The Revelation Incentive for Issue Engagement in Campaigns

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Abstract

Empirical studies have found that although parties focus disproportionately on favorable issues, they also address the same issues – especially, salient issues – through much of the 'short campaign'. We present a model of multiparty competition with endogenous issue salience where parties behave in line with these patterns in equilibrium. In our model, parties' issue emphases have two effects: influencing voter priorities, and informing voters about their issue positions. Thus, parties trade off two incentives when choosing issues to emphasize: increasing the importance of favorable issues ('the salience incentive'), and revealing positions on salient issues to sympathetic voters ('the revelation incentive'). The relative strength of these two incentives determines how far elections constrain parties to respond to voters' initial issue priorities.

Keywords: Issue competition; Issue salience; Elections; Campaigns; Multiparty competition

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1 Introduction

Which issues do parties choose to talk about in campaigns and why? Does electoral competition force parties to address the issues that voters consider important? Prior research on issue selection by parties in campaigns has repeatedly documented five empirical patterns. First, political parties disproportionately emphasize issues on which they are 'advantaged' relative to their opponents – issues on which a party's policies are more popular with most voters, or issues which they are more trusted to handle by most voters. Second, parties do nevertheless address issues on which they are disadvantaged with most voters as well. Third, as a consequence, political parties discuss multiple issues during election campaigns. Fourth, parties spend a significant fraction of their campaigning time discussing the same issues as each other ('issue engagement'), and fifth, this is especially the case when these are issues important to voters.

Understanding what motivates parties to behave in this way is essential for assessing when and how the electoral mechanism is able to discipline parties' behavior. However, extant formal models of issue selection by parties during campaigns provide support for the empirical tendency of parties to focus more on advantaged issues, but generally do not match the other empirical patterns documented above. Rather, most of this formal literature has concluded that parties will typically campaign only on their most favorable issue in equilibrium to increase its salience, and two parties will never campaign on the same issue if each is advantaged on a different issue.[1] In comparison, we develop a formal model of multiparty competition where several parties choose how much to emphasize multiple issues and where, in equilibrium, parties behave in accordance with these patterns.

Our model starts from the premise that the extent to which a party emphasizes an

1. We review this literature in Section 2. Denter 2020, Egorov 2015, Demange and Van der Straeten 2020 and Barberà and Gerber 2023 present important exceptions to this tendency, but, as we elaborate below, our model and theoretical account differs from theirs in several key respects.

issue has at least two effects: it may influence the importance, or salience, of an issue for voters, but it also influences voters' certainty regarding the party's policies on the issue. Thus, party emphasis decisions involve a trade-off between two competing incentives. The first is the more frequently studied 'salience incentive', which is the incentive to emphasize an issue on which a party's policies are relatively popular in order to increase the proportion of voters who consider the issue important. The second, which we term the 'revelation incentive', is the incentive to emphasize an already salient issue to increase the proportion of voters who are aware of the party's policies on the issue. Doing so benefits the party electorally because voters are less inclined to support a party if they do not know its policies on a salient issue. Therefore, even if a party's position on an issue is unpopular with the majority of voters, the party still has an incentive to emphasize that issue to reveal its policies to the minority of sympathetic voters for whom the issue is important. Consequently, parties will emphasize the same issue as one another if this issue is highly salient.

By incorporating the 'revelation' incentive into a model of party strategy with endogenous issue salience, we propose an explanation for why parties tend to disproportionately focus on issues that favor them, while also spending much of their campaigns discussing the same issues as each other (even if unfavorable) – and especially when these issues are particularly salient to voters. In our model, multiple parties take distinct policy positions on multiple issues and strategically choose which issues to emphasize in order to maximize their vote share. Parties trade off two competing incentives when deciding how much to emphasize each issue. First, as in prior literature, emphasizing an issue increases the proportion of voters who consider the issue important, which is advantageous for a party if its position on the issue is relatively popular (the 'salience incentive'). Second, emphasizing an issue also increases the proportion of voters who are aware of the party's position on the issue. Even if a party's position is only popular with a minority of voters, placing some emphasis on the issue is electorally beneficial, as those voters will be less inclined to support the party if they do not know its position on an issue salient to them (the 'revelation incentive').

In order to tractably model the revelation incentive, we depart from most of the literature by assuming that voters are ambiguity averse rather than standardly expected utility maximizing. Ambiguity averse agents are not comfortable assigning probabilities to uncertain future events and so instead maximize their utility in the worst-case scenario. Models with ambiguity averse voters have been studied by Ghirardato and Katz (2006), Ashworth (2007), Ellis (2016) and Yang (2024), who have argued that this assumption helps explain a range of otherwise puzzling empirical voting phenomena. In our context, ambiguity aversion means that voters who do not know a party's position on an issue important to them 'fear the worst' – that the party might be very far from their ideal point on the issue – and so always prefer to vote for a party whose position they know over one whose position they do not know. This therefore provides a revelation incentive for parties to reveal their positions to voters. While this is a much more tractable assumption about voter behavior than standard expected utility maximization in our setting, it is much less common in the literature. For this reason, we also study the case of standard expected utility maximizing voters as an extension. We are unfortunately unable to solve the expected utility maximizing case analytically, but results from numerical simulations we consider with two parties and two issues are qualitatively similar for the expected utility maximizing case and the ambiguity aversion case, provided party positions are not too extreme. This is suggestive that our main qualitative conclusions do not depend upon ambiguity aversion. We conjecture that this would also be true numerically with larger numbers of parties and issues.

With ambiguity averse voters, and under some special assumptions about the structure of voter information, we show analytically that the revelation incentive is sufficiently powerful that all parties choose to campaign on all issues in equilibrium. Nevertheless, parties tend to emphasize more salient issues relatively more and also emphasize issues on which they have a comparative advantage relatively more. If one issue is much more salient than all others, then the resulting strong 'revelation incentive' leads all parties to primarily talk about the issue regardless of their positions on the issue. Similarly, if voter priorities are not very flexible – e.g. late in the electoral cycle (Seeberg 2020) – then the revelation incentive will dominate parties' calculations, and parties will primarily focus on the issues already important to voters.

An additional contribution of this study is the tractability of our framework, which may prove useful for future models of campaign strategy. To our knowledge, this is the first formal model of party competition with endogenous issue salience where an arbitrary number of parties are able and motivated to choose a continuous and non-extreme level of emphasis on an arbitrary number of issues. Nevertheless, under some strong restrictions on voters' information structure, the assumption of ambiguity averse voters makes it possible to solve for the equilibrium analytically. Furthermore, we show in the appendix that the model can be solved numerically with expected utility maximising voters and alternative voter information structures in the two-party two-issue case (the principal setting studied in the literature), and these numerical results are qualitatively very similar to the cases that can be studied analytically. Moreover, while our analysis focuses on parties' emphasis decisions on positional issues, our model and results are also straightforwardly extended to a case with one or more non-positional, or valence, issues, as discussed on page 17.

The existence of a 'revelation incentive' is consistent with a sizable literature arguing that the more uncertain a voter is about candidate positions, the less likely she is to support the candidate (e.g. Bartels (1986), Alvarez (1998), and Ezrow, Homola, and Tavits (2014)). However, our argument that individuals are less inclined to vote for a party if uncertain of its position on a salient issue may appear to jar with recent research that, instead, stresses the electoral benefits of positional ambiguity (Tomz and Houweling 2009; Somer-Topcu 2015; Bräuninger and Giger 2018). In fact, our findings are actually consistent with this literature, as our analysis clarifies that the incentives parties face to avoid, or to speak less, about an issue – i.e., a party's level of emphasis on an issue – are distinct from those encouraging parties to present a less *precise* stance on an issue – i.e. a party's positional ambiguity on an issue.

To illustrate this, in Section 5.1, we extend our model to include the effects of positional ambiguity on voter decisions, allowing parties to choose a level of precision of messages *as well as* a level of emphasis on each issue. This generates an additional trade-off for parties: parties do face a 'revelation incentive' to communicate precise positions on issues important to many voters, but also face an additional 'projection incentive' to communicate slightly different positions to different voters. Consistent with the empirical research on the electoral benefits of positional ambiguity, our analysis establishes that, if able to, parties will want to communicate slightly imprecise positions during campaigns. Nevertheless, we find that parties' emphasis decisions show the same qualitative patterns as our baseline model, and so the imprecise campaigns model can also account for the same empirical patterns in parties' issue emphases.

2 Related Literature

A large literature on what has variously been described as 'heresthetic', 'issue competition', 'saliency theory' or 'issue ownership theory' has documented the following five empirical patterns in party behavior in campaigns.

First, political parties disproportionately emphasize issues on which they are 'advantaged' relative to their opponents, ostensibly in order to increase the salience of these issues to voters and thereby to alter the dimensions on which they are evaluated (Budge and Farlie 1983; Riker 1993; Petrocik 1996). To date, empirical researchers have amassed considerable evidence from a wide range of countries supporting this general pattern (Green and Hobolt 2008; Green-Pedersen and Mortensen 2010; Vavreck 2009).[2]

Second, parties do nonetheless also campaign on issues where they are disadvantaged relative to their opponents among most voters – with the consequence that, third, each party addresses multiple issues over the course of an election campaign. This has been documented in national election campaigns in the US (Sides 2006), as well as in the United Kingdom and Austria (Green and Hobolt 2008; Meyer and Wagner 2016). For instance, Sides (2006) finds that, during the 1998 midterm elections, Republicans and Democrats spent a similar amount of advertising time on Social Security, the environment, jobs and Medicare, even though many more voters trusted the Democrats on all four issues. Similarly, Wagner and Meyer (2014) find in 17 countries that parties devote, on average, only twice as much time to owned (i.e. advantaged) issues as non-owned issues in election manifestos.

Fourth, as a result, parties actually spend much of their campaigns addressing the same issues as each other. For instance, when analyzing presidential campaigns in the U.S., Sigelman and Buell (2004) found that all candidates spoke on the same issue, on average, a staggering 75.3% of the time. However – fifth – this is especially the case for issues which are already salient to voters (Sides 2006; Green and Hobolt 2008; Klüver and Sagarzazu 2016) – a strategy described by Ansolabehere and Iyengar (1994) as 'riding the wave'. In keeping with this observation, Seeberg (2020) finds that parties in Denmark are significantly more likely to focus on their owned issues early in the election cycle, as they try to shape the political agenda in their favor. Even so, as the election draws closer, and as further movements in voter priorities become less likely, parties shift their focus to the issues dominating the political agenda instead. Along similar lines, Kristensen

2. Relatedly, a large empirical and experimental literature on the importance of "priming effects" argues that political advertising has a significant effect on voters' issue priorities (Iyengar and Kinder 1987; Krosnick and Kinder 1990).

et al. (2022) present evidence from six West European countries that parties are more likely to talk about the same issue – even if some of those parties do not own that issue – when it relates to a particularly pressing societal problem, elevating it on the 'party system agenda' (Green-Pedersen and Mortensen 2010).

Extant formal models of issue selection by parties during campaigns provide support for the empirical tendency of parties to focus more on advantaged issues, but generally do not match the other empirical patterns documented above. Most of this formal literature has concluded that parties will typically campaign only on their most favorable issue in equilibrium to increase its salience, and two parties will never campaign on the same issue if each is advantaged on a different issue. Indeed, apart from a few exceptions, discussed below, models in the literature imply that parties will not campaign on the same issue when each is advantaged on a different issue. For example, in Dragu and Fan (2016), parties never advertise the same policy issue in equilibrium.[3] Meanwhile, in Aragonês, Castanheira, and Giani (2015), while two parties may 'invest' in the quality of their proposals on the same issue, parties only communicate on issues where they (weakly) come to hold a comparative advantage (unless one party is advantaged on all issues). Some studies have found multiple parties campaigning on the same issue in equilibrium – but only when these parties share ownership of the issue (Ascencio and Gibilisco 2015), or when one party is majority preferred on all issues, but its comparative advantage on any one issue is not too large (Amorós and Socorro Puy 2013).

Our paper relates most closely to four other works in the formal literature, which, to our knowledge, are the only other models that predict that parties may, at times,

3. Dragu and Fan (2016) propose that one way to reconcile this literature with the empirical fact that parties often campaign on the same issues is to interpret parties emphasizing different issues in a model as emphasizing different aspects of the same issue in the data. This interpretation is consistent with empirical findings that, when 'trespassing' on issues owned by other parties, parties do seek to frame the issues in ways favorable to them, perhaps by emphasizing different aspects of the issue (Sides 2006, p. 426). Nevertheless, while this interpretation allows the literature to account for two parties emphasizing the same issue, it does not provide an explanation for why this should be more common for salient issues, or why parties should emphasize multiple issues.

campaign on the same issue when each is advantaged on a different issue.[4] These four models are those of Denter (2020), Egorov (2015), Demange and Van der Straeten (2020) and Barberà and Gerber (2023).

The model of issue selection in Denter (2020) is also able to match the five empirical features of party behavior in campaigns that we have identified, and is, to our knowledge, the only other model in the literature able to do so. However, there are two key differences between our model and that of Denter.

First, Denter limits attention to a model with two candidates and two issues, whereas we provide a model of issue competition with multiple parties and multiple issues that can account for these patterns.

