Extremist platforms: political consequences of profit-seeking media*

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Abstract

We analyze the effect of information about candidate-quality on the choice of electoral platforms by an office-motivated political challenger. The incumbent is of known quality and located at the ideal policy of the single voter. The voter cares for both policy and the candidates' quality and can learn about the challenger's quality by buying information. A high-quality challenger then has an incentive to signal her quality by choosing a policy that induces the voter to buy information. We first study the benchmark case in which the information is supplied exogenously, and its quality is independent of the challenger's platform; this yields multiple equilibria and indeterminacy of equilibrium platforms. By contrast, when the information is supplied by a profit-maximizing media outlet, its quality depends on the challenger's platform and we obtain a unique equilibrium platform. In particular, when the incumbent's quality is relatively low, the challenger's platform diverges from the voter's ideal policy as the voter's preference for quality increases.

Keywords: Unobserved quality, Political challenger, Profit-maximizing media outlet, Platform extremism.

JEL Classifiers: C72, D72, D82

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1 Introduction

We study how information about the quality of a politician can affect their choice of platforms. In particular, we analyze whether, and under what conditions, this can cause the rise and electoral success of politicians who espouse policies that are distinctly positioned to the right or left of the median voter. Whilst politicians with median platforms are supposed to be more successful by being closer to a majority of voters, there are examples of politicians (and parties) who have run for office by taking stands on certain issues that are different from the median platform.[1] This has been seen in the success of Narendra Modi in India, of Donald Trump in the U.S. and the rise of far right parties across Europe, all occurring at a time of voter dissatisfaction about politicians in power. [2] At the same time, there is evidence – for example, from the 2014 Indian General elections and the 2016 US Presidential elections – of unprecedented media attention for such candidates.[3]

There can be many reasons behind media attention for extremist platforms. This paper shows how the presence of a partially-revealing signal about candidate quality – for example, through media coverage – interacts with voter beliefs about quality to determine the politician's choice of platforms away from the voter's ideal policy. We study this in a scenario where there is an incumbent of known quality facing a challenger whose quality is unknown. If the source from where the information emanates has an incentive to satisfy the voter's demand for news (e.g. a profit maximizing media), the challenger will choose a particular policy that moves away from the voter's ideal point – thus becoming extremist – as the voter's preference for a high-quality challenger increases. To strip out the impact of various competing channels that can also lead to extremist platforms, we construct a model where neither the media nor the challenger has any ideological bias and there is only a single voter. Extremist platforms are chosen by candidates because the demand for information about a relatively unknown challenger increases with both the distance between the platform from the voter's ideal policy and with higher quality of information. Voters face a higher cost of making a wrong choice when electing a candidate who makes policy commitments that are away from the median. This generates demand for information that a high-quality challenger exploits, aided by the media outlet responding to its profit-seeking interests by providing enhanced coverage for such a candidate.

We now explain the mechanism in more detail. The voter in our model cares about two dimensions, a horizontal dimension which we interpret as policy and a vertical dimension which we call quality. The voter has a bliss point on the policy dimension whilst utility is monotonic on the quality dimension. There is an unknown challenger facing a known incumbent in a winner take

[1] Following Kartik and McAfee (2007) and the subsequent papers in the literature, in the rest of the paper, we shall refer to candidate platforms that do not coincide with the median voter's as "extremist". This is to be understood as a comparative term; the further the platform from the median voter's, the more extremist it is.

[2] See Golder, 2016 for a review that analyzes the rise of the far right for Europe. This dissatisfaction was also seen in the US where only 33% of voters thought the country is in the right direction - see http://www.rasmussenreports.com/public-content/politics/mood-of-america/right-direction-or-wrong-track. Even when they did not win, far left politicians like Bernie Sanders in the U.S. as well as Jeremy Corbyn in the U.K. have been far more popular electorally than anticipated.

[3] A recent article by Frank Bruni at the New York Times entitled, "Will the media be Trump's accomplice again in 2020" highlights this.

all election. The challenger knows his or her quality, but other participants hold a common prior belief on this quality. The challenger incurs a cost to enter the race against the incumbent. There is a media outlet that is willing to provide the voter a signal about the challenger if the voter pays a fee.[4] The signal reveals the true quality of the challenger with some probability. This probability is increasing in the level of (costly) investment made by the media outlet. This induces candidates of high-quality, who want more media coverage, to rationally take a policy position away from the voter, generating voter demand for information. The voter of course has a choice of whether or not to buy information from the media outlet. In a situation where the voter is not particularly happy with the incumbent, he would like to consider voting for the challenger. However, if the challenger takes a relatively extreme position (compared to the voter's bliss point) the cost of choosing the winner incorrectly is greater for the voter. This increased value for information increases the voter's demand for news and the media outlet, in anticipation, invests more in coverage of a more extreme candidate.

The assumption of profit-maximizing behavior of the media outlet is consistent with the findings by Genztkow and Shapiro (2010) that the slant that a newspaper chooses are on average close to what it would have chosen if it had "independently maximized its own profits." In addition, our observation on media coverage of candidates with platforms away from the median is consistent with empirical evidence from the US and some stylized facts across the world. McCluskey and Kim (2012) examined the coverage of 208 political action groups in 118 newspapers in the United States. They conclude that "groups that expressed more polarized opinions on political issues were mentioned in larger newspapers, appeared earlier in articles, and were mentioned in more paragraphs." This is not confined to the US alone. India's current Prime Minister Narendra Modi was considered to be a polarizing figure when he challenged the then ruling Congress party in the 2014 General Elections. As in our framework, the Indian National Congress party was considered centrist and relatively poor in governance. In the run up to the election, Modi got 7.5 times more coverage than the Congress leadership. Several press releases and opinion polls suggest that voters saw him as a decisive leader who could deliver a well-governed India. Indeed as the New York Times reported, Modi "emerged with a bold, right-wing narrative in a country with a staunchly socialist past" at a time when the centrist Congress was struggling with an image of policy paralysis.

Our main finding is that when the incumbent's quality is relatively low in comparison with the expected quality of the challenger, a high-quality challenger enters the contest by committing to a policy that is away from the voter's ideal point. As any other policy makes the voter believe that the challenger is of low quality, a low-quality challenger must mimic this with strictly positive probability in order to avoid being revealed, and otherwise stay out of the contest. If the low quality challenger enters with probability one, the equilibrium is pooling and otherwise separating. In addition, the policy moves further away from the voter as the voter's preference for a high-quality challenger increases. The media outlet optimally invests in covering her and charging an access fee to the voter. The voter then pays the fee to follow the media coverage and learn about

[4]Subscription fees are widespread for better known outlets like the New York Times or The Times. However it is important to understand that our results remain intact if instead we assume that the voter must incur some cost in following the media, while media revenues are generated through commercial adverts that respond positively to the size of viewership.

the true quality of the challenger with a probability proportional to the amount of coverage. This equilibrium is of course not universal in the parameter space and we characterize other instances where extremist platforms are obtained. In general, the existence of imperfect signals plays a crucial role in obtaining equilibria where the high-quality challenger initiates information acquisition through announcing extremist platforms. It is also worth noting that such platforms can be obtained even with exogenous signals. However, exogenously fixed quality of information leads to multiple equilibria, and hence, indeterminacy of equilibrium platforms (as proved in Section 3).[5]

Our results have broader implications in more general principal-agent frameworks where the agent wants to signal quality through commitments in actions. Although our equilibrium mechanism has elements that are reminiscent of costly signalling (Spence,1974) and signalling via money burning (Milgrom and Roberts, 1986 and Austen-Smith and Banks, 2000), it differs significantly from both. Unlike signalling models, high types and low types do not have any direct differential costs of choosing such platforms. Further, unlike money burning, the choice of platform is not per se informative but instead triggers information acquisition that favors the high type.[6] This paper is also related to a large literature where an informed principal (eg. a seller) tries to persuade an agent (eg. a buyer). While in some papers, like Gill and Sgroi (2012), the seller can directly choose an optimal test for the quality of its product, in others, like Taylor (1999), the buyer is the one who chooses the intensity of the costly test of quality. In our framework, the challenger cannot directly choose the optimal quality of a test, but has to provide incentives for the voter to pay for a more informative test in terms of higher media coverage. Of course, when outside information is exogenously fixed, the challenger loses his ability to indirectly affect the quality of such tests.

We now outline the rest of the paper. In subsection 1.1, we discuss the literature. Section 2 lays out the model formally. In Section 3 we demonstrate how extremism can be generated, first using a lottery example and then keeping quality of outside information exogenously fixed. The heart of the analysis is in Section 4.1, where the quality of outside information is determined by a profit-maximizing monopolist media outlet. Section 5 discusses the theoretical implications of relaxing the different modeling assumptions and the paper concludes in Section 6. The appendix contains the proofs and formal details of equilibria and the equilibrium refinement we use.

1.1 Related literature

A recent and influential literature in the field of media and politics advocates the notion of media induced platform extremism and polarized sorting, largely based upon suggestive evidence that media has ideological bias, as in Baron (2006), or slant to cater to partisan viewership bases, as in Gentzkow and Shapiro (2006, 2010). Existence of media bias is argued to lead politicians without an established valence to pander to the biased media in anticipation of obtaining more favorable media

[5] In Section 6, we argue that all our results go through in today's age of the internet where there is an abundance of information, especially about politically unknown challengers in important elections, and the voter can acquire it by incurring search and analysis costs.

