w^e - \frac{c}{2+\gamma} \rho^\gamma (\sigma_I(\bar{w} - \underline{w}))^{2+\gamma} \\
&\quad + (\bar{w} - \underline{w}) \psi \left[\rho \sigma_I(\bar{w} - \underline{w}) + \frac{(1-\rho)}{2} \left(\frac{\bar{\sigma}(K_A) - \underline{\sigma}(K_B)}{2} + \frac{\bar{\sigma}(K_B) - \underline{\sigma}(K_A)}{2} \right) \right]. \tag{44}
\end{aligned}$$

Using (23), we can further simplify this expression as

$$\begin{aligned}
EU^I(K_A, K_B, 1) &= w^e + \mu \rho^{\frac{2}{1+\gamma}} (\bar{w} - \underline{w})^{\frac{2+\gamma}{1+\gamma}} \\
&\quad + (\bar{w} - \underline{w}) \frac{\psi(1-\rho)}{2} \left(\frac{\bar{\sigma}(K_A) - \underline{\sigma}(K_B)}{2} + \frac{\bar{\sigma}(K_B) - \underline{\sigma}(K_A)}{2} \right). \tag{45}
\end{aligned}$$

Subtracting (43) from (45) yields $\mu \rho^{\frac{2}{1+\gamma}} (\bar{w} - \underline{w})^{\frac{2+\gamma}{1+\gamma}}$, which is positive because $\bar{w} > \underline{w}$. \square

Proof of Lemma 4. We start by examining how media outlets' choice of slant translates into the audience each outlet obtains under the various conditions on partisans' and independents' news demand. The outlets' audience is pinned down by i) the rules of ethical behaviour derived in Section 3.2; ii) the assumption that, when indifferent, citizens randomise over outlets; and iii) the assumptions on partisans' utility from news consumption (\bar{n} and \underline{n}). The result is presented in Tables 3 and 4.

Table 3 looks at the monopoly case ($M = 1$). Thanks to our assumption that, if only one partisan outlet is available, its slant is n_A , we can restrict attention to two strategies: n_A and n_I . Of the seven relevant demand conditions in the table (excluding the case $R > \max\{\Delta_I, \Delta_P + \bar{n}\}$, where there is no market), there are four in which the optimal slant is unique and corresponds to the one given in Table 1. There are three in which both n_A and n_I produce the same audience. When $R \leq \Delta_I$ and $R > \Delta_P + \bar{n}$, only independents consume news, so any slant is optimal. When $R \leq \Delta_P + \underline{n}$, irrespective of whether $R > \Delta_I$ or $R \leq \Delta_I$, partisans are willing to consume any slant. Slant n_I , however, produces higher aggregate utility because, by assumption, $\bar{n} + \underline{n} < 0$, allowing us to eliminate n_A .

Table 4 looks at the duopoly case ($M = 2$), where we can restrict attention to four strategy pairs: (n_A, n_A) , (n_A, n_B) , (n_A, n_I) , and (n_I, n_I) . This is because of our assumption that the first partisan slant is n_A and because, when considering deviations that would result in other strategy pairs $(n, n') \in \{n_A, n_B, n_I\}^2$, there always exist equivalent deviations that would yield the same audience to the deviator. For example, starting from (n_A, n_B) , a deviation to (n_B, n_B) by outlet 1 would yield outlet 1 the same audiences as a deviation to (n_A, n_A) by outlet 2 would yield outlet 2. Of the seven relevant demand conditions in the table, there are two in which there is a unique equilibrium: namely, when $\Delta_P \leq R < \Delta_P + \bar{n}$, both for $R > \Delta_I$ and $R \leq \Delta_I$. There are five in which at least two different strategy pairs form an equilibrium. When $R \leq \Delta_I$ and $R > \Delta_P + \bar{n}$, all four strategy pairs yield the same audience. When $\Delta_P + \underline{n} < R \leq \Delta_P$, the three strategy pairs (n_A, n_B) , (n_A, n_I) and (n_I, n_I) all yield the same audience, and nobody has an incentive to deviate, regardless of whether $R > \Delta_I$ or $R \leq \Delta_I$. Pareto dominance, however, eliminates all but (n_A, n_B) , which procures citizens the highest aggregate utility. When $R \leq \Delta_P + \underline{n}$, all four strategy pairs yield the same audience, again regardless of whether $R > \Delta_I$ or $R \leq \Delta_I$; but also here the Pareto dominance refinement leaves only (n_A, n_B) . \square