Second, while both models are able to match the empirical facts above, we differ in the campaign incentives we ascribe to parties. In both models, parties (or candidates) choose how much to emphasize each issue, and doing so affects the salience of issues, creating an incentive for parties to campaign more on issues on which they are comparatively advantaged in order to maximize expected vote share. In both models, parties also face a competing incentive to emphasize already salient issues. In our model, this is the revelation incentive; in Denter's, parties are motivated to campaign on already salient issues due to the potential of campaigns to persuade voters to support them on that issue. More precisely, his model, unlike ours, assumes valence rather than policy issues, and a candidate's valence on an issue is an increasing function of the amount they campaign on the issue. However, we view the revelation incentive as an (at least) equally plausible explanation for this empirical tendency, given prior research that voters often do not know parties' positions on key issues and learn about these positions during campaigns (Lenz 2013; Le Pennec and Pons 2023). That said, further empirical research is needed to evaluate the relative importance of revelation and persuasion incentives for parties.

4. A number of other models, including those of Aragonês, Castanheira, and Giani (2015) and Amorós and Socorro Puy (2013), imply that parties may campaign on the same issue when one party has an absolute advantage on all issues.

Other studies of party campaigns that relate closely to ours are Egorov (2015) and Demange and Van der Straeten (2020). In both studies, campaigns are informative, which generates a very similar incentive for issue engagement to our 'revelation incentive'. In Egorov (2015), parties choose which of two issues to campaign on and may choose to campaign on the same issue if the loss of voter information from campaigning on different issues is large. In Demange and Van der Straeten (2020), parties are able to inform voters (or not) regarding their issue positions by communicating more or less precise information in their campaigns. As such, parties have an incentive to campaign more precisely on issues where their issue positions are more popular. However, neither of these papers allows for endogenous issue salience. Furthermore, in Egorov (2015) assumes issues are equally salient, and in Demange and Van der Straeten (2020) salience does not affect party campaign strategy. As such, neither model accounts for why issue engagement is more common on salient issues.

Finally, in very recent work, Barberà and Gerber (2023) develop a parsimonious framework that can rationalize essentially any pattern of issue convergence and divergence in campaigns. Unlike us, however, they do not seek to defend a specific theory to account for empirically observed patterns about election campaigns: rather, their framework is intentionally abstract and not tied to a specific theory of how campaigns affect vote choice. Furthermore, unlike us, they do not discuss the possibilities that campaigns reveal information to voters about parties' unknown positions, or change the issues that voters consider important.

3 A Model of Party Emphasis Decisions

Voters may be less likely to support a party if uncertain about its position on an issue, and particularly if that issue is electorally salient. Given this, we suggest that parties possess an incentive to address even unfavorable issues in their campaigns in order to reveal their positions on these issues. In this section, we develop a model of electoral competition with multiple vote-maximizing parties and multiple issues, where this 'revelation incentive' arises. We formally explore the implications of this incentive for equilibrium party strategy in Sections 4 and 5 below.

3.1 Parties

There are $J \geqslant 2$ parties (indexed by $j = 1, ..., J$) which compete for votes over $K \geqslant 2$ issues (indexed by $k = 1, ..., K$). At the start of play, nature chooses a distinct policy position for each party on each issue so that no two parties have the same position on any issue.

At this stage we make no further assumptions about how these issue positions are chosen by nature. The resulting issue positions for each party j on each issue k is denoted θ_j^k. We also use θ to refer to the $J \times K$ dimensional vector of all parties' issue positions $(\theta_1^1, ..., \theta_J^1, ..., \theta_1^K, ..., \theta_J^K)$. We assume that $\theta \in \Theta$, where $\Theta = (\underline{\theta}, \overline{\theta})^{JK} \subset \mathbb{R}^{JK}$. Each party observes its own position alongside those of its rivals.

Each party campaigns in order to maximize its vote share. Although party positions are set by nature, each party is able to choose how much to emphasize each issue in its election campaign.[5] e_j^k denotes the relative emphasis of party j on issue k in its campaign. We assume that each party's choices must satisfy $e_j^k \geqslant 0$, for each k, and $\sum_{k=1}^K e_j^k \leqslant 1$. For each party j, a strategy $s_j \in S_j$ is a function mapping the parties' positions to j's emphasis on each issue. That is, s_j is a function $s_j : \Theta \to [0,1]^K$. s denotes a strategy profile $(s_1, ..., s_J)$ and $S = \times_{j=1}^J S_j$ denotes the set of all permissible strategy profiles.

5. The rationale for this assumption is that party platforms are considerably less flexible than the issues on which they choose to campaign. This may be because of institutional factors or core influential groups in parties that anchor them to particular policy positions. This might include for instance, links with religious organizations or trade unions, or individual party activists or donors who expect them to hold certain positions. By treating party positions as set by nature, our model abstracts from the factors that determine party positions, allowing us to focus on what issues a party chooses to emphasize *given party policy positions*. A richer model could potentially embed our theory of party emphasis strategies into a setting where parties have some choice over their policy positions at the start of the campaign.

As we discuss in Sections 3.3 and 4.1, the extent to which a party emphasizes each issue has two effects: it influences the salience of issues for voters, and also influences the probability with which voters observe parties' positions on each issue.

3.2 Voters

There is a continuum of voters. Each voter i has an ideal point on $x_i^k \in (\underline{\theta}, \overline{\theta})$ on each issue k. Voter ideal points are distributed according to the joint cdf F and pdf f. That is, for any $y \in [\Theta]$:

$$F(y) = \text{Prob}(x_i^1 \leqslant y^1, ..., x_i^K \leqslant y^K) \equiv \int_{x \leqslant y} f(x)dx.$$

where $dx = dx^1, ..., dx^K$ and $x \leqslant y$ denotes $x^k \leqslant y^k, \forall k$.

We use F^k and f^k to denote the cdfs and pdfs of the marginal distributions of F with respect to issue k. We assume that F is twice continuously differentiable with respect to its arguments.

In addition to differing from one another in their ideal points, voters also vary on how much they care about one issue rather than another. For each issue k, we assume that an exogenous fraction $\tilde{\pi}_k \in (0, 1)$ are inclined to care relatively more about issue k, with $\sum_{k=1}^{K} \tilde{\pi}_k = 1$. We refer to these as "issue k-oriented voters". Nevertheless, after witnessing party campaigns, issue-k-oriented voters may ultimately come to care more about other issues, as will be discussed below. The vector $\tilde{\pi} = (\tilde{\pi}^1, ..., \tilde{\pi}_k)$ is exogenous and commonly known to parties and voters. The value of each $\tilde{\pi}_k$ can be interpreted as depending upon all the many factors that might affect the salience of issue k to voters before the campaign begins, but which are presumably treated as exogenous by parties when determining their campaign strategy. As such, $\tilde{\pi}_k$ should be expected to vary across time and space when applying the model to real-world examples.

3.3 Voter Information

Voters prefer to vote for parties whose policy positions are closer to their ideal points. However, voters do not observe all parties' positions on all issues. In particular, whether a voter i observes parties' positions on an issue depends on whether the voter witnesses parties' campaigns on the issue. This in turn depends on how far the parties emphasize the issue in their campaigns.

Consider an issue-k-oriented voter, for some $k \in \{1, ..., K\}$. Each k-oriented voter witnesses party j's campaign on issue k with probability given by $\left(1 - \gamma_0 + \frac{\gamma_0}{K}\right) \eta(e_j^k)$, where $\gamma_0 \in (0, 1)$ is a parameter representing the degree to which voters are likely to witness campaigns on issues they are not already focused on[6] and $\eta : [0, 1] \to [0, \overline{\eta}]$ is a function which is continuous on $[0, 1]$ and twice continuously differentiable on the interior, whose derivatives satisfy $\eta'(e) > 0$ and $\eta''(e) < 0$ for $e \in (0, 1)$. Furthermore, we assume that $\eta(0) = 0$, $\eta(1) = \overline{\eta} \leqslant \frac{1}{J}$, $\eta'(1) = 0$ and $\lim_{x \to 0} \eta'(x) = \infty$. Therefore, the more party j emphasizes issue k, the more each k-oriented voter is likely to witness its campaign on issue k. Since k-oriented voters are focused on issue k, they have a lower probability of witnessing parties' campaigns on other issues: an issue k voter witnesses party j's campaign on each issue $m \neq k$ with probability $\left(\frac{\gamma_0}{K}\right) \eta(e_j^m)$.

Since voters have limited time to pay attention to politics, it is assumed that witnessing one party's campaign on one issue may reduce the time available for them to witness other parties' campaigns on the same or other issues. In particular, the probability of a voter witnessing $M \geqslant 1$ different campaigns is equal to δ^{M-1} multiplied by the product of the probability of witnessing each of these campaigns individually, where $\delta \in [0, 1]$ is a parameter. So, for instance, the probability of a k-oriented voter witnessing party 1 and party 2's campaigns on issue k is given by $\delta\eta(e_1^k)\eta(e_2^k)$. More generally, let $A \subset \{1, ...J\} \times \{1, ...K\}$ be some set of campaigns the voter could have witnessed. The

6. The specific function form $\left(1 - \gamma_0 + \frac{\gamma_0}{K}\right) \eta(e_j^k)$ helps guarantee that probabilities of voters witnessing combinations of campaigns are always between zero and one. See footnote 7.

probability that a k-oriented voter witnesses all the campaigns in the set A is given by:

$$P(k\text{-oriented voter witnessing } A) = \delta^{M-1} \prod_{(j,m)\in A} \left((1-\gamma_0)\cdot \mathbf{1}\{m=k\} + \frac{\gamma_0}{K}\right) \eta(e_j^m), \quad (1)$$

where $\mathbf{1}\{\cdot\}$ denotes the indicator function. The two extreme cases of $\delta = 0$ and $\delta = 1$, correspond, respectively, to cases where witnessing multiple campaigns are either mutually exclusive or independent events.[7]

Whether or not a voter witnesses a party's campaign matters because it affects how much voters care about particular issues and also the probability that a voter observes party positions on an issue. These correspond to the 'salience' and 'revelation' effects of campaigns, respectively.

To capture the 'salience' effect of campaigns, it is assumed that voters are to some degree 'impressionable'. Specifically, we assume that voters who witness at least one party's campaign on an issue will ultimately come to care about (and will cast their votes entirely based on) the issues on which they witness party campaigns, and will not be strongly concerned with other issues.[8]

Furthermore, witnessing campaigns affects the probability that voters observe parties' policy positions (the 'revelation effect'). We assume that, if a voter does witness some party j's campaign on some issue m, then she observes all parties' positions on issue m with probability $\gamma_2 \in (0,1)$ (regardless of the issue), and only party j's position on issue m (and no other parties' positions) with probability $1-\gamma_2$. On the other hand, if a voter does not witness any party campaign on any issue, then, given her resulting lack of political information, she is assumed to care only about the issue k on which was

7. The restrictions $\gamma_0 \in (0,1)$, $\delta \in [0,1]$ and $\eta(1) = \overline{\eta} \leqslant \frac{1}{J}$ ensure that the probability that a k-oriented voter witnesses the set of campaigns A is always less than one for any A.

8. We could allow that there is some probability that a voter also witnesses some campaigns on other issues and does not come to care about those issues. This would not affect the equilibrium of the model in any way because witnessing campaigns on an issue a voter does not care about would have no effect on vote choice.

already oriented, and to not observe or care about party positions on any other issues. In that case, with probability $\gamma_1 \in (0, 1)$ she observes all parties' positions on issue k (but no positions on other issues) and with probability $1 - \gamma_1$ she does not observe party positions on any issue.

Here, $\gamma_1 \in (0, 1)$ and $\gamma_2 \in (0, 1)$ are exogenous parameters. Furthermore, we assume that $\gamma_1 + \frac{J-1}{J}(1 - \gamma_1) > \gamma_2 \geqslant \gamma_1$, that is, witnessing one party's campaign on issue k makes a voter more likely to observe other parties' positions on that issue than if she had not observed any campaign – but not by too much.[9]

Note that a consequence of these assumptions is that every voter either observes either no party's position on a particular issue, only one party's position on that issue, or all parties' positions on that issue. This limited range of possible cases increases the tractability of the model.[10]

We assume that a law of large numbers holds, so that, for instance, the total proportion of issue-k-oriented voters that witness party j's campaign on issue k is equal to $\left(1 - \gamma_0 + \frac{\gamma_0}{K}\right) \eta(e_j^k)$.

3.4 Vote Choice

Voters gain utility from voting for parties whose positions are close to their ideal points on the issues that they ultimately care most about (itself a function of the campaigns they witnessed). Suppose a voter i cares most about the set of issues $\Xi_i \subset \{1, ...K\}$,

9. It is necessary to assume that $\gamma_1 + \frac{J-1}{J}(1 - \gamma_1) > \gamma_2$ because, otherwise, it emerges that a party might prefer not to campaign at all in order to avoid revealing other parties' platforms to voters. Since real-world parties do campaign, we consider $\frac{J-1}{J} + \frac{\gamma_1}{J} > \gamma_2$ to represent the more relevant case. In principle, one might imagine γ_1 and γ_2 to vary by issue, if voters are more informed about some issues than others (γ_0 and δ cannot be issue-specific without creating mathematical inconsistencies). We find that allowing for issue-specific γ_1 and γ_2 does not have a substantial effect on our qualitative results while complicating the exposition. Therefore, for brevity, we do not consider this case.

10. Our assumptions about the probabilities of a voter seeing a party's position if the voter does not witness the party's campaign can be straightforwardly generalized to allow voters to observe e.g. several but not all party positions on an issue k. In independent analyses, we have found our main qualitative conclusions to be robust to a generalization of this kind but at the cost of greater notational complexity. Results for this generalization are available upon request.

then the utility she gets from voting for party j is given by $\sum_{k\in\Xi_i} U(|x_i^k - \theta_j^k|)$ where $U : \mathbf{R}_+ \to \mathbf{R}$ is a strictly decreasing function.