[6] These are also reasons why standard refinement requirements do not reduce the set of Perfect Bayesian equilibria in our model (see more about this in Appendix A and Appendix B).

endorsements about their calibre. As shown by Chakraborty and Ghosh (2016), such polarization occurs as an equilibrium phenomenon even when voters are fully aware of media bias.[7] Moreover, partisan media can potentially make both professional politicians and voters with existing bias to become more distinctly sorted by broadcasting polarized views.

This polarization can however occur without media bias. As shown by Bernhardt et.al (2008), a profit-maximizing media may deliberately slant news to cater to the ideological bias of voters. An analytical survey by Prior (2013) on media and political polarization however concludes that "most large media outlets [in the US] are centrist compared to members of Congress" and there is no compelling evidence that partisan media, even if they existed, have made Americans more partisan.[8] Boleslavsky and Cotton (2015) study a model where two ideological parties on two sides of the median voter commit to platforms that are perfectly observable, while their qualities remain private information. Voters obtain a public signal about quality, and the precision of the public signal is exogenously fixed. They show that when the public signal is highly uninformative, both parties must announce policies close to the voter as with no public information about party quality, the voter always votes for the closer policy. On the other hand, when public information becomes more informative, policy moderation does not guarantee electoral victory, allowing parties to care about their ideologies and announcing platforms closer to their own ideal policies, thereby generating platform extremism. We note that perfect outside information in our model cannot generate platform extremism while without any information, there can be a continuum of equilibria leading to platform indeterminacy. Moreover, for our mechanism to generate sharp policy predictions, quality of outside information cannot be fixed but must be driven by third-party incentives like those of a profit-seeking media.

When the electorate is ideologically divided but uninformed about both valence as well as ideological positions of competing political parties, media competition can generate platform extremism and polarization even without media having to take strategic partisan stands (see for example, Perego and Yuksel (2015),Gul and Pesendorfer (2012)). However, there is evidence that seems to suggest little ideological division in the electorate (see Fiorina (2014), Evans (2003), Di Maggio et al. (1996) and Hirano et al. (2010)). Our paper demonstrates that even if there is no ideological divergence or media competition, platform extremism can be triggered. Duggan and Martinelli (2011) also study a model of elections with an unknown challenger. But lack of information there is about the challenger's fiscal policy, rather than quality. Although the media in their case enjoys monopoly power as in our case, it has an a priori bias for or against the challenger. They show that a biased media can be more informative.

Our work describes a particular mechanism for the success of candidates who do not promise the voter's ideal policy. A large body of literature suggests that weaker candidates are more likely to contest with electorally popular platforms or that politicians use extremist positions to signal

[7]The literature on media's influence on politics is large (see e.g. Mullainathan and Shleifer (2005), Andina-Diaz (2006), Chiang and Knight (2008), Della Vigna and Kaplan (2007), Anderson and McLaren (2012), Chakraborty et al. (2016) and Chakraborty et al. (2018). For excellent surveys see Prat and Stromberg (2013) and Stone (2015).

[8]Oliveros and Vardy (2015) show that the option to abstain breaks ideological segregation and generates this "mix and match" in news consumption, leading to disproportionately higher demand for media outlets that are centrist or only moderately biased.

strength.[9] Kartik and McAfee (2007) show that rational politicians stand away from the median position to mimic sincere candidates. Their result stems from the presence of candidates with character who do not act strategically but according to their personal beliefs about what would be the right policy (modeled as a random process that assigns probabilities to different policy platforms) and thus do not cater to popular demand. Taking extremist positions can then signal character, which is valued by the voters, thereby causing some strategic players to also try and mimic this (although they always assign a strictly positive probability to contesting with the median policy). Carrillo and Castanheira (2008) have two active candidates, and obtain extremist platforms, but unlike us, quality is not a given characteristic and can be improved through unobservable investment about which the voter can learn through media coverage. However, media coverage is non-strategic. Honryo (2013) obtains extremist platforms as a result of candidates trying to signal their competence about their ability to read the true state of the world. Aragones and Xefteris (2017) analyze a two-candidate Downsian model where voters use media endorsements to obtain more information about the candidates' policy platforms. They show that equilibrium generates extremist platforms, but the platforms of the two parties may converge or diverge depending on how voters behave when indifferent between the candidates. Costly information acquisition on the part of voters is shown to generate polarization in Matejka and Tabellini (2018). They show that divisive issues attract more attention and better quality of information can increase the degree of divisiveness. They also obtain the result that competing opportunsitic candidates do not always converge on the same policy issues.

Stone and Simas (2010) look at positions of disadvantaged challengers relative to incumbents and find that such challengers take extremist positions on an average and also get higher financial contributions which increase their chances of winning. While the purpose of the paper is completely different, this finding is consistent with our result that challengers announce extremist platforms typically when they are considered, ex-ante, inferior to the incumbent and voters derive significant benefits from having a high-quality winner. Bandyopadhyay et al. (2017), on the other hand, consider a partially informative media that induces extremist policies in a framework with sequential entry where politicians have unknown valence, though in their model the media is non-strategic.

2 Model

We present a simple model to demonstrate how the media outlet's incentive to maximize profits, the voters' incentive to learn about a challenger's quality and the challenger's incentive to signal quality generate unique predictions about platforms chosen by challengers to signal quality. The model has the following features:

[9] Although Fiorina (1973) offers some evidence to the contrary, there is strong evidence of the marginality hypothesis (see Ansolabehere et. al. (2001) and Griffin (2006) for recent empirical support for the hypothesis). In this respect, Bernhardt et al. (2011) provide a theoretical explanation for the mixed empirical results on valence and platform extremism in a model of repeated elections with ideologically driven politicians. See also Degan (2007) who studies the impact of candidates' policy positions, valence, and voters' information on electoral outcomes. It is worth noting that anti-pandering behavior can be used to signal ablity in settings other than one of political competition e.g. in an educational setting, see for example Feltovich and Harbaugh (2002).

The voter: There is a single voter who elects one of two candidates, an incumbent and a challenger. We denote by x the probability with which the voter votes for the challenger.

Candidate quality: The quality of the *challenger* is her private information. It can be either high (H) or low (L) and the prior probability that it is H is γ. This quality pertains to non-ideological issues like ability to provide good governance, keep the government corruption free or maintain law and order – on which voters agree i.e. a higher quality is preferred by all voters. Electing a high-quality challenger therefore yields an additional utility of $h > 0$ to the voter while this utility is normalized to 0 if the challenger is of low quality. The *incumbent*'s quality is known to be "average": re-electing the incumbent yields an additional utility of $\alpha > 0$ to the voter, with $0 < \alpha < h$.

Policy platforms: The incumbent in the model is a non-actor and his policy platform is the voter's ideal policy 0. The platform choice of the challenger is denoted by $z \in \mathbb{R}_+$, where z is to be interpreted as the distance from the voter's ideal policy – whether it is ideologically to the right or left of 0 is irrelevant for our purposes.[10]

Payoffs of Parties and Voters: The voter has Euclidean preference over policies. In particular, if the challenger commits to the policy platform z and gets elected, and the voter believes at the stage of voting that the challenger is of type H with probability ρ, then the voter's utility is $-z + \rho h$. Re-electing the incumbent on the other hand yields a payoff of α. The political challenger gets a payoff only from winning and not from the policy implemented. However, entry by the challenger requires a cost of $k > 0$. If the challenger enters and wins he earns $1 + k$ (that is, the office rent over-compensates the cost of entry by an amount 1) while if he loses he earns 0. Staying out yields a payoff of 0 as well.

Media coverage and access: Before voting and after the challenger enters the competition by announcing a policy, the voter has the option of using a paid media source to obtain more information about the true quality of the challenger. In particular, a profit-seeking monopolist media outlet invests in the size of media coverage $Q \in [0, 1]$ that is perfectly observable and can be obtained by the voter against an access fee of F. The pair (Q, F) is set strategically by the media outlet in order to maximize profits, net of coverage costs $c(Q)$. We assume $c(Q)$ is differentiable, strictly increasing and convex with $c'(0) = 0$ and $c'(1)$ sufficiently large for an interior solution to exist for the media's profit-maximizing exercise. A coverage amount Q reveals the true quality of the challenger with probability Q while with probability $1 - Q$ it reveals no additional information. Upon observing Q

[10] We assume there are significant reputational costs to reneging from a policy commitment of z, once announced. Since commitment is an important power that a challenger would like to express, one could also think of the challenger-party choosing a known-to-all and ideologically extreme candidate to convey the signal of emphasis on governance. This mechanism of announcing an extremist leader (known to have extremist views on a certain policy) rather than an extremist policy is one way for parties to commit to extremist platforms. In the run up to the 2014 general elections in India, Modi was carefully chosen by the then opposition party's candidate for Prime Minister (even though India does not have a presidential system where the identity of the person for the top job is announced prior to elections) over better known and both less as well as more extreme alternatives.

the voter decides whether to pay the access fee $F \geq 0$ in order to follow the media coverage.[11]

Timeline: This environment yields a signaling game between the challenger and the voter and a market for media coverage with the following time structure:

- *Stage 1*: The challenger chooses whether to stay 'out' or enter with a platform z; If 'out', the game ends and the incumbent is elected uncontested; otherwise,
- *Stage 2*: The media observes the challenger's platform z and chooses the pair (Q, F);
- *Stage 3*: The voter observes the challenger's platform z, the pair (Q, F) and either votes without accessing the media coverage or pays F to the media outlet and uses media coverage to update information about the quality of challenger and then votes for the candidate that maximizes his utility.