Proof of Proposition 2. Let $T(M)$ denote total expected turnout when there are M active outlets. The proposition includes four claims, each focusing on one particular area of the (ρ, R) plane. These areas correspond to the five regions in Figure 1, with regions 1 and 2 considered jointly in Claim (i).

Table 3: Audience as a function of slant when $M = 1$

Demand conditions		Slant	
Indep.	Partisans	n_A	n_I
$R > \Delta_I$	$R > \Delta_P + \bar{n}$	0	0
	$\Delta_P < R \leq \Delta_P + \bar{n}$	$(1 - \rho)/2$	0
	$\Delta_P + \underline{n} < R \leq \Delta_P$	$(1 - \rho)/2$	$1 - \rho$
	$R \leq \Delta_P + \underline{n}$	$1 - \rho$	$1 - \rho$
$R \leq \Delta_I$	$R > \Delta_P + \bar{n}$	ρ	ρ
	$\Delta_P < R \leq \Delta_P + \bar{n}$	$\rho + (1 - \rho)/2$	ρ
	$\Delta_P + \underline{n} < R \leq \Delta_P$	$\rho + (1 - \rho)/2$	1
	$R \leq \Delta_P + \underline{n}$	1	1

 Table 4: Audience as a function of slant when $M = 2$

Demand conditions		Slant			
Indep.	Partisans	(n_A, n_A)	(n_A, n_B)	(n_A, n_I)	(n_I, n_I)
$R > \Delta_I$	$R > \Delta_P + \bar{n}$	0, 0	0, 0	0, 0	0, 0
	$\Delta_P < R \leq \Delta_P + \bar{n}$	$\frac{1-\rho}{4}, \frac{1-\rho}{4}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, 0$	0, 0
	$\Delta_P + \underline{n} < R \leq \Delta_P$	$\frac{1-\rho}{4}, \frac{1-\rho}{4}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$
	$R \leq \Delta_P + \underline{n}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$	$\frac{1-\rho}{2}, \frac{1-\rho}{2}$
$R \leq \Delta_I$	$R > \Delta_P + \bar{n}$	$\rho/2, \rho/2$	$\rho/2, \rho/2$	$\rho/2, \rho/2$	$\rho/2, \rho/2$
	$\Delta_P < R \leq \Delta_P + \bar{n}$	$\frac{\rho}{2} + \frac{1-\rho}{4}, \frac{\rho}{2} + \frac{1-\rho}{4}$	1/2, 1/2	1/2, $\rho/2$	$\rho/2, \rho/2$
	$\Delta_P + \underline{n} < R \leq \Delta_P$	$\frac{\rho}{2} + \frac{1-\rho}{4}, \frac{\rho}{2} + \frac{1-\rho}{4}$	1/2, 1/2	1/2, 1/2	1/2, 1/2
	$R \leq \Delta_P + \underline{n}$	1/2, 1/2	1/2, 1/2	1/2, 1/2	1/2, 1/2

Claim (i): If $\Delta_I(\rho) < R \leq \Delta_P(\rho) + \bar{n}$ (regions 1 and 2), entry decreases expected turnout (strictly if $\gamma > 0$).