We assume that which issue a voter is initially oriented towards is independent of the voter's ideal point on all issues. Furthermore, whether a voter observes a party's campaign or position on an issue is also independent of the voter's ideal point.

Voters have to decide which party to vote for under conditions of uncertainty: frequently they do not observe all parties' positions on the issues they care most about. In the paper and appendix, we study two different assumptions about how voters deal with this uncertainty. In the baseline case that we focus on in the main paper, we assume that voters are ambiguity averse in the sense of Gilboa and Schmeidler (1989) and cannot know parties' positions for certain unless they observe them in the campaign.[11] As such, we assume that each voter chooses to support the party that maximizes her utility in the worst case scenario that is consistent with what she has observed. That is, voter i votes for the party that maximizes $\sum_{k\in\Xi_i} U(|x_i^k - \hat{\theta}_j^k|)$, where:

$$\hat{\theta}_j^k = \begin{cases} \theta_j^k \text{ if voter } i \text{ observes } \theta_j^k, \\ \arg\inf_{\hat{\theta}\in(\underline{\theta},\overline{\theta})} U(|x_i^k - \hat{\theta}|) \text{ otherwise.} \end{cases} \tag{2}$$

A consequence of this assumption is that, if a voter observes party j's position on an issue she cares about, but does not observe party m's position on any issue she cares about, then she will never vote for party m, since she fears that party m might be extremely distant from her ideal point.[12]

11. Ambiguity aversion on the part of voters has been modeled and argued to be empirically relevant by Ghirardato and Katz (2006), Ashworth (2007), Ellis (2016) and Yang (2024). For instance, Ghirardato and Katz (2006) have argued that ambiguity aversion helps to explain selective voter abstention. Bade 2013 argues that 'political economy would appear to be a prime arena for the application of ambiguity aversion [since] we are facing a situation of subjective uncertainty over the state of the world, and agents will likely consider a set of probability distributions'. In economic contexts, widespread evidence for ambiguity aversion has been documented. See Ilut and Schneider (2022) for a recent survey.

12. Our ambiguity aversion assumption can be formalized by assuming voters hold a set of all possible priors over party positions in Θ and behave in a maximin manner consistent with Gilboa and Schmeidler

In Section 5 and Appendix C, we also discuss and present results for the model with two parties when the assumption that voters are ambiguity averse is replaced with the alternative assumption that voters are expected utility maximizers. That is, they vote for the party that maximizes their expected utility, based on their posterior beliefs about party's positions, which are assumed to be Bayesian rational. The case of ambiguity averse voters is considerably more tractable than the case where voters are expected utility maximizing. As such, we are only able to obtain numerical solutions in the latter case. Nevertheless, our numerical results presented in Appendix C indicate that equilibrium party emphasis decisions are virtually identical across the two cases for the parameter values we consider, except when party positions are relatively extreme.

Finally, we assume throughout that if a voter would be indifferent between voting for two different parties, then she votes for each with equal probability. Thus, for instance, if a voter observes no parties' positions on any issue, she has no reason to expect higher utility from one party than another, and so votes for each party with probability $\frac{1}{J}$.

Valence Issues While we have set up the model to focus on positional issues, extending it to consider valence issues is straightforward. Suppose that issue k is the valence issue of leader competence. Then we may assume that each party j's leader competence is given by $\theta_j^k \in [\underline{\theta}, \overline{\theta}]$, and furthermore that all voters i have the ideal point $x_i^k = \overline{\theta}$ on issue k. That is, all voters agree that a higher level of leader competence is desirable for a party. This is simply a limiting case of the model we present here, and results go through unchanged.[13]

(1989). If a voter does not observe a party's position, they will therefore act according to the worst possible prior, which puts probability 1 on the party holding one of the most extreme positions in the set Θ. For the sake of brevity, we omit this formalization here.

13. In the notation discussed below, this would entail that $\psi_j^k = 1$ for the party j with the highest competence, and $\psi_m^k = 0$ for all other parties m.

3.5 Parameters Governing Voter Information and Priorities

In this section, we review the key exogenous parameters introduced so far and discuss their role in the model. Table 1 summarizes these parameters and their role. Of central importance to the analysis are the $\tilde{\pi}_k$ parameters, which capture how many voters consider issue k important before election campaigning even begins. As a shorthand, we therefore refer to $\tilde{\pi}_k$ as the *pre-campaign salience* of issue k.

Table 1: Key Parameters Governing Voter Information and Priorities

Parameter	What It Determines	Name
$\tilde{\pi}_k$	Fraction of issue-k-focused voters	Pre-campaign salience of k
γ_0	Probability voters witness campaigns on issues they are not already focused on	Priming potential of campaigns
γ_1	Probability voters observe all parties' positions on an issue if they witness no campaigns	Priming potential of campaigns
γ_2	Prob. voters observe all parties' positions on an issue if they witness only one campaign	Priming potential of campaigns
δ	Prob. voters witness multiple campaigns	Mutual compatibility of campaigns

Our assumptions about campaigns and voter information imply that, in addition to the function $\eta(\cdot)$, four additional parameters (each between 0 and 1) determine an issue-k-oriented voter's probability of learning various party positions from campaigns.[14] For maximum generality, we consider cases where these four parameters all vary. However, as discussed below, we find in practice that the value of δ appears to matter little for the qualitative properties of the model, and higher values of each of the three γ parameters

14. We assume that these parameters reflect long term structural features of the political system and technology that affect levels of voter information and attentiveness, but which are treated as roughly exogenous by parties in the short term. This might include, for instance, the length of political campaigns and level of campaign spending, the diversity of the media environment and the quality of the education system.

all tend to pull the properties of the model in the same direction. To build intuition, we therefore focus much of the verbal discussion of the model around the case where $\delta = 0$ and when $\gamma_0 = \gamma_1 = \gamma_2 = \gamma$. As a shorthand, we refer to γ as the *priming potential of campaigns*, and to δ as the *mutual compatibility of campaigns*.

The three γ parameters can all be said to increase the 'priming' potential of campaigns, because high values of these parameters consistently increase the tendency for parties' campaigns to influence the issues on which voters observe their positions, but reduce the tendency for a party's campaign to inform voters about its positions overall. Since voters are assumed to care only about the issues on which they see party positions (or the issue on which they are already focused), this means, in effect, that higher values of the γ parameters strengthen the degree to which campaigns influence the salience of issues (the salience effect of campaigns) but weaken the degree to which they reveal a party's positions to voters on already salient issues (the revelation effect).

Higher values of the γ parameters have these effects because, with high values of γ_1 and γ_2, voters are likely to observe a party's positions on at least one issue even if they witness no campaigns, or just the campaigns of other parties. Meanwhile, when γ_0 is high, voters are almost equally likely to witness a campaign on any issue, regardless of whether or not they are initially oriented towards that issue, and therefore highly likely to observe a party's position on any issue that it campaigns on enough. However, when γ_0 is low, a k-oriented voter is very unlikely to witness campaigns on any issue apart from k, and when γ_1 and γ_2 are low, a voter is very unlikely to observe a party's position on an issue unless they witness its campaign (in which case, they always observe its position on the issue).

We refer to δ as the *mutual compatibility* of campaigns because $\delta \in [0, 1]$ determines the probability that voters witness multiple campaigns, and the two extreme cases of $\delta = 0$ and $\delta = 1$, correspond to cases where witnessing multiple campaigns are mutually exclusive or independent events. We focus on these two extreme cases in the paper and appendices: Section 4 provides analytical results for the case $\delta = 0$, while Section 5 outlines results for the case $\delta = 1$, with the details of those results given in Appendix D.

As such, we present analytical results for the $\delta = 0$ case only. This corresponds to the extreme case where witnessing different campaigns are mutually exclusive events and so a voter may witness at most one party's campaign on one issue. This extreme assumption greatly simplifies the exposition, notation and analytical tractability of the model, because it entails that each voter will ultimately only observe parties' positions on at most one issue (although they may observe multiple party positions on that issue).

Nevertheless, this extreme assumption is hard to defend empirically, since real world voters do have knowledge of party positions on multiple issues. For this reason, we also solve the model with $\delta = 1$ in Appendix D. Due to the greater complexity of the $\delta = 1$ model, we only present numerical results, and only for the two-party two-issue case. Perhaps surprisingly, we show that the models with $\delta = 0$ and $\delta = 1$ generate numerical results which are qualitatively identical and quantitatively very similar. Continuity arguments suggest that parametrizations of the model in intermediate cases, with $\delta \in (0, 1)$ are likely to yield results in between those of the $\delta = 0$ and $\delta = 1$ cases, which is suggestive that the main predictions of the model are insensitive to δ. For this reason, we focus in Section 4 on the much simpler $\delta = 0$ case.

4 Model Results with $\delta = 0$ and Ambiguity Aversion

As explained above, we now study the properties of the model analytically in the case with $\delta = 0$ and ambiguity averse voters. We relax these assumptions in the numerical analyses discussed in Section 5 and Appendices C and D.

We first characterize the vote share of each party with $\delta = 0$ and ambiguity aversion. Let ρ_j^k denote the proportion of voters who only observe party j's position on (only) issue

k. Let ρ_A^k denote the proportion of voters who observe all parties' positions on (only) issue k, and let ρ_0^k denote the proportion of all voters who care mainly about issue k but who do not observe any parties' positions on any issue. Then, our assumptions above, along with $\delta = 0$, imply that these cases are the only possible outcomes for a voter, so that $\sum_{k=1}^{K}\left(\rho_0^k + \rho_A^k + \sum_{j=1}^{J}\rho_j^k\right) = 1$, and that the values of ρ_0^k, ρ_j^k and ρ_A^k are as follows:

$$\rho_j^k = \left((1-\gamma_0)\tilde{\pi}_k + \frac{\gamma_0}{K}\right)\eta(e_j^k)(1-\gamma_2), \tag{3}$$

$$\rho_A^k = \rho_0^k\left(\frac{\gamma_1}{1-\gamma_1}\right) + \sum_{j=1}^{J}\rho_j^k\left(\frac{\gamma_2}{1-\gamma_2}\right), \tag{4}$$

$$\rho_0^k = \tilde{\pi}_k\left[1 - \sum_j(1-\gamma_0)\eta(e_j^k) - \sum_m\sum_j\left(\frac{\gamma_0}{K}\right)\eta(e_j^m)\right](1-\gamma_1). \tag{5}$$

For convenience, we will use η_j^k to denote $\eta(e_j^k)$.

Our assumptions about vote choice imply, under ambiguity aversion, that if a voter observes no party positions on any issue, she votes for each party with probability $\frac{1}{J}$. If she observes only one party j's position on one issue, she cares primarily about that issue and votes for party j, fearing other parties could be very distant from her in policy terms.

Among voters who observe all party positions on (only) the issue k, the vote share of party j is given by ψ_j^k, where:[15]

$$\begin{aligned}\psi_j^k &= \int_{\infty}^{-\infty}\mathbf{1}\{U(|x_i^k-\theta_j^k|) > \max_{m\neq j}U(|x_i^k-\theta_m^k|)\}f^k(x_i^k)\ \partial x_i^k\\ &\equiv \int_{\infty}^{-\infty}\mathbf{1}\{|x_i^k-\theta_j^k| < \max_{m\neq j}|x_i^k-\theta_m^k|\}f^k(x_i^k)\ \partial x_i^k\end{aligned} \tag{6}$$

We refer to ψ_j^k as the *relative popularity* of party j on issue k: when ψ_j^k is close to 1, party j is relatively popular on issue k in the sense that most voters will support it on the

15. This definition of ψ_j^k uses that voters' ideal points are independent of the party positions that they observe. Since we assume that the cdf F is continuous, we can define ψ_j^k without considering the vote choice of voters whose ideal points are equidistant between two parties, since the measure of these voters is zero.

issue if only they see its position. When ψ_j^k is close to 0, party j is relatively unpopular on issue k, in that fully informed voters will not support it on the issue.

To see how the ψ_j^k terms arise from party policy positions, consider a case of two parties and two issues, where voter ideal points are uniformly distributed on the interval $[0, 1]$ on each issue (so that the median voter is located at 0.5). Then, if both parties are located at 0.5 on each issue, then we would have $\psi_1^1 = \psi_2^1 = \psi_1^2 = \psi_2^2 = 0.5$. Alternatively, suppose that party positions on the two issues are given by the vector $(\theta_1^1, \theta_2^1, \theta_1^2, \theta_2^2) = (0.5, 0.9, 0.1, 0.5)$. Inputting these positions into equation (6) reveals that Party 1 is relatively more popular on issue 1 ($\psi_1^1 = 0.7$, whereas $\psi_2^1 = 0.3$), and Party 2 is relatively more popular on issue 2 (symmetrically, $\psi_2^2 = 0.7$, whereas $\psi_1^2 = 0.3$). Thus, each party is more popular on the issue where its position is closer to the median voter.

Recall that a strategy s_j is a function mapping the parties' positions to j's emphasis on each issue. Let $V_j(\theta, s)$ denote the total vote share of party $j \in \{1, 2, ..., J\}$, given that parties hold positions given by θ and given the parties' strategies s. Then, in the case with $\delta = 0$ and ambiguity averse voters, it follows that $V_j(\theta, s)$ is given by:

$$V_j(\theta, s) = \sum_{k=1}^{K} \left(\frac{\rho_0^k}{J} + \rho_A^k \psi_j^k + \rho_j^k \right), \tag{7}$$

where the values of the ρ terms depend on party issue emphases e_j^k, which in turn are understood to depend on s and θ.