The above environment leads to a 3-player game of incomplete information. We characterize Perfect Bayesian equilibria (PBE) of this game. As is well known, such games generate multiple PBEs. We focus on a particular equilibrium that survives a refinement using the notions of consistency (similar to Perfect Sequential Equilibrium (PSE) a la Farrell (1985) and Grossman and Perry (1986)) and monotonicity (a generalization of D1 a la Banks and Sobel (1987) and Cho and Kreps (1987)).[12] Consider a PBE $(\sigma^*, (Q^*, F^*), (a^*, x^*))$ with associated equilibrium beliefs ρ^* and off-the-equilibrium beliefs ρ about the challenger being of type H, where (i) σ^* is the (possibly mixed) strategy of the challenger in his choice between staying out or contesting with a particular platform, (ii) (Q^*, F^*) is the media outlet's choice for the amount of coverage and size of the access fee, and (iii) (a^*, x^*) is the voter's choice of whether to pay the access fee and use media information $(a^* = 1)$ or not $(a^* = 0)$ and then to vote for the challenger with probability x^*. Let z^* be a policy in the support of σ^*. A deviation by the challenger that has any meaningful consequence occurs when he announces some platform z that is not in the support of σ^*. Then, the monotonicity requirement asserts that if the gain $G(t)$ of type $t \in \{L, H\}$ challenger is more than the gain $G(t')$ of the other type $t' \in \{L, H\}, t \neq t'$ from a particular deviation and a consequent optimal response by other players (media and voters), then type t should be considered weakly more likely than type t', if such a deviation is observed. Consistency implies that if a particular response by others (to such a deviation) is in fact optimal given beliefs that satisfy the condition of monotonicity, then the challenger's deviating behavior will be such as to confirm these beliefs. The refinement puts restrictions on out-of-equilibrium beliefs as proved in Section 7.2.2 of Appendix B. In Section 7.2.4 of Appendix B we also show that these restrictions on out-of-equilibrium beliefs reject all PBE except the ones we focus on.

[11] Alternatively, the mechanism goes through even if the voter does not have to pay the access fee. Higher voter attention for challengers with more extreme policies can simply draw more advertisements for the media outlet so that the burden of the access fee is borne by firms who have strong incentives to pay advertisement rates.

[12] See Appendix A (Section 7.1) for formal definitions.

3 Fixed quality of information

In this section we explain the mechanism through which platforms generate demand for information when quality of information is fixed exogenously. We then show that exogenously fixed information leads to indeterminacy of equilibrium policies.[13]

3.1 A lottery example

The main arguments behind our results are based on how the voter values information about the unknown challenger. To illustrate this, consider the voter's choice between electing the incumbent and earning α for sure and electing the unknown challenger with platform z that generates a lottery with returns $-z+h$ with probability γ and $-z$ with probability $1-\gamma$. If $z > h-\alpha$ then the choice is clear and the voter will always elect the incumbent. So suppose $z \leq h-\alpha$. Suppose further that the voter has an option to know perfectly the outcome of the lottery before making this choice (in terms of our model, this is the case when we set $Q=1$). The value of this option is $(1-\gamma)(z+\alpha)$ if $z < \gamma h - \alpha$ and $\gamma(h-(z+\alpha))$ if $z \geq \gamma h - \alpha$. The value of information is non-monotonic in z, rising and then falling, reaching its maximum at $z = \gamma h - \alpha$. Hence, if one wants to increase the voter's incentives to acquire information, one should increase z up to the point where $z = \gamma h - \alpha$, thereby making the lottery relatively risky, but not beyond. This mechanism is central to the main insight of the paper: since a high-quality challenger has incentives to be revealed, she would like to take an relatively more extreme platform to trigger information acquisition by the voter.

3.2 Elections with fixed Q and F

Elections introduce two additional complications in our model. First, the possibility of mimicry of the high-quality challenger's actions by her low quality counterpart changes the probabilities (γ and $1-\gamma$) associated with the returns of the lottery described above. This affects the value of information in equilibrium and thereby renders the analysis to be much more involved, both in terms of how these probabilities change and whether mimicry can at all be an equilibrium feature. Second, z is a strategic variable for the challenger that needs to be determined in equilibrium. In what follows we assume that Q and F are exogenously fixed, that is, the media is a non-actor.

Denote by $\sigma_{p,z} : \{L, H\} \to \Delta(\mathbb{R}_+ \cup \{out\})$ a strategy for the challenger in this restricted game where a type H challenger enters the contest at some $z \in \mathbb{R}_+$ with probability 1 while his type L counterpart randomizes between entering at z with probability p and staying out with probability $1-p$. We call $\sigma_{p,z}$ a separating strategy if $0 \leq p < 1$, and pooling if $p = 1$. We ask under what conditions on the parameters of the model (viz. Q and F) will $\sigma_{p,z}$ constitute an equilibrium of this game and what would be the equilibrium value of z. Let $\rho(\sigma_{p,z})$ be the belief held by the voter, before using exogenous information, that the challenger with platform z is of type H when the strategy $\sigma_{p,z}$ is used. Then,

$$\rho(\sigma_{p,z}) = \frac{\gamma}{\gamma + p(1-\gamma)}. \tag{1}$$

[13] We thank an anonymous referee for raising these issues.

We will often use the shorthand $\rho := \rho(\sigma_{p,z})$. Note that in any equilibrium, it must be that $z \leq h-\alpha$ as otherwise the voter votes for the incumbent irrespective of his beliefs regarding the quality of the challenger or the information revealed exogenously and therefore the challenger is strictly better of by staying out.

With $p > 0$, the voter is not sure about the quality of the challenger. Thus, he has an incentive to acquire information. Just like in the lottery example above, we show that the value of information increases in z up to a point beyond which, the voter's interest in the challenger's quality (and so his incentive to acquire information) gets diminished. In addition to this, the voter's willingness to pay increases monotonically in Q. We derive the voter's demand for information V, as a function of z and Q. As stated in Lemma 1 the nature of this demand is sensitive to how the voter's preferences are placed prior to using outside information. The challenger's strategy $\sigma_{p,z}$ can sway the voter's preferences towards either of the two candidates before the voter decides whether or not to access outside information.

LEMMA **1** *If the challenger uses the strategy $\sigma_{p,z}$ defined above for some policy $z \in \mathbb{R}_+$, then the voter's demand for coverage of size Q is given by the following expression:*

$$V(\sigma_{p,z}, Q) = \begin{cases} Q(1-\rho)(z+\alpha) & \text{if } z \leq \rho(\sigma_{p,z})h - \alpha \\ \\ Q\rho((h-(\alpha+z)) & \text{if } z > \rho(\sigma_{p,z})h - \alpha. \end{cases} \tag{2}$$

Figure 1 depicts this demand (or willingness-to-pay) for a fixed coverage Q (and for two values of p, namely p' (blue) and p'' (red) with $p' < p''$) where on the x-axis we plot z. It is also drawn for the case $p'' < \gamma/(1-\gamma)$ so that the peak of the demand under p'' is taller than that under p'. The value(s) of z (namely $\rho' h - \alpha$ (for p') and $\rho'' h - \alpha$ for p'') at which the two graphs peak are points where the voter is indifferen between the . For a higher Q rises, these demand schedules move upwards. The important message is that demand for information is maximum when the pair

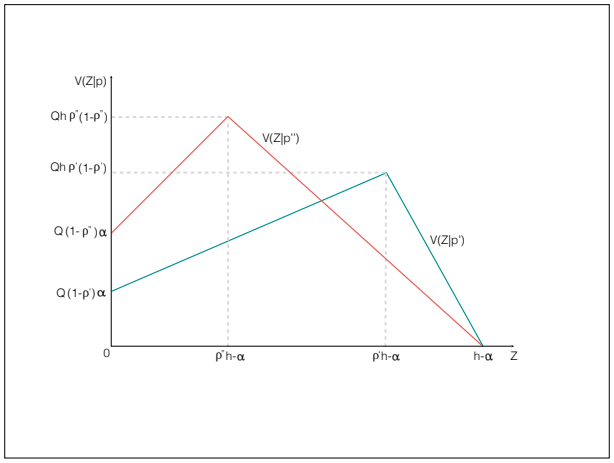

Figure 1: Voter's demand for coverage of size Q on a challenger for different policies $z \geq 0$ and for two values of type L's entry probability $p' < p'' < \gamma/(1-\gamma)$ (p'' corresponds to the red schedule).

(z, p) leads to voter-indifference without media information. Also, as long as $F \leq V(\sigma_{p,z}, Q)$, the voter will acquire information.

We start by looking at a case where there are only two policies available to the challenger, 0 and $\bar{z} > 0$. Proposition 1 characterizes the equilibrium set when the voter is indifferent between the challenger and the incumbent prior to using exogenous information. It shows the possibility of generic multiplicity of equilibrium policies. For some $\bar{Q}$, define $\bar{F}_0 = \alpha\bar{Q}\left(1 - \frac{\alpha}{h}\right)$ and $\bar{F}_1 = (\bar{z} + \alpha)\bar{Q}\left(1 - \frac{\bar{z}+\alpha}{h}\right)$.