In this area, independents never consume news, hence this result depends entirely on partisans' news consumption. By Proposition 1, when $\gamma = 0$, expected partisan turnout is unaffected by information, so changes in the media market will not matter. When $\gamma > 0$, we have to consider two cases:

- Region 1: when $\Delta_P(\rho) \leq R < \Delta_P(\rho) + \bar{n}$, the first outlet to enter ($M = 1$) chooses n_A (see Lemma 4). Partisans of A becoming informed, $T(1) = ET_P^1 + ET_P^0 < 2ET_P^0 = T(0)$. When a second outlet enters ($M = 2$), the equilibrium is (n_A, n_B) . Partisans of B becoming informed, turnout decreases further: $T(2) = 2ET_P^1 < ET_P^1 + ET_P^0 = T(1)$. Further entry does not affect the voters' information, as independents never consume news and partisans are already informed. Thus, for any $M \geq 2$, $T(M) = T(2)$.
- Region 2: when $R < \Delta_P$, a monopolist serves both groups of partisans by providing slant n_I . All partisans become informed at once: $T(1) = 2ET_P^1 < 2ET_P^0 = T(0)$. Further entry has no effect on voters' information. Thus, for any $M \geq 1$, $T(M) = T(1)$.

Claim (ii): If $\Delta_P(\rho) + \bar{n} < R \leq \Delta_I(\rho)$ (region 3), entry strictly increases expected turnout.

When the first outlet enters the market, independents become informed and turnout increases: $T(1) = 2ET_P^0 + ET_I^1 > 2ET_P^0 = T(0)$. Any further entry cannot affect turnout, as independents are already informed and partisans never consume news. Thus, for any $M \geq 1$, $T(M) = T(1) > T(0)$.

Claim (iii): If $\Delta_P(\rho) < R \leq \min\{\Delta_P(\rho) + \bar{n}, \Delta_I(\rho)\}$ (region 4), entry of the first outlet decreases expected turnout if $\rho < \rho^*$, and increases it otherwise. Entry of a second outlet decreases turnout (strictly if $\gamma > 0$). Further entry has no effect on turnout.

The first outlet chooses slant n_A , leading both partisans of A and independents to become informed. Expected turnout decreases if $\rho < \rho^*$ and increases if $\rho \geq \rho^*$: by construction, we have $T(1) = ET_P^1 + ET_P^0 + ET_I^1 < 2ET_P^0 = T(0) \Leftrightarrow ET_I^1 < ET_P^0 - ET_P^1$ if and only if $\rho < \rho^*$. After a second outlet enters, the equilibrium is (n_A, n_B) . Entry of the second outlet leads partisans of B to become informed, which implies that $T(2) = 2ET_P^1 + ET_I^1 \leq T(1)$. By Proposition 1, the inequality holds strictly for $\gamma > 0$, while $T(2) = T(1)$ for $\gamma = 0$. If further entry occurs, the market remains covered; hence, for any $M \geq 2$, $T(M) = T(2)$.

Claim (iv): If $R \leq \min\{\Delta_P(\rho), \Delta_I(\rho)\}$ (region 5), entry strictly decreases turnout if $\rho < \rho^{**}$, and increases it otherwise.

The first outlet chooses slant n_I , leading all citizens to become informed. Expected turnout

decreases if $\rho < \rho^{**}$ and increases if $\rho \geq \rho^{**}$: by construction, we have $T(1) = 2ET_P^1 + ET_I^1 < 2ET_P^0 = T(0) \Leftrightarrow ET_I^1 < 2(ET_P^0 - ET_P^1)$ if and only if $\rho < \rho^{**}$. After a second outlet enters, the equilibrium is (n_A, n_B) , and everyone remains informed; further entry does not affect which groups are informed. Thus, for any $M \geq 1$, $T(M) = T(1)$. \square

Proof of Proposition 3. Concerning Claim (i), we distinguish the following cases:

- if $\Delta_P + \bar{n} < R < \Delta_I$ (region 3), partisans never consume news, and any slant (or combination of slants) can be chosen by outlets in equilibrium. Since an outlet that enters with a partisan slant has no reason to change its reporting strategy after further entry occurs, we conclude that the number of partisan outlets weakly increases with M .
- if $\Delta_P < R \leq \Delta_P + \bar{n}$ (regions 1 and 4), the equilibrium is n_A for $M = 1$ and (n_A, n_B) for $M = 2$; additional entrants will always choose partisan slant. Hence, the number of partisan outlets strictly increases with M . Moreover, the first and second outlet entering the market induce an increase in the number of available slants.
- if $R < \Delta_P$ (regions 2 and 5), the equilibrium is n_I for $M = 1$. For $M = 2$, the equilibrium is (n_A, n_B) , and additional entrants will always choose partisan slant. Hence, entry of the first outlet keeps slant constant, while subsequent entrants induce an increase in the supply of slanted news, as measured by the number of partisan outlets.

We conclude that as M increases, there is always a weak increase in the number of partisan outlets available.

To establish Claim (ii), note that in all cases examined above, entry leads more citizens to become informed: as the availability of partisan news increases, so does the probability that partisans consume news; moreover, provided $R \leq \Delta_I$, independents consume news whenever at least one outlet is available. Hence, an increase in M raises the number of informed voters. When independents are informed, they vote for the type- \bar{w} candidate; otherwise they abstain. When partisans become informed, they increase their turnout when they know their candidate is of type \bar{w} and decrease it otherwise, compared to the case where they are uninformed. Therefore, both independents' and partisans' news consumption increase the chances of the type- \bar{w} candidate. \square

Proof of Proposition 4. We consider separately independents and partisans. In either case, we face three possible scenarios:

- A) when they are informed. This occurs when they consume any outlet publishing the state of the world.

- B) when voters are genuinely uninformed. This occurs if they do not consume any news, or if they consume an independent outlet that did not publish the state of the world ($\hat{s} = \emptyset$)
- C) when they are partially informed. This occurs if they consume a partisan outlet that did not publish the state of the world and therefore they cannot distinguish the case of absence of signal ($\hat{s} = \emptyset$) from the one of the outlet omitting to publish it ($\hat{s} = S$, with news suppression by the outlet). However, compared to the previous case, consumers Bayesian-update their beliefs about the state of the world, and they expect the state of the world to be unfavourable to the outlet's preferred candidate with probability $1/(2-q)$.

Under scenarios A) and B), nothing changes compared to the case of $q = 1$ analysed in subsection 3.1: voters solve (6), with $E(u_i^V)$ defined by (22) and (20) for independents and partisans respectively. The solution is given by (23) and (21) respectively.

The novelty, with respect to subsection 3.1, comes from scenario C), under which agents are partially informed. We denote the expected turnout of a group, given the state of the world, as $\sigma_{i,S} = E(\sigma_i|S)$, with $i = A, B, I$ and $S = A, B$, where the expectation is taken over the realisation of the signal.

Independents. Under scenario C), let us assume, without loss of generality, that independents consume an outlet with slant n_A , and that if they vote, they support candidate B. Independents' expected utility of voting is given by:

$$E(u_I^V) = \Pr(S = A|n_A = \emptyset) [\bar{w} \Pr(\theta = A|S = A) + \underline{w} \Pr(\theta = B|S = A)] \\ + \Pr(S = B|n_A = \emptyset) [\bar{w} \Pr(\theta = B|S = B) + \underline{w} \Pr(\theta = A|S = B)]. \quad (46)$$

Then, due to the linearity and separability of the probability of winning, we can write $\Pr(\theta = A|S = A) = \frac{1}{2} + \psi \left(\frac{1-\rho}{2} (\sigma_{A,A} - \sigma_{B,A}) - \rho \sigma_{I,A} \right)$, while $\Pr(\theta = B|S = B) = \frac{1}{2} + \psi \left(\frac{1-\rho}{2} (\sigma_{B,B} - \sigma_{A,B}) + \rho \sigma_{I,B} \right)$.