4.1 Salience and Revelation Effects of Campaigns

This formal framework implies that campaigns may affect the salience of issues for voters, which we term the 'salience effect' of campaigns, and campaigns may also influence the probability with which voters observe parties' positions on issues salient to them, which we term the 'revelation effect' of campaigns. In this section we show how the strength of these effects can be quantified in our model.

Recall that $\tilde{\pi}_k$ represents the pre-campaign salience of issue k. Let π_k denote the *post*-campaign salience of issue k. That is, π_k represents the proportion of voters who care about issue k after voters have observed (or not observed) party positions. Then, π_k is given by:

$$\pi_k = \rho_0^k + \rho_A^k + \sum_{j=1}^{J} \rho_j^k \tag{8}$$

Using equations (3)-(5) above, it follows that an increase in party j's emphasis on issue k increases the post-campaign salience of the issue, since:

$$\frac{\partial \pi_k}{\partial e_j^k} = \left(\frac{\gamma_0}{K}\right)(1 - \tilde{\pi}_k)\eta'(e_j^k) \geqslant 0$$

Equally, emphasis on an issue $m \neq k$ reduces the post-campaign salience of issue k, since

$$\frac{\partial \pi_k}{\partial e_j^m} = -\left(\frac{\gamma_0}{K}\right)\tilde{\pi}_k \eta'(e_j^m) \leqslant 0, \text{ for } m \neq k. \tag{9}$$

These effects arise because, if party j campaigns more on an issue k, this increases the proportion of voters who witness its campaign and come to care about this issue, and therefore decreases the proportion who ultimately care about other issues (since voters who witness campaigns ultimately only care about issues on which they witness campaigns). The degree to which parties' issue emphases can affect the post-campaign salience of issues is larger when the priming potential of campaigns is larger (that is, higher values of the γ parameters). This is because, as explained in Section 3.5, a greater priming potential of campaigns entails that voters are more likely to witness party campaigns and come to care about issues on which they are not initially oriented.[16]

However, in addition to affecting the salience of issues, party campaigns also affect

16. In this case, γ_0 is the relevant parameter as this determines voters's probability of witnessing campaigns on which they are not initially oriented.

the fraction of voters that observe party positions, as discussed in the Section 3. Using the definitions on page 21, the probability that a randomly chosen voter i observes (at least) party j's position on issue k is given by:

$$\text{Prob}(i \text{ observes } j\text{'s position on } k) = \rho_j^k + \rho_A^k.$$

Using equations (3)-(5) and combining with (9), we get that this depends on e_j^k according to:

$$\frac{\partial}{\partial e_j^k}(\rho_j^k + \rho_A^k) = \underbrace{(1-\gamma_1)\left((1-\gamma_0)\tilde{\pi}_k + \frac{\gamma_0}{K}\right)\eta'(e_j^k)}_{\text{revelation effect}} + \underbrace{\gamma_1 \frac{\partial \pi_k}{\partial e_j^k}}_{\text{salience effect}}. \tag{10}$$

The first term on the right hand side is the revelation effect of campaigns – campaigns on issue k directly increase the proportion of voters who observe party positions on this issue, aside from any effects on issue salience. The revelation effect is stronger when the pre-campaign salience of the issue, $\tilde{\pi}_k$ is higher, since more voters are likely to witness a campaign on a more salient issue. The magnitude of the revelation effect is decreasing in the priming potential of campaigns. This is because, as explained in Section 3.5, higher values of the γ parameters imply that a party's campaign has less influence on whether voters observe its positions *at all*, thereby weakening the revelation effect.

The second term on the right hand side is the salience effect of campaigns. As a party campaigns more on an issue, the salience increases, which directly increases the proportion of voters who observe party positions on the issue, since voters are more likely to see party positions on issues they care about. A higher priming potential of campaigns raises the size of the salience effect, both directly in (10) and via increasing the magnitude of $\frac{\partial \pi_k}{\partial e_j^k}$ in (9). This is because larger γ parameters both increase the extent to which parties can influence the salience of issues, and increase the probability that voters observe party positions on salient issues.

4.2 Equilibrium Party Strategies

We define an equilibrium in this model as a strategy profile $s \in S$ such that each party's strategy maximizes its vote share for each θ, given the strategies of the other parties. Focusing on the case with $\delta = 0$ and ambiguity averse voters, $s \in S$ constitutes an equilibrium if for each $\theta \in \Theta$, and for each $j \in \{1, ..., J\}$, there is no $\tilde{s}_j \in S_j$ satisfying $V(\theta, s_1, ..., \tilde{s}_j, ..., s_J) > V(\theta, s_1, ..., s_j, ..., s_J)$.[17]

We solve for party j's equilibrium strategy by fixing θ and solving for party j's vote maximizing emphasis choices $\{e_j^1, ..., e_j^K\}$ given θ and given $\{e_m^1, ..., e_m^K\}_{m \neq k}$. To build intuition, we first heuristically derive an interior solution to party j's optimization problem, i.e. a solution in which each $e_j^k \in (0, 1)$.

The first order condition for party j's choice of e_j^k is:

$$\frac{\partial V_j}{\partial e_j^k} = \lambda_j$$

where $\lambda_j \geqslant 0$ is the Lagrange multiplier on the constraint $\sum_{k=1}^{K} e_j^n \leqslant 1$.

Substituting equations (3)-(5) into equation (7), and simplifying, we obtain that

$$V_j = \text{terms that don't depend on j's strategy} + \sum_{k=1}^{K} q_j^k \eta(e_j^k), \tag{11}$$

17. Given the vote share function (7) and policy position of each party, this corresponds to a subgame perfect Nash equilibrium in pure strategies between the parties – each party maximizes its vote share given the other parties' strategies for each θ chosen by nature. At the same time, the behavior of voters cannot be viewed as part of a subgame perfect Nash equilibrium, since voters are ambiguity averse and so are not acting to maximize expected utility.

and so $\frac{\partial V_j}{\partial e_j^k} = \eta'(e_k^j)q_j^k$, where

$$q_j^k = q_{j,r}^k + q_{j,s}^k \tag{12}$$

$$q_{j,r}^k = \left((1-\gamma_0)\tilde{\pi}_k + \frac{\gamma_0}{K}\right)\left[(1-\gamma_1)\left(1-\frac{1}{J}\right) - (\gamma_2-\gamma_1)(1-\psi_j^k)\right] \tag{13}$$

$$q_{j,s}^k = \gamma_1\left(\frac{\gamma_0}{K}\right)\left(\psi_j^k - \sum_{n=1}^{K}\tilde{\pi}_n\psi_j^n\right)\Bigg] \tag{14}$$

Therefore, we can write the first order condition as:

$$\eta'(e_k^j)q_j^k = \lambda_j \tag{15}$$

Since $\eta'(e_j^k) > 0$ for $e_j^k \in (0,1)$, it follows that the first order condition can only be satisfied in the interior if $q_{j,r}^k + q_{j,s}^k > 0$ for each k. Then $\lambda_j > 0$ and so complementary slackness implies $\sum_{n=1}^K e_j^n = 1$. Adding up the first order conditions across different issues m implies that λ_j must satisfy:

$$\sum_{m\neq k: q_j^m>0} \eta'^{-1}\left(\frac{\lambda_j}{q_j^m}\right) = 1 - e_j^k, \tag{16}$$

where $\eta'^{-1}(\cdot)$ denotes the inverse of $\eta'(\cdot)$. Given this characterization of λ_j, the optimal choice of e_j^k is uniquely pinned down by the first order condition, since $\eta''(\cdot) < 0$. The left hand side of the first order condition is the marginal benefit to the party of emphasizing issue k. λ_j is the marginal opportunity cost of emphasizing k – emphasizing k means the party has less time to devote to other issues. Implicitly differentiating equation (16) with respect to e_j^k reveals that λ_j is an increasing function of e_j^k.

The marginal benefit of emphasizing issue k is proportional to $q_{j,r}^k + q_{j,s}^k$. The $q_{j,r}^k$ and $q_{j,s}^k$ relate, respectively, to the revelation and salience effects of campaigns discussed on page 24. To provide some intuition as to where these terms come from and what they depend upon, it is instructive to consider the special case $\gamma_0 = \gamma_1 = \gamma_2 = \gamma$. In that case, the terms simplify to:

$$q_{j,r}^k = \left((1-\gamma)^2\tilde{\pi}_k + \frac{\gamma(1-\gamma)}{K}\right)\left[1 - \frac{1}{J}\right],$$
$$q_{j,s}^k = \frac{\gamma^2}{K}\left(\psi_j^k - \sum_{n=1}^{K}\tilde{\pi}_n\psi_j^n\right)\bigg].$$

The term $q_{j,r}^k\eta'(e_j^k)$ is the revelation incentive to emphasize issue k. This incentive is the key novel incentive in our model relative to much of the prior literature. The revelation incentive to emphasize an issue arises because emphasizing an issue increases the proportion of voters for whom the party's position is revealed. Since voters are ambiguity averse, they are more likely to vote for a party if they know its position, so emphasizing an issue tend to increase a party's vote share all else equal. In the special case where $\gamma_0 = \gamma_1 = \gamma_2$, this term is proportional to the revelation effect discussed on page 24.[18] More generally, our parameter restrictions on γ_1 and γ_2 on page 15 imply, using equation (13), that $q_{j,r}^k > 0$ for all $\psi_j^k \in [0,1]$. That is, regardless of a party's position on an issue, it has a positive revelation incentive to emphasize the issue. This is because it is always the case that some voters will support a party if they see its position, whereas no voters will support a party if they only another party's position, so parties always have an incentive to reveal their position to as many voters as possible.

As the revelation effect on page 24 is larger when the pre-campaign salience of an issue (i.e. $\tilde{\pi}_k$) is higher, so $q_{j,r}^k$ is higher when $\tilde{\pi}_k$ is higher. Thus, the revelation incentive to emphasize an issue is stronger if its pre-campaign salience is higher, since parties strengthen their electoral appeal by making their positions known to voters on the issues already important to those voters, as voters are ambiguity averse. The level of $q_{j,r}^k$ depends ambiguously on the γ parameters, but becomes close to zero when all three γ parameters

18. Alternatively, when $\gamma_1 > \gamma_2$, equation (13) reveals that $q_{j,r}^k$ has the additional term $-(\gamma_2 - \gamma_1)(1 - \psi_j^k)$, which arises because j emphasizing an issue increases the likelihood of voters observing other parties' positions on the issue, which acts to reduce j's vote share.

are close to 1. This is because, as discussed above, the revelation effect shrinks when the priming potential of campaigns is larger.

The term $q^k_{j,s}\eta'(e^k_j)$ is the salience incentive to emphasize issue k: emphasizing issue k increases the salience of that issue and decreases the salience of other issues. This term is similar to the salience effect on page 24, but is proportional to $\psi^k_j - \sum_{n=1}^K \tilde{\pi}_n \psi^n_j$, which represents whether or not party j has a comparative advantage on issue k – i.e. whether it is relatively more popular on issue k than on other issues (weighted by their pre-campaign salience). The salience incentive is positive (negative) if party j has a comparative advantage (disadvantage) on issue k, since party j's vote share is higher when the issues it is advantaged on become more salient. The magnitude of $q^k_{j,s}$ is increasing in the priming potential of campaigns, since salience effects are larger in that case.

The optimal choice of the party is shown graphically in Figure 1. The MB shows the marginal benefit of emphasizing the issue, and the MC curve shows the marginal cost. The marginal benefit is composed of the revelation and salience incentives. The RI curve shows the revelation incentive. Optimal e^k_j is the intersection of the MB and MC curves. Figure 2 repeats the same diagram for the case where the salience incentive is negative.

Note that the definitions of $q^k_{j,r}$ and $q^k_{j,s}$ imply that these do not depend on other parties' decisions. Then, party j's first order condition has a unique solution regardless of other parties' decisions, and so each party j has a unique dominant strategy. It follows that there exists a unique equilibrium in the model. The following Proposition, proven in the Appendix, makes this argument formal and shows that a corner solution $e^k_j = 0$ arises if $q^k_{j,r} + q^k_{j,s} < 0$, since in that case that marginal benefit from emphasizing the issue is negative.