PROPOSITION **1** *Let $\{0, \bar{z}\}$ be the available policy alternatives for some $\bar{z} > 0$ and let $(\bar{Q}, \bar{F})$ be the exogenously fixed values of Q and F. Let (z^*, p^*, x^*) be an equilibrium such that $z^* = \rho^* h - \alpha$. It exists if and only if $\bar{Q} \leq \frac{1}{1+k}$ and $\bar{F} \leq (z^* + \alpha)\bar{Q}(1 - \rho^*)$. In this equilibrium, $x^* = \frac{k}{(1-k)(1-\bar{Q})}$. In addition, the following is true:*

1. *Suppose $h > 2\alpha$.*
   - *(i) If $\bar{z} < h - 2\alpha$ then (a) if $\bar{F} < \bar{F}_0$ then both $\bar{z}$ and 0 are equilibrium policies while (b) if $\bar{F}_0 < \bar{F} < \bar{F}_1$, then $\bar{z}$ is the unique equilibrium policy*
   - *(ii) If $\bar{z} > h - 2\alpha$ then (a) if $\bar{F} < \bar{F}_1$ then both $\bar{z}$ and 0 are equilibrium policies while (b) if $\bar{F}_1 < \bar{F} < \bar{F}_0$, then 0 is the unique equilibrium policy*
2. *Suppose $h < 2\alpha$. If (a) $\bar{F} < \bar{F}_1$ then both $\bar{z}$ and 0 are equilibrium policies while (b) if $\bar{F}_1 < \bar{F} < \bar{F}_0$, then 0 is the unique equilibrium policy*

To see how Proposition 1 works, note that $z^* = \rho^* h - \alpha$ is the condition for the voter to be indifferent between the challenger and the incumbent before using exogenous information. Also, as the type L challenger is randomizing, his indifference between mimicking the policy of the type H challenger and staying out means $\bar{Q}(-k) + (1 - \bar{Q})(x^* - k(1 - x^*)) = 0$ from which we obtain the equilibrium value of x^*. Since x^* is a probability, it follows that $\bar{Q} \leq \frac{1}{1+k}$.[14] From (2), it follows that the value of information in equilibrium equals $\bar{Q}(1 - \rho^*)(z^* + \alpha)$. Hence $\bar{F}_0$ is this value when the policy is 0 and it is $\bar{F}_1$ when the policy is $\bar{z}$. Simple algebra shows that if $h < 2\alpha$ then $\bar{F}_1 < \bar{F}_0$ while if $h > 2\alpha$, then $\bar{F}_1 < \bar{F}_0$ if $\bar{z} > h - 2\alpha$ and $\bar{F}_1 > \bar{F}_0$ if $\bar{z} < h - 2\alpha$. For the voter to use exogenous information, $\bar{F}$ must be less than the voter's demand for information.

Proposition 1 shows that the availability of exogenous information can generate equilibria where the high-quality challenger takes a policy different from that of the ideal policy of the voter. But there are certain robust parametric conditions under which multiplicity of equilibria arise as both $z^* = 0$ and $z^* = \bar{z}$ are sustained as equilibrium policies. When we move to a policy space that is a continuum, this multiplicity becomes stark as pointed out in the following corollary.

COROLLARY **1** *Let $(\bar{Q}, \bar{F})$ be the exogenously fixed values of Q and F. There exists a continuum of equilibria satisfying monotonicity and consistency with $z^* = h\left(\frac{\gamma}{\gamma + p^*(1-\gamma)}\right) - \alpha$ and $x^* = \frac{k}{(1-\bar{Q})(1+k)}$, provided $\bar{Q} \leq \frac{1}{1+k}$ and $\bar{F} \leq \bar{Q}\left(1 - \frac{\gamma}{\gamma + p^*(1-\gamma)}\right)(z^* + \alpha)$. Moreover, $z^* = 0$ is an element of the equilibrium set if and only if $\gamma h < \alpha$.*

[14] Note that if $x^* = 1$ then it imposes a stringent requirement on the parameter space for such an equilibrium to exist since then we need $\bar{Q} = \frac{1}{1+k}$.

The proof of the corollary is similar to that of Proposition 1. Assume that (z^*, p^*) are chosen such that the voter is indifferent between the challenger and the incumbent without additional exogenous information. Then $\alpha = -z^* + \rho^* h$, where $\rho^* = \frac{\gamma}{\gamma + p^*(1-\gamma)}$. Assume now that the voter uses outside information. For this to be true, the access fee must be small enough and this yields the condition $\bar{F} \leq \bar{Q}\left(1 - \frac{\gamma}{\gamma + p^*(1-\gamma)}\right)(z^* + \alpha)$.[15] Since the L-type challenger is randomizing, it must be that she is indifferent between contesting at z^* and staying out. This indifference yields $(1-\bar{Q})[x^* - k(1-x^*)] - k\bar{Q} = 0$, from which we obtain $x^* = \frac{k}{(1-\bar{Q})(1+k)}$. But since x^* is a probability, it must be that $\bar{Q} \leq \frac{1}{1+k}$. Now let's look at the type H challenger's best response. Her expected utility is $\bar{Q}(1-x^*)(1+k) + [x^* - k(1-x^*)]$. It is important to note that the expected utility of the type H challenger is independent of the equilibrium platform z^* (as well as p^* since x^* is independent of p^*). Thus there is a continuum of equilibria such that the policy is indeterminate. Can $z^* = 0$ be an element of the equilibrium set? For that to be true, it must be that $p^* = \frac{\gamma}{1-\gamma}(h/\alpha - 1)$, which is always strictly positive. It is strictly less than 1 if $\gamma h < \alpha$. Finally all such candidate equilibria satisfy monotonicity and consistency. This follows from the fact that with Q fixed at $\bar{Q}$, the gains from any deviation is equal for each type of challenger.[16] Hence monotonicity imposes no restrictions on out-of-equilibrium beliefs and consequently, consistency holds trivially.

Proposition 1 and Corollary 1 show that whenever the strategy of the challenger leads to a situation where, without information, the voter is indifferent between the incumbent and the challenger, Q cannot remain equal to 1 as in the lottery example. This is because with perfect information, a type L challenger never wins and hence there cannot be an equilibrium where she would enter. The proposition and the corollary are useful for the remainder of the paper. On one hand they demonstrate how the mechanism of platform choice generating demand for information plays out in an election. But on the other hand they show that when information is exogenously fixed, there are multiple equilibria leading to indeterminacy of equilibrium policy. To overcome this indeterminacy, one needs an information source that has its own incentives to supply information, or in other words, determine Q, and this determination must be sensitive to policy commitments. We study the equilibrium when the information is endogenously determined by a profit-maximizing media in Section 4.

4 Endogenous information

We now study the full model where the pair (Q, F) is determined by a profit-maximizing media outlet. As usual, we work backwards and first analyze the media's profit-maximizing behavior. We continue with the challenger's strategy $\sigma_{p,z} : \{L, H\} \to \Delta(\mathbb{R}_+ \cup \{out\})$. Lemma 1 gives the demand function for coverage and we use that to find the profit-maximizing choice of Q.

The media outlet will set the access fee F to extract the entire surplus from the voter so that in equilibrium one obtains $F = V(\sigma_{p,z}, Q)$.[17] Thus the profit function of the media is given by the

[15] Note that if $\bar{F}$ is higher, the voter will vote for the challenger with an arbitrary probability x.

[16] To confirm this, see Section 7.2.2 of Appendix B and set $Q' = Q^* = \bar{Q}$ therein to obtain $G(H) = G(L) = (1-\bar{Q})[(x' - x^*)(1+k)]$.

[17] All results will go through qualitatively if instead we assumed that the surplus V is shared between the media outlet and the voter. For instance, if $\mu > 0$ was the share of the media, then the media outlet's optimal choice of Q

voter's demand for information, less the cost of coverage:

$$\pi(Q) = V(\sigma_{p,z}, Q) - c(Q). \tag{3}$$

Notice that $V(\cdot)$ is differentiable in Q. Further, our assumptions on $c(\cdot)$ imply that there exists a unique maximizer of $\pi(Q)$, denoted by Q^*, that is strictly positive whenever $V(\cdot) > 0$. Proposition 2 completely characterizes this supply. As $c(\cdot)$ is strictly convex, c' is strictly increasing in Q over its entire domain $[0, 1]$. Given this and the facts that $c'(0) = 0$ and $c'(1)$ large enough, Proposition 2 follows immediatey from the media outlet's profit maximizing condition given by $c'(Q) = \frac{\partial V}{\partial Q}$.