After some algebra, equation (46) can be rearranged as

$$E(u_I^V) = w^e + \frac{(\bar{w} - \underline{w})\psi}{2-q} \left(\frac{1-\rho}{2} ((1-q)(\sigma_{A,A} - \sigma_{B,A}) + \sigma_{B,B} - \sigma_{A,B}) \right) \\ + \frac{(\bar{w} - \underline{w})\psi q}{2-q} \rho \sigma_I. \quad (47)$$

Therefore, the solution to (6) for independents under scenario C) is

$$\sigma_I = \begin{cases} \rho^{\frac{1-\gamma}{1+\gamma}} \left(\frac{q}{2-q} \frac{(\bar{w} - \underline{w})\psi}{c} \right)^{\frac{1}{1+\gamma}} & \text{if } c > \frac{q}{2-q} (\bar{w} - \underline{w}) \psi \rho^{1-\gamma} \\ 1 & \text{if } c \leq \frac{q}{2-q} (\bar{w} - \underline{w}) \psi \rho^{1-\gamma}. \end{cases} \quad (48)$$

Since independents do not vote when they do not consume news, and because $\sigma_I > 0$ in equation (48), it follows directly that when independents consume news, their turnout increases even if the outlet reports nothing at all.

Partisans. Under scenario C), the expected utility of voting of a partisan of A is $E(u_A^V) = \Pr(S = A)\bar{w}\Pr(\theta = A|S = A) + \Pr(S = B)\underline{w}\Pr(\theta = A|S = B)$. Then $\Pr(\theta = A|S = A) = \frac{1}{2} + \psi\left(\rho\sigma_{I,A} + \frac{1-\rho}{2}(\sigma_{A,A} - \sigma_{B,A})\right)$, and $\Pr(\theta = B|S = B) = \frac{1}{2} + \psi\left(\rho\sigma_{I,B} + \frac{1-\rho}{2}(\sigma_{B,B} - \sigma_{A,B})\right)$.

$$E(u_i^V) = w(q) \left(\frac{1}{2} + \psi \frac{1-\rho}{2} \sigma_i \right) - \Xi_i, \quad (49)$$

with $w(q) = \frac{\underline{w}}{2-q} + \frac{(1-q)\bar{w}}{2-q} = \frac{2w^e - q\bar{w}}{2-q}$ and $\Xi_i = \frac{(1-q)\bar{w}\psi}{2-q} \left(\frac{1-\rho}{2} \sigma_{j,i} - \rho\sigma_{I,i} \right) + \frac{\underline{w}\psi}{2-q} \left(\frac{1-\rho}{2} \sigma_{j,j} + \rho\sigma_{I,j} \right)$. Therefore, the solution to (6) for partisans of i under scenario C) is:

$$\sigma_i = \begin{cases} \left(\frac{1-\rho}{2} \right)^{\frac{1-\gamma}{1+\gamma}} \left(\frac{w(q)\psi}{c} \right)^{\frac{1}{1+\gamma}} & \text{if } c > w(q)\psi \left(\frac{1-\rho}{2} \right)^{1-\gamma} \\ 1 & \text{if } c \leq w(q)\psi \left(\frac{1-\rho}{2} \right)^{1-\gamma}. \end{cases} \quad (50)$$

For $q \in [0, 1]$, we have $w(q) \in [\underline{w}, w^e]$.

Thus, once again we find that the optimal σ_i is given by (7), noting that for $i = A, B$, $\delta_i^V = E(u_i^V | K_i, \theta = i)$, and that when partisans of i consume an outlet with slant n_i , $E(u_i^V | t_i = \emptyset, \theta = i) = w(q)$. Observe that for any $\gamma > 0$, $\sigma_i(\delta_i^V)$ is increasing and strictly concave.