Proposition 1. *There exists a unique equilibrium of the model for all parameter values. In the equilibrium, party j's emphasis e^k_j on issue k, for given $\theta \in \Theta$, satisfies $e^k_j = 0$ if $q^k_{j,s} + q^k_{j,r} \leqslant 0$. If $q^k_{j,s} + q^k_{j,r} > 0$ then e^k_j is the unique solution to* (15) *and the*

Figure 1: Optimal choice of e_j^k

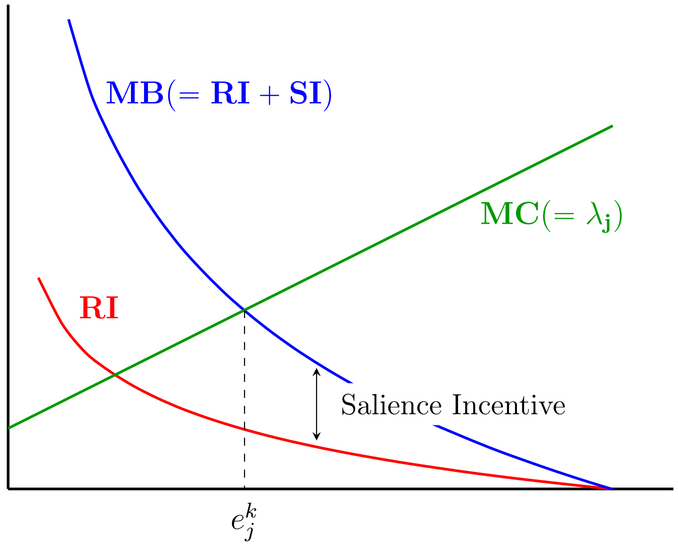
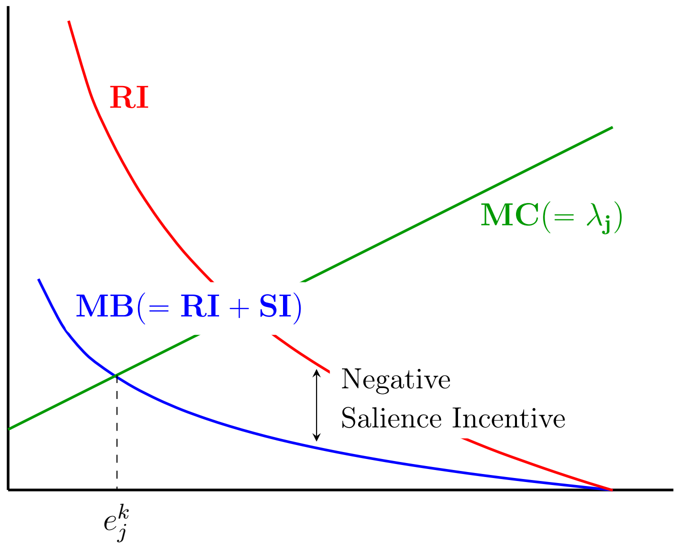


Figure 2: Choice of e_j^k when salience incentive is negative



characterization of λ_j *in* (16).

4.3 Two Numerical Examples

We now show that the model has a number of novel implications for party emphasis strategies, which differ from the results of much of the formal literature. To illustrate some key properties of the model equilibrium, we first present two numerical examples. We derive more general analytical results about these properties of the model in Section 4.4. For both numerical examples, we assume that there are two parties and two issues. Voter ideal points are uniformly distributed on the interval $[0; 1]$ on both issues. As in our earlier in example in Section 4, party positions on the two issues are given by the vector $(\theta_1^1, \theta_2^1, \theta_1^2, \theta_2^2) = (0.5, 0.9, 0.1, 0.5)$, implying that $\psi_1^1 = 0.7$, $\psi_2^1 = 0.3$, $\psi_1^2 = 0.3$ and $\psi 2_1 = 0.7$. That is, Party 1 is more popular on issue 1 and Party 2 is more popular on issue 2.

We assume that issue 1 has a higher pre-campaign salience ($\tilde{\pi}_1 = 0.7$, whereas $\tilde{\pi}_2 = 0.3$). As above, we assume $\delta = 0$ and voters are ambiguity averse. The function η is assumed to be $\eta(e) = 0.3e^0.3$. The only difference between the two examples is the priming potential of campaigns. In Example 1, the priming potential is low: $\gamma_0 = \gamma_1 = \gamma_2 = 0.3$. In Example 2, the priming potential is high: $\gamma_0 = \gamma_1 = \gamma_2 = 0.7$.

Table 2 summarizes the key parameters of the model and their values in the numerical examples.[19] Table 3 summarizes the equilibrium issue emphases in the two numerical examples and the corresponding values of the $q_{j,R}^k$ and $q_{j,S}^k$ terms (representing the strength of the revelation and salience incentives).

Inspecting the last two columns of Table 3, we first note that, across the two examples, the revelation incentive terms are positive and identical for the two parties, whereas the

19. Strictly speaking, the ψ_j^k are not parameters, since they depend on parties' positions. However, the ψ_j^k do not depend on party strategies and so may be treated as parameters as far as the equilibrium is concerned.

Table 2: Key Parameters in Numerical Examples

Parameter	Name	Value in Numerical Examples
$\tilde{\pi}_1$	Prior Salience of Issue 1	0.7
$\tilde{\pi}_2$	Prior Salience of Issue 2	0.3
ψ_1^1	Popularity of Party 1 on Issue 1	0.7
ψ_1^2	Popularity of Party 1 on Issue 2	0.3
ψ_2^1	Popularity of Party 2 on Issue 1	0.3
ψ_2^2	Popularity of Party 2 on Issue 2	0.7
γ_0, γ_1, γ_2	Priming Potential of Campaigns	0.3 (Example 1); 0.7 (Example 2)
δ	Mutual Compatibility of Campaigns	0

Note: The table summarizes the key parameters of the model and shows their values in the two numerical examples discussed in the main text. Both examples are identical except for assuming different values of the γ terms. Both examples assume $\eta(e) = 0.3e^{0.3}$.

Table 3: Party Issue Emphases and Values of q_R and q_S in Numerical Examples

	Party	Issue	Emphasis	Revelation Term	Salience Term
Example 1 $\gamma = 0.3$ (low priming potential case)	1	1	$e_1^1 =$ 0.73	$q_{1,R}^1 =$ 0.224	$q_{1,S}^1 =$ 0.005
	1	2	$e_1^2 =$ 0.27	$q_{1,R}^2 =$ 0.126	$q_{1,S}^2 =$ -0.013
	2	1	$e_2^1 =$ 0.66	$q_{2,R}^1 =$ 0.224	$q_{2,S}^1 =$ -0.005
	2	2	$e_2^2 =$ 0.34	$q_{2,R}^2 =$ 0.126	$q_{2,S}^2 =$ 0.013
Example 2 $\gamma = 0.7$ (high priming potential case)	1	1	$e_1^1 =$ 1.00	$q_{1,R}^1 =$ 0.084	$q_{1,S}^1 =$ 0.029
	1	2	$e_1^2 =$ 0.00	$q_{1,R}^2 =$ 0.066	$q_{1,S}^2 =$ -0.069
	2	1	$e_2^1 =$ 0.22	$q_{2,R}^1 =$ 0.084	$q_{2,S}^1 =$ -0.029
	2	2	$e_2^2 =$ 0.78	$q_{2,R}^2 =$ 0.066	$q_{2,S}^2 =$ 0.069

Note: The table shows party equilibrium emphasis and the comparative strengths of the revelation and salience incentives in the two numerical examples with high and low values of the γ terms. The final three columns of the table show, in turn, party equilibrium emphases on each issue, the q_R terms corresponding to the strength of the revelation incentive for each party on each issue, and the q_S terms corresponding to the strength of the salience incentive for each party on each issue.

salience incentive terms have opposite signs for the two parties. Examination of equations (13) and (14) reveals that these will always be true in a two-party two-issue case if $\gamma_2 = \gamma_1$. The revelation incentive terms for each party are larger for issue 1 (in both examples) because it is the issue with higher pre-campaign salience. As discussed on page 28, the revelation incentive is stronger for issues with higher prior salience, because parties have a particular need to reveal their positions to voters on the issues most important to these voters, since voters are ambiguity averse. The salience incentive term is positive for each party on the issue on which it has a comparative advantage and negative on the other issue. This is because, as discussed on page 28, parties have an incentive to emphasize the issues on which they are relatively more popular in order to increase the salience of these issues.

The 'Emphasis' column of Table 3 shows the implications of these incentives for parties' equilibrium issue emphases in the two examples. Strikingly, in example 1, both parties place positive emphasis on both issues, even though Party 1's position on issue 1 is more popular than Party 2's and Party 2's position on issue 2 is more popular than Party 1's. This contrasts with the results of most models in the literature, which do not predict that all parties emphasize all issues when they are advantaged on different issues. Across the two examples, party 1 places more emphasis on issue 1 than party 2 does, and so party 2 places relatively more emphasis on issue 2. That is: each party places relatively more emphasis (compared to the other party) on the issue on which it has a comparative advantage. At the same time, between them the two parties place on average more emphasis on issue 1 than issue 2 – for instance, in example 1, their average emphasis on issue 1 is $\frac{0.73+0.66}{2} = 0.695$, and their average emphasis on issue 2 is 0.305.

To understand these patterns, recall that the marginal benefit to party j of emphasizing issue k is, all else equal, proportional to $q^k_{j,R} + q^k_{j,S}$. According to Proposition 1, party j places positive emphasis on issue k whenever $q^k_{j,R} + q^k_{j,S} > 0$. Crucially, in example 1, we find that $q_{j,R}^k + q_{j,S}^k > 0$ for both parties and both issues (because the revelation incentive terms dominate the salience incentive terms) and so both parties emphasize both issues despite being advantaged on different issues. Furthermore, since $q_{j,R}^k$ is the same across the two parties in both examples, and $q_{j,S}^k$ is larger for each party on the issue on which it has a comparative advantage, we find that $q_{j,R}^k + q_{j,S}^k$ is relatively higher on issue k for the party which is comparatively advantaged on issue k, and so that party places relatively more emphasis on issue k. Equally, since the salience incentive is, for each issue, zero on average across the parties, it follows that $q_{j,R}^k + q_{j,S}^k$ is relatively higher on average across the parties for issue 1, as the revelation incentive to emphasize that issue is higher. Correspondingly, we find that the parties place more emphasis on issue 1 on average.

Lastly, comparing the two examples, we see that the salience incentive terms are larger in example 2 than in example 1, and the revelation incentive terms are smaller in example 2. This is because, as discussed previously, the revelation incentive tends to become small when the priming potential of campaigns is very high, and the salience incentive becomes larger. The consequence is that, in example 1, party equilibrium behavior is largely driven by the revelation incentive, and, in example 2, it is largely driven by the salience incentive. As such, in example 1, party 1 and party 2 both emphasize issue 1 much more than issue 2 (as it has higher prior salience) even though party 2 is advantaged on issue 2, but, in example 2, each party focuses on the issue on which it is comparatively advantage.

The results of these two examples suggest that the model equilibrium may potentially be able to account for the empirical literature's findings on party strategy discussed on page 6: while parties do tend to campaign disproportionately on issues that favor them, they may often find themselves campaigning on the same issues, particularly when these issues are highly salient (as occurred in example 1). In the next section, we show that these key properties of the model equilibrium are not unique to these two numerical examples, but rather hold more generally, over a large class of parameter values.

4.4 Properties of the Equilibrium

We now show that some key properties of the equilibria in the two numerical examples above hold generally for a large class of parameter values in the model. First, we show that, if the priming potential of campaigns is sufficiently low, then the revelation incentive is sufficiently strong (compared to salience incentives) for all parties to emphasize all issues in equilibrium, as occurred in numerical example 1 above. Conversely, we show that when the priming potential of campaigns is high, then salience incentives will dominate and all parties will 'talk past each other' and exclusively emphasize different issues, in accordance with much of the previous formal literature. Numerical example 2 above tended in this direction.

Next, we derive comparative statics for how the model equilibrium depends upon the values of the parameters. We show that all parties tend to emphasize an issue k if the pre-campaign salience of issue k is higher. Equally, we show a party tends to emphasize an issue relatively more when its position on the issue is relatively more popular.

Finally, we show that, if the priming potential of campaigns is sufficiently low (and so the revelation incentive is sufficiently dominant) and if the pre-campaign salience of issue-k- is sufficiently close to one, for some k, then all parties may choose to primarily emphasize issue k in their campaigns regardless of how popular their positions are on the issue. Numerical example 1 tended in this direction.

Together, these properties of the model equilibrium can account for the empirical literature's findings on party strategy discussed on page 6: while parties do tend to campaign disproportionately on issues that favor them, they may often find themselves campaigning on the same issues, particularly when these issues are highly salient.

We now derive these formal properties of the equilibrium in turn. First, we to derive conditions under which the revelation incentive is sufficiently strong for all parties to emphasize all issues in equilibrium. From Proposition 1 it is immediate that this will be the case if and only if $q_{j,r}^k + q_{j,s}^k > 0$ for all $k = 1, ..., K$ and $j = 1, ..., J$. Furthermore, since $q_j^k > 0$ always, a sufficient condition for this is that $|q_{j,s}^k| < q_{j,r}^k$, that is, that the revelation incentive dominates the salience incentive. On the other hand, if $|q_{j,s}^k| > q_{j,r}^k$ for all k and j, then the salience incentive dominates, and parties will only place positive emphasis on issues on which they have a comparative advantage, since $q_{j,s}^k + q_r^j < 0$ for other issues.

Manipulation of equations (13)-(14) for $q_{j,r}^k$ and $q_{j,s}^k$ reveals that these two cases apply under the following conditions:

Proposition 2. *If* $\max\{\gamma_0; \gamma_1; \gamma_2\} < \frac{J-1}{2J-1}$ *then* $e_j^k > 0$ *for all* $k = 1, ..., K$ *and* $j = 1, ..., J$ *in equilibrium. Conversely, if,*

$$\min\{\gamma_0; \gamma_1; \gamma_2\} > \frac{1}{\sqrt{1 + \left(\frac{J}{J-1}\right) \frac{\min_k \max_j |\psi_j^k - \sum_{n=1}^K \tilde{\pi}_n \tilde{\psi}_j^n|}{K}}}, \tag{17}$$

then $e_j^k > 0$ *in equilibrium if and only if* $\psi_j^k > \sum_{n=1}^K \tilde{\pi}_n \psi_j^n$.