PROPOSITION **2** *Let $Q^*(z, p)$ be the profit maximizing supply of media coverage given the challenger follows the strategy $\sigma_{p,z}$. Then $Q^*(z, p)$ is unique and is given implicitly by*

$$c'(Q^*) = \begin{cases} (1-\rho)(z+\alpha) & \text{if } z \leq \rho h - \alpha \\ \\ \rho((h-(\alpha+z)) & \text{if } z > \rho h - \alpha. \end{cases} \tag{4}$$

From Proposition 2 it follows that $Q^*(z, p)$ increases in z and p when $z \leq \rho h - \alpha$ and decreases in z and p when $z > \rho h - \alpha$. Figure 2 depicts the profit-maximizing media coverage for two values of types L's entry probability p (viz. p' and p'' for the case $p' < p'' < \gamma/(1-\gamma)$ as in Figure 1) as a function of different values of z. As expected, the supply of profit-maximizing media coverage closely follows its demand generated by the challenger's strategy. As seen from the figure, supply of media coverage peaks when the voter is indifferent between the challenger and the incumbent.

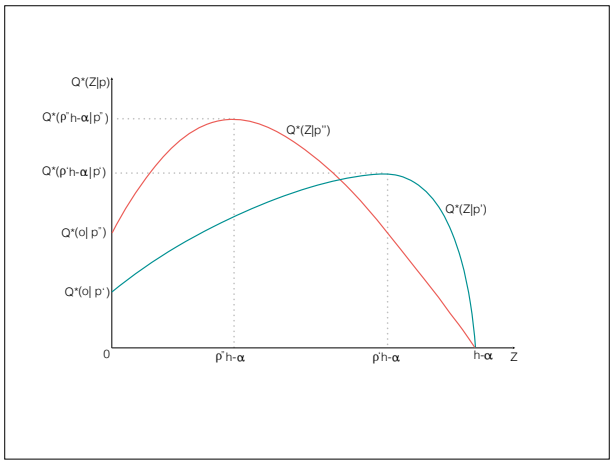

Figure 2: Profit-maximizing supply of media coverage on a challenger for different values of the platform z and for two values of type L's entry probability $p' < p'' < \gamma/(1-\gamma)$; p'' corresponds to the red schedule.

would rise in μ.

4.1 Equilibrium platform

If the outside information is provided by a profit-maximizing media outlet so that Q is no more fixed but responds optimally to z and p, what platform will be obtained in equilibrium? Our main result is Theorem 1 where the entry cost for the challenger is small. It characterizes the equilibrium choice of platform z^* where, the voter remains indifferent between the two candidates without media information. Define three critical values for k:

$$k_1 \equiv \frac{1}{c'^{-1}(h/4)} - 1, k_2 \equiv \frac{1}{c'^{-1}(\alpha(1-\alpha/h))} - 1, k_3 \equiv \frac{1}{c'^{-1}(\gamma(1-\gamma)h)} - 1,$$

and let $\bar{k} = \max\{k_1, k_2, k_3\}$. Given $c''(\cdot) > 0$, it is easy to verify that $k_1 < \min\{k_2, k_3\}$. Also, if $\gamma > \alpha/h$, a case that will be relevant (viz. part (c) below), then $k_2 < k_3$ if and only if $\gamma > 1/2$.

Theorem **1** *An equilibrium $(z^*, p^*, Q^*, F^*, x^*)$ with voter indifference prior to media information exists if and only if $k \leq \bar{k}$. In such an equilibrium, $F^* = V(\sigma_{p^*,z^*}, Q^*)$ and the equilibrium policy is determined as follows:*

(a) Suppose $h > 2\alpha$, $\gamma < 1/2$ and $k \leq k_1$. Then, $z^* = h/2 - \alpha$, $p^* = \gamma/(1-\gamma)$, $c'(Q^*) = h/4$ and $x^* = k/[(1-Q^*)(1+k)]$;

(b) Suppose $h < \min\{2\alpha, \alpha/\gamma\}$ and $k \leq k_2$. Then, $z^* = 0$, $p^* = [\gamma/(1-\gamma)](h/\alpha - 1)$, $c'(Q^*) = \alpha(1-\alpha/h)$ and $x^* = k/[(1-Q^*)(1+k)]$;

(c) Suppose $h > \alpha/\gamma$ and $k \leq k_3$. Then, $z^* = \gamma h - \alpha$, $p^* = 1$, $c'(Q^*) = \gamma(1-\gamma)h$ and $x^* \geq k/[(1-Q^*)(1+k)]$.[18]

Consider the equilibrium reported in Part (a) of Theorem 1. Here, the incumbent is incompetent in relative terms (viz. $\alpha < h/2$) and the challenger being low-quality is more likely ($\gamma < 1/2$) – this is represented in the blue plus green regions in Fig. 4. The existence of a profit-seeking media outlet generates a particular platform $z^* = h/2 - \alpha$, through which a high-quality candidate strategically attracts optimal media coverage in order to communicate with the voter through the media.[19] The comparative statics of the the key variables in this equilibrium with respect to h is presented in the left panel of Figure 3 below. In this equilibrium, as h increases, so does the equilibrium degree of platform extremism and the size of media coverage. The voter remains indifferent without media information and the probability with which she votes for the challenger, in the event media coverage yields no additional information, increases in h as well. However the probability with which the low quality challenger contests at platform z^* remains invariant to h and equals the prior odds in favor of the challenger being type H as depicted in the right panel of Figure 3. Part (b) – the yellow zone in Fig. 4 – is an immediate extension of part (a) and characterizes conditions under which political entry signals quality but with $z^* = 0$. A key feature of the two equilibria (viz. parts (a) and (b)) that distinguishes them from all other equilibria reported in this section is that the

[18] In addition $z^* = 0$ if and only if $\gamma = \alpha/h$ but this is a non-generic requirement in the parameter space.

[19] Of course, this equilibrium continues to hold outside this parametric zone so long as $\gamma < 1/2$, but not uniquely.

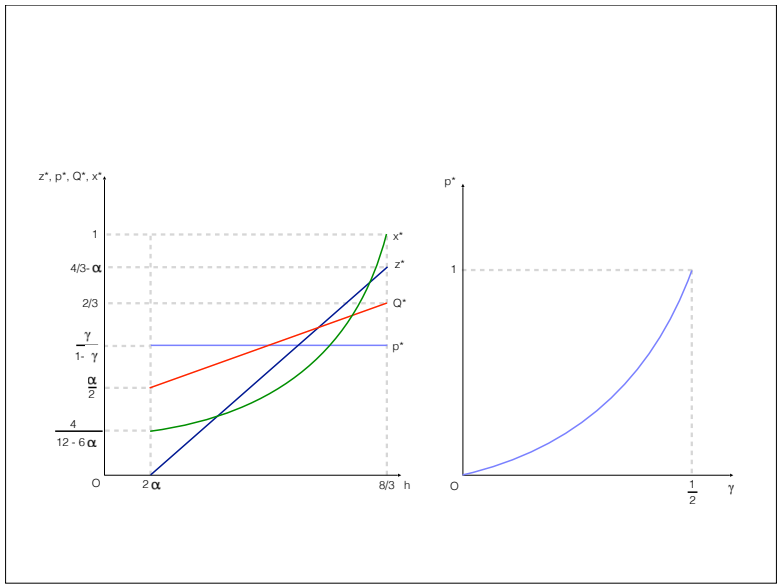

Figure 3: Theorem 1(a): Equilibrium with voter indifference where z^* is traced as a function of h (and drawn for $c(Q) = Q^2/2$ and $k = 1/2$) to demonstrate how platform extremism rises with h.

H type's influence on the degree of platform extremism is direct through her optimization exercise (see the optimization problem (8) in the appendix). As depicted in Figure 4, these equilibria do not exist in the grey region of the $(\alpha/h - \gamma)$ plane; however, we show (viz. part (c)) that extremist platforms continue to prevail: unlike before, the voter will know little about the challenger directly from platform choice and will have to depend entirely on media coverage to obtain information.

We note that for $k \leq k_1$, there is always a non-empty set of values of parameters α, h and γ for which each of these equilibria exists. Moreover, they fully span the permissible parameter values. For example, if $h > 2c'(1/2)$, then for any $k < 1$, there is always an equilibrium with voter indifference. While equilibria with voter indifference fill the parametric space, they indeed fail to exist if k is very large in comparison to h. For completeness of our analysis, we end this section by looking at equilibria that continue to exist even when entry costs are high. A distinguishing feature of these equilibria is the fact that prior to using media information, the voter strictly prefers the challenger.

PROPOSITION **3** *Let $(z^*, p^*, Q^*, F^*, x^*)$ be an equilibrium where prior to media information, the voter prefers the challenger so that is $x^* = 1$. Then, (z^*, p^*) satisfy $p^* = \left(\frac{\gamma}{1-\gamma}\right)\left(\frac{c'\left(\frac{1}{1+k}\right)}{z^*+\alpha-c'\left(\frac{1}{1+k}\right)}\right)$. Moreover,*

(i) It exists and is separating if and only if $k > k_4 \equiv \frac{1}{c'^{-1}(h(1-\gamma))}$ where $k_4 < k_3$. In this equilibrium, $Q^* = 1/(1+k)$;

(ii) It exists and is pooling if and only if $k < k_5 \equiv \frac{1}{c'^{-1}(\alpha(1-\gamma))}$ where $k_4 < k_5$. In this equilibrium, $c'(Q^*) = (1-\gamma)(z^*+\alpha) \leq 1/(1+k)$.