For notational simplicity, let $\sigma_i(\bar{w}) \equiv \bar{\sigma}$, $\sigma_i(\underline{w}) \equiv \underline{\sigma}$, $\sigma_i(w^e) \equiv \sigma^e$, and $\sigma_i(w(q)) \equiv \sigma^*$. Suppose that each group of partisans consumes their own partisan outlet, so that with probability q , one group is informed about the state of the world and the other receives no news. Then, total expected partisan turnout (divided by $(1-\rho)/2$) under news consumption is $q(\bar{\sigma} + \sigma^*) + (1-q)2\sigma^* = (2-q)\sigma^* + q\bar{\sigma}$, while in the absence of news consumption it is $2\sigma^e$. Let

$$f(q) \equiv (2-q)\sigma^* + q\bar{\sigma} - 2\sigma^e. \quad (51)$$

Because $w(0) = w^e$ and $w(1) = \underline{w}$, $f(0) = 0$ and $f(1) = \underline{\sigma} + \bar{\sigma} - 2\sigma^e < 0$, where the inequality follows from strict concavity of σ_i . Hence, it suffices to show that $f'(q) < 0$ for all $q > 0$ to establish the claimed result. We have

$$f'(q) = (2-q)w'(q)\sigma_i'(w(q)) - \sigma_i(w(q)) + \bar{\sigma}. \quad (52)$$

Noting that $w'(q) = -\frac{\bar{w}-\underline{w}}{(2-q)^2} = w(q) - \bar{w}$, we obtain

$$f'(q) = \sigma_i(\bar{w}) - [\sigma_i(w(q)) + (\bar{w} - w(q))\sigma_i'(w(q))]. \quad (53)$$

Concavity of σ_i and the fact that $\bar{w} > w(q)$ for all q imply $\sigma_i(\bar{w}) < \sigma_i(w(q)) + (\bar{w} - w(q))\sigma_i'(w(q))$ and thus $f'(q) < 0$ for all $q \in [0, 1]$. \square

Proof of Proposition 5. Let $\sigma^e \equiv \sigma(\sigma^e, w^e)$, $\underline{\sigma} \equiv \sigma(\underline{\sigma}, \underline{w})$, and $\bar{\sigma} \equiv \sigma(\underline{\sigma}, \bar{w})$. What needs to be shown is that $\sigma^e \geq (\underline{\sigma} + \bar{\sigma})/2$. Notice first that, by Jensen's inequality, $\sigma_{11} \leq 0$ implies

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w\right) \geq \frac{\sigma(\underline{\sigma}, w) + \sigma(\bar{\sigma}, w)}{2} \quad (54)$$

for any w , and $\sigma_{22} \leq 0$ implies

$$\sigma\left(s, \frac{w + \bar{w}}{2}\right) \geq \frac{\sigma(s, w) + \sigma(s, \bar{w})}{2} \quad (55)$$

for any s . Furthermore, $\sigma_{12} \geq 0$ implies

$$\sigma(s, w) - \sigma(s', w) \geq \sigma(s, w') - \sigma(s', w') \quad (56)$$

for $s \geq s'$ and $w \geq w'$ (increasing differences).

Define \tilde{w} such that

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \tilde{w}\right) = \frac{\underline{\sigma} + \bar{\sigma}}{2}. \quad (57)$$

In general, the value of s that solves $s = \sigma(s, w)$ is increasing in w : by the implicit function theorem,

$$\frac{\partial s}{\partial w} = \frac{\sigma_2}{1 - \sigma_1} > 0, \quad (58)$$

where the inequality follows from $\sigma_2 > 0$ and the fact that necessarily $\sigma_1 < 1$ at a fixed point. Hence, to establish that $\sigma^e = \sigma(\sigma^e, w^e) \geq (\underline{\sigma} + \bar{\sigma})/2 = \sigma((\underline{\sigma} + \bar{\sigma})/2, \tilde{w})$, it suffices to show that $w^e \geq \tilde{w}$, a sufficient condition for which is

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w^e\right) \geq \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \tilde{w}\right). \quad (59)$$