Proposition 2 establishes that, if the priming potential of campaigns is sufficiently low (i.e. all γ parameters are small), then all parties will choose to emphasize all issues to some degree in equilibrium regardless of which issues they are advantaged on. This contrasts with many existing results in the formal literature, but was evident in numerical example 1 above. The reason that all parties emphasize all issues when the priming potential of campaigns is low is that, as discussed on page 4.2, the salience incentive diminishes in size when the priming potential of campaigns is low. In that case, the revelation incentive dominates the salience incentive. Since the revelation incentive for a party to emphasize an issue is positive regardless of the party's position on the issue, this provides an incentive for all parties to emphasize all issues. Furthermore, since the η function is strictly concave and $\eta'(1) = 0$, emphasizing an issue beyond a certain point hardly increases the fraction of voters that observe a party's position on an issue, and so the marginal gain to a party from emphasizing an issue a very large amount is relatively smaller. The consequence of this is that, for a low priming potential of campaigns, the powerful revelation incentive ensures that parties will tend to prefer to emphasize all issues to some degree, rather than just exclusively emphasizing one issue.

On the other hand, Proposition 2 also shows that, when the priming potential of campaigns is sufficiently high, party j chooses $e_j^k = 1$ if and only if $\psi_j^k > \sum_{n=1}^{K} \tilde{\pi}_n \psi_j^n$ – that is, parties will tend to talk about different issues, as each party focuses on the issues on which it is relatively more popular. Intuitively, when the priming potential of campaigns is high, the revelation incentive diminishes in size, and the salience incentive grows in size, as discussed on pages 4.2-4.2. Similar to results of the prior literature, the powerful salience incentive encourages parties to focus on the issues on which they have a comparative advantage in order to increase the salience of these issues.

We now show how parties' emphasis strategies change in the model when the model parameter values and party positions change. Based on the representation of the choice of e_j^k in Figure 1, it follows that e_j^k will increase if the MB curve shifts up (which occurs if $q_{j,s}^k + q_{j,r}^k$ rises) or if the MC curve shifts down, i.e. λ_j falls. Applying the implicit function theorem to (16) reveals that λ_j falls if $q_{r,m}^k + q_{s,m}^k$ falls for some other issue $m \neq k$. As such, the comparative static results for the choice of e_j^k can be straightforwardly derived by differentiating $q_{j,r}^k$ and $q_{j,s}^k$ with respect to the parameters. They are as follows:

Proposition 3. *Let* $e_j^{\star k}(\{\tilde{\pi}_n\}_{n=1}^{K-1}, \{\psi_j^n\}_{j=1,n=1}^{J,K}, \gamma_0, \gamma_1, \gamma_2)$ *denote the equilibrium emphasis* e_j^k *for some* $k \in \{1, ..., K-1\}$ *and* $j \in \{1, .., J\}$ *for given values of* $\{\tilde{\pi}_n\}_{n=1}^{K-1}, \{\psi_j^n\}_{j=1,n=1}^{J,K}$ γ_0*,* γ_1*, and* γ_2*, where* $\tilde{\pi}_k = 1 - \sum_{n=1}^{K-1} \tilde{\pi}_n$*. Suppose that* $e_j^k > 0$ *and let* $m \neq k$ *denote some* *other issue in* $\{1, ..., K\}$. *Then,* e_j^k *satisfies the following comparative statics:*

$$\frac{\partial e_j^{\star k}}{\partial \psi_j^k} > 0 \tag{18}$$

$$\frac{\partial e_j^{\star k}}{\partial \psi_j^m} < 0 \tag{19}$$

$$\frac{\partial e_j^{\star k}}{\partial \tilde{\pi}_k} > 0 \tag{20}$$

The three comparative statics contained in Proposition 3 are intuitive. The first result (18) arises because, when ψ_j^k is higher, party j's position on issue k is relatively more popular. This encourages party j to increase its emphasis on issue k for two reasons: first, in order to reveal its more popular position to voters, and second, to increase the proportion of voters who care about issue k. The second result (19) states that when a party's position on some issue $m \neq k$ is more popular, emphasis on k decreases, since it becomes relatively more valuable to emphasize m. Finally, (20) states that when the pre-campaign salience of issue k is higher then parties emphasize issue k more. This is because when voters primarily care about issue k, parties can gain more votes by revealing their positions on issue k than on other issues. Consequently, parties increase their emphasis on issue k.

Finally, we show that if the priming potential of campaigns is sufficiently low and the initial salience of an issue k are sufficiently high, then the revelation incentive to emphasize this issue is large and dominates salience incentives. In that case, all parties will choose to primarily campaign on this issue regardless of the positions they hold on the issue, as occurred in numerical example 1 above. Thus, the equilibrium may involve all parties talking mainly about the same issue if it is highly salient and voters are sufficiently focused on one issue, even if some parties have very unpopular positions on the issue.

Proposition 4. *For any* $z \in (0, 1)$, *there exist* $\pi^\star$, $\gamma^\star \in (0, 1)$ *such that, for any* $k \in \{1, ..., K\}$, *if* $\tilde{\pi}_k > \pi^\star$ *and* $\max\{\gamma_0; \gamma_1; \gamma_2\} < \gamma^\star$ *then in equilibrium all parties* $j \in \{1, ..., J\}$

will choose $e_j^k > z$ for all $\theta \in \Theta$ and all other parameter values.

5 Extensions of the Baseline Model

As shown in the previous section, the model is analytically tractable when voters are ambiguity averse and see party positions on (and ultimately care about) at most one issue. Nevertheless, these assumptions are arguably relatively extreme, and it does not seem empirically plausible that voters only care about a single issue. For this reason, we study extensions of the model where $\delta = 1$ (so that voters can witness multiple campaigns and therefore see party positions on multiple issues) and where voters are expected utility maximizing (so that they may sometimes prefer to vote for a party whose position is unknown to them rather than voting for a party whose extreme position they observe). These two extensions are unfortunately not as tractable as the case studied in Section 4 and so we are only able to obtain numerical results. Nevertheless, when studying the two-party two-issue case numerically, we find that both the qualitative and quantitative conclusions of the model in Section 4 are little changed in these extensions, except when party positions are rather extreme. This is suggestive that the value of δ and the ambiguity aversion assumption are not especially important for the predictions of the model. We conjecture that, for larger numbers of parties and issues, numerical results with $\delta = 1$ and expected utility maximization would also be similar to those with $\delta = 0$ and ambiguity aversion.

For reasons of space, we omit discussion of the results of these extensions here. Full results for numerical simulations of these extended models are given in the appendix. Appendix C provides results for the case when voters maximize expected utility, and Appendix D provides results for the case with $\delta = 1$.

In Section 5.1, we discuss an additional extension of the model: where parties are able to provide voters with imprecise campaign messages.

5.1 Campaigns with Imprecise Messaging

Thus far, we have assumed that voters are ambiguity averse and so less likely to support a party if they do not know its position on the issue most important to them.[20] If this accurately characterizes voter behavior, one might also expect parties, when emphasizing an issue, to be extremely precise in their campaign messages, communicating very specific policy proposals in order to minimize voter uncertainty about their positions. However, this is clearly at odds with many real-world campaigns as well as much research on party position-taking, as parties are known to frequently use imprecise language or to tailor their messaging to different audiences – even on issues central to their campaigns. Indeed, many studies have demonstrated that this approach may even be electorally beneficial for parties (Tomz and Houweling 2009; Rovny 2012; Somer-Topcu 2015).[21]

To consider such issues, we extend our model in Appendix B to incorporate the possibility that parties are able to send more or less precise messages in their campaigns. There, we examine whether and when they might choose to send imprecise messages, and how this possibility affects their emphasis strategies in a context with ambiguity averse voters and endogenous issue salience. Sending imprecise messages, we suggest, can help a party win over voters who would not be particularly favorable to the party's true issue positions. Nevertheless, we show analytically that the key qualitative results for party emphasis strategy from our baseline model remain unchanged in this imprecise campaigns model, because the revelation and salience incentives continue to operate.

20. In Appendix C, we study the model where voters maximize expected utility and are risk averse, which also yields this prediction in most cases.

21. Much of this literature refers to this phenomenon as parties taking 'ambiguous positions'. We instead use the term "imprecise messaging" to refer to this behavior, to avoid confusion with the theoretically distinct concept of ambiguity aversion, which is assumed throughout in the model.

6 Concluding Remarks

In the paper, we develop a formal model to match five general patterns of party emphasis strategy noted by the empirical literature. A key force that allows our model to match these five patterns simultaneously is the 'revelation incentive' in our model. This incentive provides a novel explanation hitherto missing from the formal literature for why parties often emphasize unfavorable issues, and also why multiple parties often campaign on the same issues when these issues are particularly salient to voters. While we only qualitatively compare our model to the empirical literature here, future work could examine how far a model of this kind is able to quantitatively match empirical data on party issue emphases.

Our model also speaks to the question of how and when elections can force parties to respond to voters' priorities in their campaigns, versus when parties are able to shape the electoral agenda in their favor instead. This paper suggests that conditions that strengthen the revelation incentive vis-á-vis the salience incentive are key to voters' ability to use elections to hold politicians' accountable on issues important to them. The relative strength of the revelation incentive varies inversely with what we have called the priming potential of campaigns, that is, how far electoral campaigns alter voters' issue priorities versus informing voters about parties' positions. In footnote 14, we suggest that the priming potential of campaigns might be determined by long term structural features of the political system and technology that affect levels of voter information and attentiveness. Future work might consider, both formally and empirically, whether and how the priming potential of campaigns varies across countries and over time, as well as the implications of this for party campaigns and electoral outcomes, for instance in an estimated structural model.

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Appendices

Contents

Appendix A Proofs of Propositions

For convenience, we define $\hat{\pi}_k$ as: $\hat{\pi}_k := (1-\gamma_0)\tilde{\pi}_k + \frac{\gamma_0}{K}$. For the proofs, we rely heavily on the following three lemmas, which we state and prove first.

Lemma 1. *For all parameter values, $\hat{\pi}_k$, $q^k_{j,r}$, $q^k_{j,s}$ and q^k_j satisfy:*

$$0 < \hat{\pi}_k < 1, \tag{A.1}$$

$$\hat{\pi}_k\left[1-\gamma_1\right]\frac{J-1}{J} \geqslant q^k_{j,r} \geqslant \hat{\pi}_k\left[1-\gamma_2-\frac{1-\gamma_1}{J}\right] > 0, \tag{A.2}$$

$$\hat{\pi}_k(\gamma_0\tilde{\pi}_k)\gamma_1 > |q^k_{j,s}| > \hat{\pi}_k\gamma_1\left(\hat{\pi}_k-(1-\gamma_0)\tilde{\pi}_k\right)\min_k\min_j\left|\psi^k_j-\frac{\sum_{n=1}^K\tilde{\pi}_n\psi^n_j}{K}\right|, \tag{A.3}$$

$$J\cdot K\cdot\hat{\pi}_k\left[1-\frac{1-\gamma_1}{J}+\gamma_2\right] > q^k_j > \hat{\pi}_k\left[1-\gamma_2-\frac{1-\gamma_1}{J}-(\gamma_0\tilde{\pi}_k)\gamma_1\right]. \tag{A.4}$$

Proof. For (A.1) note that $\hat{\pi}_k > (1-\gamma_0)\tilde{\pi}_k > 0$ and $\hat{\pi}_k = (1-\gamma_0)\tilde{\pi}_k + \left(\frac{\gamma_0}{K}\right) < (1-\gamma_0)\tilde{\pi}_k + \gamma_0 < 1$.

For (A.2), note that $1 \geqslant \psi^k_j \geqslant 0$ and $1 \geqslant \gamma_2 \geqslant \gamma_1 \geqslant 0$, so that $\gamma_2-\gamma_1 \geqslant (\gamma_2-\gamma_1)\psi^k_j \geqslant 0$ and substituting the latter inequality to eliminate the $(\gamma_2-\gamma_1)\psi^k_j$ term in (13).

For (A.3), note first that

$$\frac{\gamma_0}{K\hat{\pi}_k} = \frac{\hat{\pi}_k-(1-\gamma_0)\tilde{\pi}_k}{\hat{\pi}_k} < \gamma_0\tilde{\pi}_k \tag{A.5}$$

where the equality above follows from the definition of $\hat{\pi}_k$ and the strict inequality follows since $\hat{\pi}_k < 1$. Substituting (A.5) into (14) and using that each $\psi^k_j \in [0,1]$, we obtain that $\hat{\pi}_k(\gamma_0\tilde{\pi}_k)\gamma_1 > |q^k_{j,s}|$. For the rest of (A.3), note that it is immediate from (14) and the definition of $\hat{\pi}_k$ that:

$$|q^k_{j,s}| = \gamma_1(\hat{\pi}_k-(1-\gamma_0)\tilde{\pi}_k)\left|\psi^k_j-\frac{\sum_{n=1}^K\tilde{\pi}_n\psi^n_j}{K}\right| \geqslant \gamma_1(\hat{\pi}_k-(1-\gamma_0)\tilde{\pi}_k)\min_j\min_k\left|\psi^k_j-\frac{\sum_{n=1}^K\tilde{\pi}_n\psi^n_j}{K}\right|$$

Then, the rest of (A.3) follows since $\hat{\pi}_k < 1$.