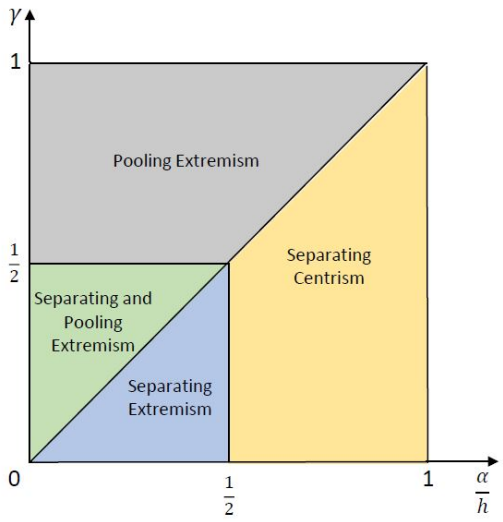

Figure 4: Parametric zones for different equilibria with voter indifference prior to media information, as in Theorem 1 (with $k < k_1$). Barring the case when α/h is bigger than both $1/2$ and γ, platforms that are away from the median prevail.

Proposition 3 describes a continuum of equilibria where the voter strictly prefers the challenger in the event the media coverage provides no further information. This implies that along the set of equilibria, the high-quality challenger remains indifferent as irrespective of what media coverage can deliver, she wins with probability 1. For k high enough (viz. $k > k_4$ as in part (i)), it is clear that the fact that prior to media information, the voter prefers the challenger, is a requirement for equilibria to exist as in the event media delivers no additional information, the low-quality challenger needs to win with very high probability. In this case we see in addition that Q^* gets fixed and fully determined by k itself and imposes a strict restriction on the parameter space (as in footnote 14 with exogenously fixed information). This is driven by low quality challenger's indifference. However, these equilibria may continue to exist even when k is small (viz. $k < k_5$ as in part (ii)) though this leads to pooling as both types enter at some common platform with probability 1. In that case media coverage falls when such an equilibrium exhibits platform closer to 0. The equilibrium is therefore constructive as the type H challenger continues to remain indifferent and so has no room to directly initiate a higher Q through choice of z, unlike in Theorem 1.

Welfare: In our model the voter's outside option is to re-elect the incumbent. Hence her ex-ante welfare cannot fall below α. Moreover, as the media outlet extracts all expected gains from media coverage that the voter might enjoy, the ex-ante welfare of the voter must equal α under all specifications. Of course, if outside information is exogenously given as in Section 3, then the voter's welfare will simply be $\max\{\alpha, \alpha + (V - F)\}$ where $V - F$ is the value of information net of access fee.

4.2 The internet and the social media

The internet, including social media, also plays an important role in elections where information about politicians is available to anybody who is willing to spend enough time surfing. Searching, assimilating and filtering this information is of course costly for the voter. We can rename the variable Q as the amount of time spent by the voter on searching and $c(Q)$ the cost of doing so. With this interpretation, the rest of the mechanism studied above holds: high-quality challengers announce extremist platforms to lure the voter into incurring the search cost and low-quality challengers mimic this with some probability but stay out otherwise. The equilibrium size of Q will maximize the voter's expected utility net of information processing cost (yielding exactly the media outlet's profit maximizing condition), *leaving a positive utility to the voter*, rather than having all the surplus taken by the monopolistic fee of the information producer. Both are realistic scenarios: voters who have limited time will buy news from reliable sources while others will incur the time costs needed in processing and filtering news from the internet.

5 Discussion of Modeling Assumptions

In this section we discuss the theoretical implications of relaxing the different modeling assumptions. For simplicity, we have considered the case where the incumbent is of known quality and located at the ideal position of the decisive voter. This need not be the case for our results to go through, so long as there is sufficient uncertainty about the challenger relative to the incumbent, making the marginal value of coverage much higher for the challenger. If the challenger's attributes are such that he will be preferred to the incumbent even if both are located at the same point and no signaling takes place, the problem becomes trivial. Likewise, if the incumbent is always preferred. In other circumstances, the relative platform extremism of the challenger is all that is needed for our conclusions to go through. We have also assumed throughout that the challenger knows her quality. If instead, the challenger is unsure about her own quality and prior information about quality in our model is imperfect but common to the challenger and the voter – both believing that the challenger is of type H with probability γ – the platform choice (or entry decision) of the challenger cannot itself carry any additional information.[20] Regardless, the media market will operate in the same fashion as reported in this paper, as extremist platforms will continue to generate demand for coverage (and the equilibrium media coverage Q^*can be obtained as a function of platform choice z by replacing ρ with γ in (4)). The lack of asymmetric information makes the analysis simpler at the platform choice stage as it generates a well-defined optimization problem for the unaware challenger to find a platform that maximizes expected returns from entry. When γ is either too high or too low, demand for information is low as well and hence platforms away from 0 cannot

[20] Chakraborty and Ghosh (2016) analyze a model with an ideologically biased media outlet that is informed about candidate quality, but where the voter and the candidates are not. As discussed in Chakraborty and Ghosh, "relevant [candidate] traits [may] surface only under prolonged and intense scrutiny, involving interviews, round-the-clock campaign coverage, or investigations into the candidate's past record or personal life. [...] An alternative interpretation [of having unaware candidates] is that candidate traits are well known to the public [and the parties] but voters [and the parties] are unsure whether these traits will be a help or hindrance in the future."

generate much coverage. For intermediate values of γ one would expect platforms away from 0 to reappear, particularly if quality of governance is valued highly by the voter and γ is sufficiently high for the challenger to take the risk of attracting high media coverage.

The mechanism of signaling through extremist platforms would break down without outside information. If $\gamma h = \alpha$, one would observe a challenger announcing the platform $z = 0$ who would win the election with probability 1/2 while if $\gamma h > \alpha$ then any platform taken by the challenger below $\gamma h - \alpha$ will constitute an equilibrium in which the challenger will win with probability 1 and there will be no particular reason to obtain platforms away from the median. Finally, if $\gamma h < \alpha$, then the incumbent would go unchallenged. When it comes to welfare, we have noted that with the media, the welfare of the voter is α, and remains so in the absence of the media unless $\gamma h > \alpha$ in which case the welfare-maximizing equilibrium will be at $z = 0$, yielding a voter welfare equal to γh. Thus, absence of media is weakly better for the voter. Of course, if the media does not have the bargaining power to set a surplus-extracting fee then media presence will be welfare enhancing whenever $\gamma h \leq \alpha$ and can be so even when $\gamma h > \alpha$.

Finally, we assume a profit-maximizing monopolist (or dominant) media. Given a single voter, and having assumed away media capture (as in Besley and Prat (2006)), media competition will not add much to our model. We have noted in Section 1.1 the differing results that may occur with a biased media, voter heterogeneity or an ideologically divided electorate. Our focus is on an undivided constituency as our objective has been to explain whether extremist platforms can occur without ideological variance, though it will be of interest to see whether this gets magnified with an ideologically divided electorate. If a profit-maximizing media outlet also cares for ideology, this may in fact bring platforms close to the median policy because of issues around credibility of candidates who are too close to the media's ideology. It will of course be interesting to study electoral outcomes when the media market is competitive, outlets have both profit motives as well as different ideological bias and the electorate is ideologically heterogenous. Can this lead to sorting of the electorate and therefore enhance platform extremism? Answering this requires further research.

6 Conclusion

We have provided a new theoretical explanation for obtaining extremist platforms by studying a model in which candidates with (relatively) unknown quality deliberately take positions away form the voter's ideal policy to generate a demand for information. This informational value is exploited by a profit-maximizing media outlet that chooses a level of coverage. We characterized conditions under which high-quality candidates deliberately take positions that move away from the voter as the voter's need for a high-quality challenger increases. Media investment, in trying to discover quality of candidates, is higher for candidates with platforms that are relatively more extreme, as they rationally anticipate that voters will want to pay more to purchase news about such candidates. Extremist platforms can arise (and serve as a credible signal) in an environment where neither the media nor the candidate cares about ideology, and the electorate is ideologically undivided. Thus, the media acts as a detached watchdog even though it is driven by pure profit motives. We have shown that extremist platforms can also appear in a world where instead of being supplied by a

profit-maximizing media outlet, information is exogenous and fixed. However, exogenously fixed outside information leads to multiple equilibria and platform indeterminacy. Hence the profit-seeking objective of media plays an important role in both facilitating the central mechanism as well as determining the degree of divergence of policies from what the voter wants. We have also argued that the results hold in an alternative scenario where the voter has access to an universe of information on the internet and can learn about the challenger by incurring a search cost.

While the main contribution of the paper is theoretical, there is suggestive evidence that platform extremism does increase media coverage as found in the study by McCluskey and Kim, as mentioned before. We have noted that platform extremism can occur under various parameter configurations, although it is most likely when voters have low expectations from both the challenger and the incumbent, as reported in Theorem 1 (and as highlighted by the blue triangle in Figure 4 where $\gamma < \alpha/h < 1/2$). As low expectations about the quality of politicians can be correlated with a sour economy or voter dissatisfaction with, for example, state responses around terrorism and immigration, we expect the rise of extreme challengers when there is a general apathy about the political class. The 2014 success of Modi, the rise of right-wing platforms in the UK and Europe as well as the rise of Trump has certainly been associated with either bad governance by past governments or pessimism about economic prospects. While we would not ascribe anything causal, the interesting patterns around extremism and higher media coverage as well as between voter pessimism about the political class appear broadly consistent with the main results we report and are areas of further empirical research that would complement the theoretical understanding of the political process.