Applying (55), we have

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w^e\right) \geq \frac{1}{2} \left[\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w\right) + \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \bar{w}\right) \right]. \quad (60)$$

What remains to be shown is

$$\frac{1}{2} \left[\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w\right) + \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \bar{w}\right) \right] \geq \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \tilde{w}\right) = \frac{\underline{\sigma} + \bar{\sigma}}{2}, \quad (61)$$

where the equality follows from the definition of \tilde{w} . Adding $(\sigma(\underline{\sigma}, w) + \sigma(\bar{\sigma}, \bar{w}))/2$ to both sides and using the definition of $\underline{\sigma}$ and $\bar{\sigma}$, (61) becomes

$$\begin{aligned} \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, w\right) + \sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \bar{w}\right) + \frac{\sigma(\underline{\sigma}, w) + \sigma(\bar{\sigma}, \bar{w})}{2} \geq \\ \frac{\sigma(\bar{\sigma}, w) + \sigma(\underline{\sigma}, w)}{2} + \frac{\sigma(\underline{\sigma}, \bar{w}) + \sigma(\bar{\sigma}, \bar{w})}{2} + \frac{\sigma(\underline{\sigma}, \bar{w}) + \sigma(\bar{\sigma}, w)}{2}. \end{aligned} \quad (62)$$

Because by (54),

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \underline{w}\right) \geq \frac{\sigma(\bar{\sigma}, \underline{w}) + \sigma(\underline{\sigma}, \underline{w})}{2} \quad (63)$$

and

$$\sigma\left(\frac{\underline{\sigma} + \bar{\sigma}}{2}, \bar{w}\right) \geq \frac{\sigma(\underline{\sigma}, \bar{w}) + \sigma(\bar{\sigma}, \bar{w})}{2}, \quad (64)$$

a sufficient condition for (61) is

$$\sigma(\underline{\sigma}, \underline{w}) + \sigma(\bar{\sigma}, \bar{w}) \geq \sigma(\underline{\sigma}, \bar{w}) + \sigma(\bar{\sigma}, \underline{w}) \quad (65)$$

$$\iff \sigma(\bar{\sigma}, \bar{w}) - \sigma(\bar{\sigma}, \underline{w}) \geq \sigma(\underline{\sigma}, \bar{w}) - \sigma(\underline{\sigma}, \underline{w}), \quad (66)$$

which is true by (56) because $\bar{\sigma} > \underline{\sigma}$. \square

Proof of Proposition 6. Letting $\Psi \equiv \psi(1 - \rho)/2$, each group i solves

$$\max_{\sigma_i} w_i \Psi \sigma_i - C(\sigma_i, \sigma_j), \quad (67)$$

leading to the first-order condition

$$w_i \Psi - C_1(\sigma_i, \sigma_j) = 0. \quad (68)$$

Solving for σ_i yields the best-response function $\sigma(\sigma_j, w_i)$. Applying the implicit function theorem, we have

$$\sigma_1 = -\frac{C_{12}(\sigma(\sigma_j, w_i), \sigma_j)}{C_{11}(\sigma(\sigma_j, w_i), \sigma_j)} < 0 \quad (69)$$

$$\sigma_2 = \frac{\Psi}{C_{11}(\sigma(\sigma_j, w_i), \sigma_j)} > 0. \quad (70)$$

By differentiating we obtain

$$\sigma_{11} = \frac{[\sigma_1 C_{111} + C_{112}] C_{12} - [\sigma_1 C_{112} + C_{122}] C_{11}}{C_{11}^2} \quad (71)$$

$$\sigma_{22} = -\frac{\Psi \sigma_2 C_{111}}{C_{11}^2} \quad (72)$$

$$\sigma_{12} = -\frac{\Psi [\sigma_1 C_{111} + C_{112}]}{C_{11}^2} \quad (73)$$

\square

Proof of Proposition 7. The symmetry property implies

$$p' \left(\frac{\sigma_i}{\sigma_j} \right) = \left(\frac{\sigma_j}{\sigma_i} \right)^2 p' \left(\frac{\sigma_j}{\sigma_i} \right). \quad (74)$$