(A.4) follows from the fact that $q_j^k = q_{j,r}^k + q_{j,s}^k$ and so $q_{j,r}^k + |q_{j,s}^k| \geqslant q_j^k \geqslant q_{j,r}^k - |q_{j,s}^k|$ and then substituting in (A.2) and (A.3) and using that $(\gamma_0 \tilde{\pi}_k)\gamma_1 < \gamma_1 + \gamma_2$ and $J \cdot K > 1$. $\square$

Lemma 2. *q_j^k and q_j^m for any $m \neq n \neq k$ satisfy the following comparative statics as ψ_j^k, $(1-\gamma_0)\tilde{\pi}_k$ and $(1-\gamma_0)\tilde{\pi}_n$ vary: $\frac{\partial q_j^k}{\partial \psi_j^k} > 0$, $\frac{\partial q_j^m}{\partial \psi_j^k} < 0$, $\frac{\partial q_j^k}{\partial \tilde{\pi}_k} - \frac{\partial q_j^k}{\partial \tilde{\pi}_n} \geqslant 0$, and $\frac{\partial q_j^m}{\partial \tilde{\pi}_k} - \frac{\partial q_j^m}{\partial \tilde{\pi}_n} = 0$.*

Proof. These comparative statics follow immediately from differentiating equations (12), (13) and (14) and using $\gamma_2 \geqslant \gamma_1 \geqslant 0$, $(1-\gamma_0) < 1$, $\hat{\pi}_k \in (0,1)$ and $q_{j,r}^k > 0$ – where the latter two were shown in Lemma 1. $\square$

Lemma 3. *An optimal strategy for party j must involve $e_j^k > 0$ if $q_j^k > 0$ and $e_j^k = 0$ otherwise.*

Proof. To show this, note first from equations (13) and (14) and Lemma (1) that $q_{j,r}^k > 0$ and $q_{j,s}^k > 0$ if $\psi_j^k > \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K}$. Since this must be true for at least one issue, it follows that $q_j^k > 0$ for at least one issue.

Second, since η is an increasing function, it follows from equation (11) that V_j is weakly decreasing in e_j^k if $q_j^k \leqslant 0$ and is strictly increasing in e_j^k if $q_j^k > 0$.

Then, it follows that, if $q_j^k \leqslant 0$ then there exists some $m \neq k$ such that $q_j^m > 0$, in which case V_j is decreasing in e_j^k and strictly increasing in e_j^m. Consequently, if $e_j^k > 0$ then a party's vote share can always be increased by reducing e_j^k and increasing e_j^m. Therefore it follows that the optimal choice of e_j^k must be zero if $q_j^k \leqslant 0$.

Finally, if $q_j^m > 0$ it must be that $e_j^k > 0$. This is because $\lim_{x \to 0} \eta'(x) = \infty$, and $\eta'(x) < \infty$ for $x > 0$. Therefore, if $e_j^k = 0$ then equation (11) implies that vote share can be increased by a small increase in e_j^k, reducing by a small amount, if necessary, the emphasis on some other issue m for which $e_j^m > 0$ to ensure that $\sum_n e_j^n \leqslant 1$ holds. Then, an optimal strategy must involve $e_j^k > 0$ in that case. $\square$

A.1 Proof of Proposition 1

To show this, we show that, for all parameter values, each party has a unique optimal strategy given by the conditions of Proposition 1. Then, since these conditions do not directly involve other parties' strategies, this implies that each party has a unique dominant strategy, and so existence and uniqueness of equilibrium follow immediately.

First we show that each party j has an optimal strategy. To show this, note that the vote share function is continuous and the choice set $\{e_j^k\}_1^K \in [0,1]^K$ is compact, so existence of an optimal strategy follows from the Weierstrass theorem.

It remains to show that each party's optimal strategy is unique and satisfies the conditions of Proposition 1. Note that Lemma 3 implies that this optimal strategy must involve $e_j^k > 0$ when $q_j^k > 0$ and $e_j^k = 0$ otherwise.

This implies that we can simplify Party j's optimization problem. Define the set $\mathcal{I} := \left\{k \in \{1, ..., K\} : q_j^k > 0\right\}$. Then, Party j's problem is equivalent to choosing $e_j^k > 0$ for all $k \in \mathcal{I}$ to maximize V_j subject to the constraints that $\sum_{k\in\mathcal{I}} e_j^k \leqslant 1$, and that $e_j^m = 0$ for all $m \notin \mathcal{I}$.

Since V_j is continuously differentiable with respect to each $e_j^k \in \mathcal{I}$ given $e_j^k > 0$, and since the constraints are all linear, it follows that a necessary solution to this optimization problem must satisfy the Kuhn-Tucker conditions. Furthermore, equation (11) implies that V_j is strictly concave in $\{e_j^k\}_{k\in\mathcal{I}}$ and so there will be at most one solution to the Kuhn-Tucker conditions, which is also sufficient for an optimum. Finally, since we showed above that a solution to the optimization problem exists, it follows that there must be exactly one solution to the Kuhn-Tucker conditions, and this uniquely characterizes the optimal strategy.

To find the Kuhn-Tucker conditions, form the Lagrangian $\mathcal{L} = V_j + \lambda_j(1 - \sum_k e_j^k)$. Taking the first order conditions and rearranging gives equations (15) and (16). Since $q_j^k \eta'(e_j^k) > 0$, (15) implies $\lambda_j > 0$.

A.2 Proof of Proposition 2

First, note that Lemma 1 implies that, for each j and k, $q_j^k > \hat{\pi}_k \left[1 - \gamma_2 - \frac{1-\gamma_1}{J} - \gamma_1\right]$, since $(1-\gamma_0)\tilde{\pi}_k > 0$. Then, since $\hat{\pi}_k > 0$, it follows that $q_j^k > 0$ for all k if $1 - \gamma_2 - \frac{1-\gamma_1}{J} - \gamma_1 > 0$. Since the left hand side of this inequality is decreasing in both γ_1 and γ_2, a sufficient condition for the inequality to be satisfied is: $1 - \max\{\gamma_0; \gamma_1; \gamma_2\} - \frac{1-\max\{\gamma_0;\gamma_1;\gamma_2\}}{J} - \max\{\gamma_0; \gamma_1; \gamma_2\} > 0$. Rearranging this, it follows that, if $\max\{\gamma_0; \gamma_1; \gamma_2\} < \frac{J-1}{2J-1}$, then $q_j^k > 0$ for all k and j, in which case Proposition 1 implies that $e_j^k > 0$ for all k and j.

It remains to show that parties only emphasize issues k for which $\psi_j^k > \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K}$ if (17) holds. For this, first we note that, if (17) holds, then $q_{j,r}^k - |q_{j,s}^k| < 0$ for all j and k. To show this, subtract (A.3) from (A.2) to obtain

$$q_{j,r}^k - |q_{j,s}^k| < \hat{\pi}_k \left[1 - \gamma_1\right] \frac{J-1}{J} - \left(\hat{\pi}_k \gamma_1 \left(\hat{\pi}_k - (1-\gamma_0)\tilde{\pi}_k\right) \min_k \min_j \left| \psi_j^k - \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K} \right| \right).$$

Since the right hand side is decreasing in both γ_1 and γ_2, and using the definition of $\hat{\pi}_k$ it follows that:

$$\begin{aligned} q_{j,r}^k - |q_{j,s}^k| <& \quad \hat{\pi}_k \left[\left[1 - \min\{\gamma_0; \gamma_1; \gamma_2\}\right] \frac{J-1}{J} - \frac{\min\{\gamma_0; \gamma_1; \gamma_2\}^2}{K} \left(\min_k \min_j \left| \psi_j^k - \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K} \right| \right) \right], \\ <& \quad \hat{\pi}_k \left[\left[1 - \min\{\gamma_0; \gamma_1; \gamma_2\}^2\right] \frac{J-1}{J} - \frac{\min\{\gamma_0; \gamma_1; \gamma_2\}^2}{K} \left(\min_k \min_j \left| \psi_j^k - \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K} \right| \right) \right]. \end{aligned}$$

Rearranging this, we obtain that equation (17) implies that $\left(q_{j,r}^k - |q_{j,s}^k| < 0\right)$.

Now, note that, if $\psi_j^k \leqslant \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K}$ then $q_{j,s}^k \leqslant 0$ according to (14) and so $q_j^k = q_{j,r}^k - |q_{j,s}^k|$. Then, since (17) implies that $q_{j,r}^k - |q_{j,s}^k| < 0$, it follows that, in that case, $q_j^k < 0$ for all k for which $\psi_j^k \leqslant \frac{\sum_{n=1}^K \tilde{\pi}_n \psi_j^n}{K}$. Proposition 1 then shows that parties put no emphasis on these issues in equilibrium.

A.3 Proof of Proposition 3

We claim, and will show below, that the λ_j^k that solves (16), given $e_j^k > 0$, is increasing in e_j^k and also increasing in each q_j^m, for $m \neq k$.

Suppose that this claim holds. Next, we show that a change in parameters or party positions that leads to a small (possibly zero) increase in q_j^k and a small (possibly zero) decrease in each q_j^m for $m \neq k$ leads to a small (possibly zero) increase in the optimal choice of e_j^k. To show this, note that it must hold if $e_j^k = 0$, since e_j^k cannot decrease in that case. If $e_j^k > 0$ (and therefore $q_j^k > 0$) then the first order condition is $q_j^k \eta'(e_j^k) - \lambda_j = 0$, and the left hand side of this is decreasing in e_j^k, since $\eta''(\cdot) < 0$ and λ_j is increasing in e_j^k. Then, a small increase in q_j^k and a small decrease in q_j^m for each $m \neq k$ leads, for given e_j^k, to a decrease in λ_j and an increase $q_j^k \eta'(e_j^k) - \lambda_j$. Then, for the first order condition to continue to hold, e_j^k must increase.

Then, the results of the proposition all follow directly from Lemma 2. For instance, Lemma 2 shows that $\frac{\partial q_j^k}{\partial \psi_j^k} > 0$ and $\frac{\partial q_j^m}{\partial \psi_j^k} < 0$ for $m \neq k$. Then, a small increase in ψ_j^k leads to a small increase in q_j^k and a small decrease in q_j^m for $m \neq k$. By the argument above, this increases e_j^k.

It remains to prove the claim above that the λ_j that solves (16), given $e_j^k > 0$, is increasing in e_j^k and also increasing in each q_j^m, for $m \neq k$. Note that since $\eta'(\cdot)$ is strictly decreasing, it follows that $\eta'^{-1}(\cdot)$ is strictly decreasing. Furthermore, $\eta'^{-1}(x) \geqslant 0$ for $x \geqslant 0$, since $\eta' \geqslant 0$. Implicitly differentiating (16) and rearranging then reveals that λ_j is increasing in e_j^k and increasing in q_j^m if $q_j^m > 0$ and $m \neq k$. Finally, suppose that $q_j^m = 0$. Then, a small increase in q_j^m can only increase the left hand side of (16), since $\eta'^{-1}(x) \geqslant 0$. Since η'^{-1} is decreasing, such an increase in q_j^m then necessitates an increase in λ_j for (16) to continue to hold.

A.4 Proof of Proposition 4

The proof is constructive. We choose z and find a corresponding $\pi^\star$ and $\gamma^\star$.

Suppose, first, that, for each $m \neq k$, $q_j^m = \alpha q_j^k > 0$, where $\alpha = \frac{\eta'(z)}{\eta'\left(\frac{1-z}{K-1}\right)} > 0$, where the inequality follows from the fact that $\eta'(x) > 0$ for all $x \in (0,1)$.

We show that, in this case, the optimal strategy would set $e_j^k = z$. To show this, note that (16) implies that $(K-1)\eta'^{-1}\left(\frac{\lambda_j}{\alpha q_j^k}\right) = 1 - e_j^k$. Rearranging this and substituting in to (15) we obtain $q_j^k \eta'(e^k) = \alpha q_j^k \eta'\left(\frac{1-e_j^k}{K-1}\right)$. Comparing this with the expression above, we see that the solution is $e_j^k = 0$.

Now, during the proof of Proposition 3, it was shown that a decrease in q_j^m, for $m \neq k$, all else equal, increases the optimal choice e_j^k. Then, it follows that if, for all $m \neq k$, $q_j^m \leqslant \alpha q_j^k$, then $e_j^k \geqslant z$.

Then, to complete the proof, we show that for any $\alpha > 0$, there exist $\pi^\star \in (0,1)$ and $\gamma^\star \in (0,1)$ such that, if $\tilde{\pi}_k > \pi^\star$ and $\max\{\gamma_0; \gamma_1; \gamma_2\} < \gamma^\star$, then $q_j^k > 0$ and $\frac{\max_{m \neq k} q_j^m}{q_j^k} < \alpha$.

Now, (A.1) and (A.4) imply that $q_j^k > 0$ as long as:

$$1 - \frac{(\gamma_0 \tilde{\pi}_k)\gamma_1}{1 - \gamma_2 - \frac{1-\gamma_1}{J}} > 0, \tag{A.6}$$

where we use that our assumptions on γ_1, γ_2 imply that $1 - \gamma_2 - \frac{1-\gamma_1}{J} > 0$.