7 Appendix

7.1 Appendix A: Formal definitions of strategies and equilibrium

We are studying a three-player signalling game. A strategy for the challenger is a function $\sigma : \{L, H\} \to \Delta(\mathbb{R}_+ \cup \{out\})$ that maps the challenger's privately known type to Δ, the space of probability distributions over the set $\mathbb{R}_+ \cup \{out\}$. A strategy for the media outlet is then a function $F : \mathbb{R}_+ \cup \{out\} \to [0,1] \times \mathbb{R}_+$ that takes the challenger's action from the set $\mathbb{R}_+ \cup \{out\}$ and chooses the size of media coverage $Q \in [0,1]$ and the access fee $F \in \mathbb{R}_+$. Let $a : \mathbb{R} \times ([0,1] \times \mathbb{R}) \to \{0,1\}$ be the voter's media-access decision that takes the platform choice z and the coverage-fee pair (Q, F) and either does not pay for the coverage (action 0) or pays for it and obtains the coverage (action 1). Let $\mathcal{O} \in \{0,1\}$ be the outcome of the coverage, where 0 stands for no information and 1 stands for full information about the challenger. Let $\mathcal{X} : \mathbb{R}_+ \times (\{0\} \cup (\{1\} \times \{0,1\})) \to [0,1]$ be the probability with which he votes for the challenger as a function of z and his own access decision a with the relevant coverage outcome $\mathcal{O}$. A strategy for the voter is then a complete specification of actions at each of the two information sets, one after platform choice (where he chooses a) and next after media coverage outcome (where she chooses $\mathcal{X}$). We denote this strategy by the pair $(a, \mathcal{X})$. Finally we denote by $\rho : \Delta(\mathbb{R}_+ \cup \{out\}) \to [0,1]$ as the voter's belief that the challenger is of type H.

We employ the notion of Perfect Bayesian Equilibrium (PBE) and refine the set of PBE by

requiring out-of-equilibrium beliefs to satisfy two properties that we call Monotonicity (that is a generalization of D1 (Banks and Sobel (1987) and Cho and Kreps (1987))) and Consistency (that is is similar to meta-rationality as in Perfect Sequential Equilibrium (PSE) a la Farrell (1985) and Grossman and Perry (1986)). Thus, we look at PBE $(\sigma^*, (Q^*, F^*), (a^*, \mathcal{X}^*))$ with associated equilibrium beliefs ρ^* and off-the-equilibrium beliefs ρ that satisfy the following properties. Consider types $t \in \{H, L\}$, a deviation platform z from the equilibrium platform z^*, resulting out-of-equilibrium beliefs $\rho(z)$ and consequent best responses Q by the media and $(a, \mathcal{X})$ by the voter; let $G(t)$ be the gain of type t from making this deviation relative to z^*. Then,

(A) Monotonicity: (i) if $G(H) > G(L) \geq 0$ then $\rho(z) \geq \rho^*$, (ii) if $G(L) > G(H) \geq 0$ then $\rho(z) \leq \rho^*$, (iii) if $G(H) = G(L) \geq 0$ then no restriction is placed on $\rho(z)$ and (iv) if $G(H) > 0$ but $G(L) < 0$ then $\rho(z) = 1$ while if $G(H) < 0$ but $G(L) > 0$ then $\rho(z) = 0$.

(B) Consistency: (i) if $\rho(z) > \rho^*$, then $G(H) > G(L)$ and (ii) if $\rho(z) < \rho^*$, then $G(L) > G(H)$.

This a plausible and weak restriction on beliefs in our setting, asserting essentially that the deviation is weakly more likely from the type that gains more from it. For certain types of equilibria (where if $G(t) > 0$ then $G(t') \leq 0$ for $t, t' \in \{L, H\}, t \neq t'$), this restriction is equivalent to D1.

7.2 Appendix B: Proofs

7.2.1 Proof of Lemma 1

In a situation where without any additional information from the media the voter prefers the challenger to the incumbent, it must be that $z < \rho h - \alpha$. If the voter decides not to use the media coverage, he votes for the challenger and obtains a payoff equal to $U^{\text{no access}} = -z + \rho h$, where $\rho := \rho(\sigma_{p,z})$. On the other hand, if the voter uses media that has announced a coverage level Q, then he foresees the following. With probability $Q\rho$ the challenger's type will be revealed to be H in which case he will vote for the challenger, yielding a payoff of $-z + h$. With probability $Q(1-\rho)$ the challenger's type will be revealed to be L in which case he will vote for the incumbent, yielding a payoff of α. Lastly, with probability $1 - Q$ media coverage will yield no additional information and so he will continue to vote for the challenger, yielding a payoff of $-z + \rho h$. Hence by using the media coverage, the voter's payoff is $U^{access} = Q\rho(-z + h) + Q(1 - \rho)\alpha + (1 - Q)(-z + \rho h)$. Then $V(\sigma_{p,z}, Q) = U^{\text{access}} - U^{\text{no access}}$ i.e. it is the difference in utility between using the media information, and voting based on ρ. By substitution, this yields $V(\sigma_{p,z}, Q) = Q(1 - \rho)(z + \alpha)$.

Now consider the situation where without any additional information from the media the voter prefers the incumbent to the challenger. This happens if and only if $z > \rho h - \alpha$. In this case, without media coverage, the voter votes for the incumbent and obtains a payoff of $U^{\text{no access}} = \alpha$. On the other hand if he goes for the media coverage, then like before, the voter foresees the following. With probability $Q\rho$ the challenger's type will be revealed to be H and and so he will vote for the challenger, yielding a payoff of $-z + h$. With probability $Q(1 - \rho)$ the challenger's type will be revealed to be L and so he will vote for the incumbent, yielding a payoff of α. And with probability $1 - Q$ coverage will yield no information and so he will continue to vote for

the incumbent to obtain a payoff of α. Hence by using the media coverage, the voter's payoff is $U^{\text{access}} = Q\rho(-Z+h) + Q(1-\rho)\alpha + (1-Q)\alpha$. Then $V(\sigma_{p,z}, Q) = Q\rho((h-\alpha)-z)$. Given the fact that in any equilibrium, $z \leq h-\alpha$, the rest of the proof is straightforward as, starting from $z = 0 < \rho h - \alpha$, $V(\sigma_{p,z}, Q)$ increases in z, reaches a maximum at $z = \rho h - \alpha$ and then decreases, attaining 0 at $z = h - \alpha$. ■

7.2.2 Necessary properties of out-of-equilibrium beliefs

We show the following: *Pick any PBE* $(z^*, p^*, Q^*, F^*, x^*)$ *and consider a deviation by the challenger to* z' *that generates the voter belief* ρ' *and this yields the actions* (Q', F', x') *from the media and the voter. Then* $\rho' \geq \rho^*$ *if* $z' > z^*$ *and* $\rho' = 0$ *if* $z' < z^*$.
To see this, note that the payoff of type H challenger in equilibrium is $u^*(H) = Q^* + (1-Q^*)[x^* - k(1-x^*)]$ while his payoff from this deviation is $u(H) = Q' + (1-Q')[x' - k(1-x')]$. Thus his gain from this deviation is

$$G(H) := u(H) - u^*(H) = (Q' - Q^*) + [(1-Q')[x' - k(1-x')] - (1-Q^*)[x^* - k(1-x^*)]].$$

Similarly, we obtain the type L challenger's gain from this deviation as

$$G(L) := u(L) - u^*(L) = -k(Q' - Q^*) + [(1-Q')[x' - k(1-x')] - (1-Q^*)[x^* - k(1-x^*)]].$$

This yields $G(H) - G(L) = (Q' - Q^*)(1+k)$. We observe that type H gains more from this deviation than L if and only if $Q' > Q^*$. Monotonicity requires that then $\rho' \geq \rho^*$. Recall at this stage that provided the voter strictly prefers the challenger without media information, (that is $z < \rho h - \alpha$), we have $c'(Q) = (1-\rho)(z+\alpha)$ where Q and z are arbitrary. Thus, if (i) $Q' > Q^*$, (ii) $\rho' \geq \rho^*$ and (iii) the deviation maintains the voter's strict preference for the challenger (note: maintains, because we have proved that any equilibrium must come with at least a weak preference for the challenger as otherwise L loses with probability 1 and is better off to stay out) then, it must be that $z' > z^*$. Also notice that only a H type challenger can possibly benefit from a deviation that yields pro-incumbency (that is if $z' > \rho' h - \alpha$). Thus consistency implies that (a) H gains from the deviation if and only if $Q' > Q^*$ and (b) H gains and $Q' > Q^*$ if and only if $z' > z^*$, provided anti-incumbency is still maintained. This proves immediately that if $z' < z^*$, then $\rho' = 0$. Now consider deviations $z' > z^*$ that lead to pro-incumbency so that $z' > \rho' h - \alpha$. If H initiates that, then consistency implies that $Q' > Q^*$ as well as otherwise even H cannot gain from deviating from the equilibrium which we have proved must have anti-incumbency or indifference. As this also means that L loses from such a deviation, the only belief is $\rho' = 1$. But if $\rho' = 1$, then consistency further implies that $Q' = 0$, a contradiction.