The objective function of group $i = A, B$ is

$$\max_{\sigma_i} w_i p\left(\frac{\sigma_i}{\sigma_j}\right) - \frac{\sigma_i^2}{2}. \quad (75)$$

Hence, the first-order conditions are

$$\frac{w_i}{\sigma_j} p'\left(\frac{\sigma_i}{\sigma_j}\right) = \sigma_i \quad (76)$$

$$\frac{w_j}{\sigma_i} p'\left(\frac{\sigma_j}{\sigma_i}\right) = \sigma_j \quad (77)$$

The second-order condition is

$$\frac{w_i}{\sigma_j^2} p''\left(\frac{\sigma_i}{\sigma_j}\right) - 1 < 0. \quad (78)$$

Dividing (76) by (77) and rearranging, we obtain

$$\frac{w_i}{w_j} = \frac{p'(\sigma_j/\sigma_i)}{p'(\sigma_i/\sigma_j)}. \quad (79)$$

Using (74), we then have

$$\frac{\sigma_i}{\sigma_j} = \sqrt{\frac{w_i}{w_j}}. \quad (80)$$

Substituting into (76) yields

$$\frac{w_i}{\sigma_i \sqrt{w_j/w_i}} p'\left(\sqrt{\frac{w_i}{w_j}}\right) = \sigma_i, \quad (81)$$

which we can solve for σ_i to obtain

$$\sigma_i(w_i, w_j) = \left(\frac{w_i}{w_j}\right)^{\frac{1}{4}} \sqrt{w_i p'\left(\sqrt{\frac{w_i}{w_j}}\right)}. \quad (82)$$

If both groups are uninformed about S , so that $w_i = w_j = w^e$, we thus have

$$\sigma^e \equiv \sigma_i(w^e, w^e) = \sqrt{w^e p'(1)}, \quad (83)$$

while if both groups are informed, we have

$$\bar{\sigma} \equiv \sigma_i(\bar{w}, \underline{w}) = \left(\frac{\bar{w}}{\underline{w}}\right)^{\frac{1}{4}} \sqrt{\bar{w} p'\left(\sqrt{\frac{\bar{w}}{\underline{w}}}\right)} \quad (84)$$

$$\underline{\sigma} \equiv \sigma_i(\underline{w}, \bar{w}) = \left(\frac{\bar{w}}{\underline{w}}\right)^{\frac{1}{4}} \sqrt{\underline{w} p'\left(\sqrt{\frac{\bar{w}}{\underline{w}}}\right)}, \quad (85)$$

where we have used the fact that, by (74), $x p'(x) = (1/x) p'(1/x)$ for $x \in [0, \infty)$.

Expected turnout when both groups are informed is lower than expected turnout when both groups are uninformed if and only if

$$\frac{\bar{\sigma} + \underline{\sigma}}{2} \leq \sigma^e \quad (86)$$

$$\Leftrightarrow \left(\frac{\bar{w}}{\underline{w}}\right)^{\frac{1}{4}} \sqrt{p' \left(\sqrt{\frac{\bar{w}}{\underline{w}}}\right) \frac{\sqrt{\bar{w}} + \sqrt{\underline{w}}}{2}} \leq \sqrt{p'(1)} \sqrt{\frac{\bar{w} + \underline{w}}{2}}. \quad (87)$$

Because by Jensen's inequality $(\sqrt{\bar{w}} + \sqrt{\underline{w}})/2 < \sqrt{(\bar{w} + \underline{w})/2}$, a sufficient condition for (87) is that $xp'(x) \leq p'(1)$ for $x \geq 1$. This is satisfied provided $p'(x) + xp''(x) \leq 0$ for $x \geq 1$. \square

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2011

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2014

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