REMARK **1** *Note that while the restriction imposed by Monotonicity and Consistency is much weaker for* $z < z^*$*, where it is only required that* $\rho(z) \leq \rho^*$*, we show above that in the game studied, it must be that* $\rho(z) = 0$ *whenever* $z < z^*$*. On the other hand, for deviations* $z > z^*$*, the refinement only requires* $\rho(z) \geq \rho^*$*. In what follows, we shall use a special case of these beliefs for quantitative clarity, where equilibrium beliefs are denoted by* ρ^**:* $\rho' = \rho^*$ *if* $z' > z^*$ *and* $\rho' = 0$ *if*

$z' < z^*$. *Other beliefs consistent with our refinement will affect the exact location of* z^* *when outside information is served by the media, that will again be a result of the type H challenger's optimization problem as defined in (8) below. However, the relation of the resulting* z^* *with* h *will remain positive. This multiplicity of equilibria is unimportant for our purposes as it is purely quantitative in nature.*

7.2.3 Proofs of Theorem 1 and Proposition 3

Strategy of the proofs: We use the restrictions on the out-of-equilibrium belief ρ as established in Section 7.2.2 above and prove the statements in Theorem 1 and Proposition 3. This establishes the PBE on which we focus. We then show in Section 7.2.4 that there is no other PBE under those out-of-equilibrium belief restrictions.

Theorem 1

Voter Indifference and Separating Equilibrium: Consider strategy $\sigma_{p,z}$ with $0 < p < 1$. Voter indifference implies

$$z = \rho h - \alpha, \tag{5}$$

where recall that $\rho = \frac{\gamma}{\gamma + p(1-\gamma)}$. Also, L's indifference implies

$$(1-Q)[x - k(1-x)] - kQ = 0. \tag{6}$$

Using these, media's choice of profit-maximizing Q is given by

$$c'(Q^*) = \left(\frac{z+\alpha}{h}\right)(h - (z+\alpha)). \tag{7}$$

Equations (5), (6) and (7) together determine a continuum of equilibrium candidates. We now identify the equilibrium by maximizing the type H challenger's expected utility. Challenger type H's expected utility at this strategy profile is $U_H^* = Q^*(1-x^*)(1+k) + [x^* - k(1-x^*)]$. Thus, $\partial U_H^*/\partial Q* = (1-x^*)(1+k) + (1+k)(1-Q^*)\partial x^*/\partial Q^*$. From L's indifference, we get $x^* = \frac{k}{(1-Q^*)(1+k)}$, so that $\partial x^*/\partial Q^* > 0$. This implies $\partial U_H^*/\partial Q* > 0$. Hence, type H's optimization problem is to choose z to maximize Q^*. Since $c'' > 0$, this means the problem is equivalent to:

$$\max_{z \in [0, h-\alpha]} \mathbb{S}(z) = \left(\frac{z+\alpha}{h}\right)(h - (z+\alpha)), \tag{8}$$

where $\frac{\mathrm{d}\mathbb{S}(z)}{\mathrm{d}z} = h - 2\alpha - 2z$. Let z^* be the solution to H's optimization problem above. Note that $z^* < h - \alpha$ since $\frac{\mathrm{d}\mathbb{S}(z)}{\mathrm{d}z} = -h$ at $z = h - \alpha$. Thus, $z^* = h/2 - \alpha > 0$ if $\alpha/h < 1/2$ and $z^* = 0$ if $\alpha/h \geq 1/2$.

Case $\alpha/h < 1/2$: In this case $z^* = h/2 - \alpha > 0$ and voter indifference means $h/2 - \alpha = \rho^* h - \alpha$ which yields $\rho^* = 1/2$ which is true if and only if $p^* = \frac{\gamma}{1-\gamma} > 0$. As the equilibrium is separating, we need $p^* < 1$ which is possible if and only if $\gamma < 1/2$. Again, L's indifference implies $x^* = \frac{k}{(1-Q^*)(1+k)} \leq 1$ if and only if $Q^* \leq \frac{1}{1+k}$. We also know that $z^* = h/2 - \alpha$ from which it follows that $c'(Q^*) = h/4$ and therefore $x^* \leq 1$ if and only if $c'^{-1}(h/4) \leq 1/(1+k)$, that is $k \leq k_1 = \frac{1}{c'^{-1}(h/4)} - 1$.

Case $\alpha/h \geq 1/2$: In this case, $z^* = 0$ and voter indifference means $\rho^* = \alpha/h$ from which it follows that $p^* = \frac{\gamma}{1-\gamma}(h/\alpha - 1) > 0$. Again since we are in a separating equilibrium, $p^* < 1$ which is possible only if $\gamma < \alpha/h$. The media coverage is now given by $c'(Q^*) = \alpha(1-\alpha/h)$. It is easy to observe that optimal Q falls now since $\alpha(1-\alpha/h) < h/4$ whenever $\alpha/h > 1/2$. Hence $k < \frac{1}{c'^{-1}(h/4)} - 1$ guarantees in this case that $x^* < 1$. In fact for existence of this equilibrium we need $k \leq k_2 = \frac{1}{c'^{-1}(\alpha(1-\alpha/h))} - 1$ with $k_1 < k_2$.

Voter Indifference and Pooling Equilibrium: We next look at voter indifference but with pooling, that is, $p^* = 1$ so that $\rho^* = \gamma$. This along with voter indifference yields $z^* = \gamma h - \alpha \geq 0$ if and only if $\gamma \geq \alpha/h$. Here, media's profit maximization yields $c'(Q^*) = \gamma(1-\gamma)h$. Of course now as L prefers to enter, we have $x^* \geq \frac{k}{(1-Q^*)(1+k)}$. Yet, x^* cannot exceed 1, from which it follows that $Q^* \leq 1/(1+k)$, that is, $k \leq k_3 = \frac{1}{c'^{-1}(\gamma(1-\gamma)h)} > k_1$. Note that since we are in the zone $\gamma \geq \alpha/h$, $k_3 > k_2$ if and only if $\gamma > 1/2$.

Finally, in either of the cases above, an out-of-equilibrium deviation to $z < z^*$, if feasible, hurts each type of challenger as $\rho(z) = 0$ (as shown in Section 7.2.2 in the Appendix), so that the voter elects the incumbent with probability 1. So consider a deviation to $z > z^*$ and note that in that case, $\rho(z) = \rho^*$ as assumed in Remark 1. In the original equilibrium we have $z^* = \rho^* h - \alpha$ and after this deviation, $z > \rho^* h - \alpha$. Hence $Q < Q*$ and $x = 0$, so that type H is strictly worse-off. Hence such a deviation can at most reveal type L, so that no deviation will take place. □

Proposition 3

We now consider equilibria with anti-incumbency. Here, $x^* = 1$. If the equilibrium is separating, that is $p < 1$, then L's indifference implies $Q^* = 1/(1+k)$. Hence from the media's optimization problem, it must follow that $c'\left(\frac{1}{1+k}\right) = \left(1 - \frac{\gamma}{\gamma + p^*(1-\gamma)}\right)(z^* + \alpha)$, from where we obtain $p^* = \left(\frac{\gamma}{1-\gamma}\right)\left(\frac{c'\left(\frac{1}{1+k}\right)}{z^* + \alpha - c'\left(\frac{1}{1+k}\right)}\right)$. Notice that $0 < p^* < 1$ if and only if $z^* > \frac{c'(1/(1+k))}{1-\gamma} - \alpha$. But we know that $z \leq h - \alpha$. Thus, such an equilibrium exists only if $k > k_4 \equiv \frac{1}{c'^{-1}((1-\gamma)h)} - 1$.

If the equilibrium is pooling, that is $p^* = 1$, L's strict preference to enter implies $Q^* \leq 1/(1+k)$. While the media's profit maximization implies that $c'(Q^*) = (1-\gamma)(z^* + \alpha)$. Hence we have $z^* < \frac{c'(1/(1+k))}{1-\gamma} - \alpha$. Since $z \geq 0$, existence requires $k \leq k_5 \equiv \frac{1}{c'^{-1}(\alpha(1-\gamma))}$. Since $h > \alpha$ it follows that $k_5 > k_4$. As type H has no incentive to deviate from this equilibrium, any deviation reveals type L. Hence the equilibrium satisfies Monotonicity and Consistency. □

7.2.4 Other equilibria that do not survive Monotonicity or Consistency

We end by showing that no other PBE satisfies the requirements of Monotonicity and Consistency. An equilibrium where the challenger chooses $z^* = 0$ for *all* parametric specifications exists if we employ beliefs where, if any entry with $z > 0$ is observed then the voter assigns a very high probability that the challenger is of type L. Similarly one can also obtain the uncontested equilibrium with beliefs that any entry must come from the type L challenger with very high probabilities. In the first case, it is easy to show that a deviation to some $z' > 0$ induces a higher media coverage that

is strictly preferred by type H and disliked by type L. For the no-entry equilibrium, the equilibrium beliefs must be γ for which the gain in payoff of type H from entry is higher than that of type L. Hence the equilibrium cannot survive Monotonicity and Consistency. Next, can there be an equilibrium where the type H challenger randomizes over two or more platforms? For that to happen, he should be indifferent. If type L also randomizes between these platforms then he should also be indifferent. But indifference from both types cannot hold simultaneously. If therefore type L does not put positive probability on one of these platforms, then H reveals himself at that platform and hence his payoff must be higher, a contradiction.

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