Furthermore, since $\sum_{n=1}^{K} \hat{\pi}_n = 1$, (A.1) and (A.4) imply that:

$$\frac{\max_{m \neq k} q_j^m}{q_j^k} < \frac{(1 - \hat{\pi}^k)\left[1 - \frac{1-\gamma_1}{J} + \gamma_2\right] J \cdot K}{\hat{\pi}_k \left[1 - \gamma_2 - \frac{1-\gamma_1}{J} - (\gamma_0 \tilde{\pi}_k)\gamma_1\right]}$$

which rearranges to:

$$\frac{\max_{m \neq k} q_j^m}{q_j^k} < \left(\frac{1 - \hat{\pi}_k}{\hat{\pi}_k}\right)\left(\frac{(1-\gamma_1)\frac{J-1}{J} + \gamma_1 + \gamma_2}{(1 - \gamma_2 - \frac{1-\gamma_1}{J})}\right)\left(\frac{J \cdot K}{1 - \frac{(\gamma_0 \tilde{\pi}_k)\gamma_1}{1-\gamma_2-\frac{1-\gamma_1}{J}}}\right). \tag{A.7}$$

Now, we find values of $\max\{\gamma_0; \gamma_1; \gamma_2\}$ and $\tilde{\pi}_k$ to guarantee that the following conditions hold:

$$1-\frac{(\gamma_0\tilde{\pi}_k)\gamma_1}{1-\gamma_2-\frac{1-\gamma_1}{J}}>\frac{1}{2}, \tag{A.8}$$

$$\frac{(1-\gamma_1)\frac{J-1}{J}+\gamma_1+\gamma_2}{(1-\gamma_2-\frac{1-\gamma_1}{J})}<2, \tag{A.9}$$

$$\left(\frac{1-\hat{\pi}_k}{\hat{\pi}_k}\right)J\cdot K<\frac{\alpha}{4}. \tag{A.10}$$

Then, (A.6) and (A.7) imply that, as long as these three conditions hold, we have that $q_j^k>0$ and $\frac{\max_{m\neq k}q_j^m}{q_j^k}<\alpha$, as desired. (A.8) and (A.9) rearrange to:

$$1-\gamma_2-\frac{1-\gamma_1}{J}>2\gamma_1\gamma_0\tilde{\pi}_k,$$

and

$$1-\gamma_2-\frac{1-\gamma_1}{J}>2\gamma_2.$$

Since the right hand side of both these inequalities is increasing in γ terms, $\gamma_1\in(0,1)$, and $\tilde{\pi}_k<1$, it follows that (A.8) and (A.9) will both be satisfied if $1-\gamma_2-\frac{1}{J}>2\max\{\gamma_0;\gamma_1;\gamma_2\}$, which in turn is satisfied if:

$$\max\{\gamma_0;\gamma_1;\gamma_2\}<\frac{J-1}{3J}. \tag{A.11}$$

Rearranging (A.10) and using that $\hat{\pi}_k>(1-\gamma_0)\tilde{\pi}_k$ by definition, we obtain that (A.10) holds if:

$$(1-\gamma_0)\tilde{\pi}_k>\frac{1}{1+\frac{\alpha}{4J\cdot K}}$$

As such, it follows that (A.8)-(A.10) all hold provided:

$$\tilde{\pi}_k > \sqrt{\frac{1}{1+\frac{\alpha}{4J\cdot K}}} = \pi^\star \in (0,1),$$

$$\max\{\gamma_0;\gamma_1;\gamma_2\} < \min\left\{1-\sqrt{\frac{1}{1+\frac{\alpha}{4J\cdot K}}}; \frac{J-1}{3J}\right\} = \gamma^\star \in (0,1).$$

Appendix B Campaigns with Imprecise Messages

First we outline the assumptions and broad implications of the incomplete campaigns model, before discussing the assumptions in details in Section B.1 and deriving the results in Section B.3.

In the imprecise campaigns model, we allow parties to have two dimensions of choice on each issue: party j can choose its emphasis on each issue, given by $\{e_j^k\}_{k=1}^K$, and can also choose the precision of its messaging on each issue, which we denote by $\{P_j^k\}_{k=1}^K$, where $P_j^k \in [0,1]$ for each j and k. If $P_j^k = 1$, the party communicates a very precise position on issue k, whereas if $P_j^k = 0$, the party is maximally vague about its position on issue k. Precision and emphasis are distinct choices – a high value of e_j^k could coincide with a high or low value of P_j^k. For instance, a party may campaign very actively on an issue while remaining very vague about its position on that issue (high e_j^k, low P_j^k). Likewise, it is possible for a party to make almost no reference to an issue on its campaign, despite stating a precise position on the issue in its manifesto (low e_j^k, high P_j^k).

In the imprecise campaigns model, we assume that the choice of P_j^k involves a trade-off. First, if parties' campaign messages are less precise, this increases the likelihood that voters will remain completely uncertain about the party's position on the issue important to them, which is electorally costly as voters are ambiguity averse. As such, there is also a revelation incentive for parties to communicate precise positions on issues that they campaign on: imprecise messages are less likely to reveal a party's issue position to voters. However, as is well-documented, there are also electoral benefits associated with imprecision: by communicating imprecisely, parties can mislead voters about their true position; they are also able to communicate slightly different positions to different voters. Consistent with empirical evidence that voters often optimistically perceive 'broadly appealing' parties as ideologically proximate to themselves (Tomz and Houweling 2009; Somer-Topcu 2015), we suggest that sending imprecise messages may allow parties to attract and retain ideologically distinct voters who misperceive the party's policy stances. This enables the party to appeal to voters who would be repelled if they were made aware of the party's true position. We call this the 'projection incentive': by sending imprecise campaign messages, a party can project different positions to voters from the position it actually holds.

In Section B.3 below, we show that the trade-off between the revelation incentive and projection incentive leads parties to choose $P_j^k \in (0,1)$ on any issue on which they choose $e_j^k > 0$, provided that the distribution F of voter preferences has full support. Moreover, we show that all our results for equilibrium party emphasis strategies from Propositions 1-4 from our baseline model continue to hold in the imprecise campaigns model provided γ_1 and γ_2 are not too high. As such, the main qualitative results for party emphasis strategy from our main model are robust to allowing parties to be imprecise in their messaging.

B.1 Assumptions in Detail

As before, we assume that party positions are exogenous and given by $\theta \in \Theta \equiv (\underline{\theta}, \overline{\theta})^{JK}$, and that these positions represent the policies that parties would implement if elected. However, we now allow for the possibility that parties can send imprecise campaign messages in order to mislead voters about their true positions. Each party j now gets to make a choice of $\{e_j^k\}_{k=1}^K$ and also a choice of $\{P_j^k\}_{k=1}^K$. For each k, parties are free to choose any $P_j^k \in [0,1]$.[22]

Voter ideal points are given according to the distribution F, as in the baseline model. For the model with imprecise campaign messages, we also assume that $f(x) > 0$ for all $x \in (\underline{\theta}, \overline{\theta})^{JK}$.

In this extension, the assumptions about voter information differ from the baseline model in two ways. First, we assume that, even if a voter witnesses a party's campaign, she may not comprehend it if the party's messages are too imprecise. Specifically, if a voter witnesses a campaign on an issue, she comprehends the party's campaign messages with probability $C(P_j^k)$, where $C : [0,1] \to [\underline{C}, \overline{C}] \subset (0,1)$ is a twice continuously differentiable function satisfying $C'(1) = 0$, $C'(P_j^k) > 0$ and $C''(P_j^k) < 0$ for all $P_j^k \in [0,1)$. If a voter does not comprehend a campaign, it is as if she did not witness the campaign in which case, as before, we assume that the voter observes a position for all parties on the issue to which she is oriented with probability γ_1 and a position for no party with probability $1-\gamma_1$. If a voter does comprehend a campaign, then, also as before, she observes a position for that party on that issue with probability 1 and a position for the other parties with probability γ_2.

The second way the assumptions about voter information differ from the baseline model is that, even if a voter observes a position for a party, she might unknowingly observe the wrong position for that party. In particular, we assume that if a voter witnesses and comprehends party j's campaign, then, as mentioned above, she observes a position for party j with probability 1. However, we now assume that the position she observes is party j's true position on issue k with probability $1 - \mathcal{M}(P_j^k)$, and a misleading 'projected' position given by $\Omega(\theta_j^k, x_j^k)$ with probability $\mathcal{M}(P_j^k)$, where x_j^k is the voter's position, and Ω and $\mathcal{M}$ are functions which we now define: Ω determines the

22. Parties do not face a budget constraint when choosing $\{P_j^k\}_{k=1}^K$. (that is, there is no constraint along the lines of $\sum_k P_j^k \leqslant 1$), as it is assumed that precise messages are no more costly in resources or time to send than imprecise messages.

(misleading) projected position that a voter might see, and $\mathcal{M}$ determines the probability that the voter might see a projected position.

We assume that $\mathcal{M} : [0,1] \to [\underline{\mathcal{M}}, \overline{\mathcal{M}}] \subset (0,1)$ is a twice continuously differentiable function satisfying $\mathcal{M}'(0) = 0$, and $\mathcal{M}'(P_j^k) < 0$, $\mathcal{M}''(P_j^k) < 0$, for $P_j^k \in (0,1]$. This captures the idea that, the more imprecise the party's campaign messages, the more likely voters are to see a projected position rather than the party's true position. Voters do not know whether they have observed the party's true position or a projected position.

We assume that $\Omega : (\underline{\theta}, \overline{\theta})^2 \to (\underline{\theta}, \overline{\theta})$ is a continuously differentiable function and that, for each $x \in (\underline{\theta}, \overline{\theta})$: $\Omega(x,x) = x$; $\lim_{y \to \underline{\theta}} \Omega(y,x) = \underline{\theta}$; $\lim_{y \to \overline{\theta}} \Omega(y,x) = \overline{\theta}$, $\frac{\partial}{\partial y}\Omega(y,x) > 0$, and $\frac{\partial}{\partial x}\Omega(y,x) \in (0,1)$. It is straightforward to show that these assumptions imply that $\Omega(\theta_j^k, x_j^k)$ will always be between θ_j^k and x_j^k. Thus, a party is able to project a position somewhere in between its true position and the voter's position.

If a voter does not witness or does not comprehend party j's campaign, but the voter does observe a position for party j, we assume that, with probability $1 - \underline{\mathcal{M}}$, the position she observes is party j's true position, and, with probability, $\underline{\mathcal{M}}$ the position she observes is the projected position $\Omega(\theta_j^k, x_j^k)$.

In the case of the imprecise messages model, we restrict attention to the case where $(1 - \gamma_1)\left(\frac{J-1}{J}\right) > \gamma_2$ and $\frac{1}{J \cdot K} < \frac{\underline{C}}{\overline{C}}$. Almost all results hold without these conditions, but they simplify the proofs.

Apart from these differences, we hold all other assumptions unchanged from the baseline model. That is, voters are ambiguity averse, $\delta = 0$ (so voters see positions on at most one issue), and parties choose their levels of issue emphasis and message precision in order to maximize their vote share.

B.2 Vote Choice

Voter decisions in this imprecise messages model are the same as in the baseline model, except that voters may see parties' projected positions rather than their true positions. A voter who sees a position $\hat{\theta}_j^k$ by a party j will consider the possibility that this is the party's projected rather than true position, and will therefore consider what the party j's true position must be, if j's projected position is $\hat{\theta}_j^k$. Therefore, define $\hat{\Omega}(\hat{\theta}_j^k, x_i^k)$ as the true position on issue k that party j must have if the projected position seen by voter i is $\hat{\theta}_j^k$. That is, if, for some (θ_j^k, x_i^k), $\Omega(\theta_j^k, x_i^k) = \hat{\theta}_j^k$, then $\hat{\Omega}(\hat{\theta}_j^k, x_i^k) = \theta_j^k$. Our assumptions on the function Ω in Section B.1 imply that $\hat{\Omega} : (\underline{\theta}, \overline{\theta})^2 \to (\underline{\theta}, \overline{\theta})$ is a continuously differentiable function, and that $|\hat{\Omega}(y,x) - x| > |y - x|$.[23] .

If a voter i sees the party position $\hat{\theta}_j^k$, then the voter does not know if the true position is $\hat{\theta}_j^k$ or $\hat{\Omega}(\hat{\theta}_j^k, x_i^k)$. Since voters are ambiguity averse and $|\hat{\Omega}(\hat{\theta}_j^k, x_i^k) - x_i^k| > |\hat{\theta}_j^k - x_i^k|$, the voter who sees $\hat{\theta}_j^k$ will always act on the assumption that the party's true position is $\hat{\Omega}(\hat{\theta}_j^k, x_i^k)$, since this is the worst case scenario. Therefore a voter i who see positions for all parties on issue k will vote for the party j for which $|\hat{\Omega}(\hat{\theta}_j^k, x_i^k) - x_i^k|$ is smallest.

As before, if a voter sees no position for a party on the issue she cares about, then she acts on the worst case scenario that the party's distance from her is $\sup_{\theta \in \Theta} |\theta - x_i^k|$. Since this is always greater than $\hat{\Omega}(\theta_j^k, x_i^k)$, for any θ_j^k, it follows that if a voter sees a (possibly projected) position for only one party, then she always votes for that party.

Finally, as in the baseline model, when voters see no party's position on an issue, they vote for each party with probability $\frac{1}{J}$. It follows from this discussion that the vote share

23. To show this, choose any $x \in (\underline{\theta}, \overline{\theta})$ and let $h(\theta)$ denote $\Omega(\theta, x)$. Our assumptions on Ω immediately imply that $h : (\underline{\theta}, \overline{\theta}) \to (\underline{\theta}, \overline{\theta})$ is continuously differentiable and strictly monotone and therefore invertible. The inverse $h^{-1}(\theta)$ is, by definition the same as $\hat{\Omega}(\theta, x)$, so $\hat{\Omega}(\theta, x)$ must be, for each x, real valued and continuously differentiable in θ. The argument that $\hat{\Omega}$ is continuously differentiable in x is similar. That $|\hat{\Omega}(y,x) - x| > |y - x|$ follows from the fact that $\Omega(y,x)$ always lies between y and x.

of party j is given by the following expression:

$$V_j = \sum_{k=1}^{K} \left[\frac{\rho_0^k}{J} + \rho_j^k + \rho_{A,0}^k \psi_j^k + \sum_{m=1}^{J} \left(\rho_{A,P_m}^k \psi_{j,P_m}^k + \rho_{A,NP_m}^k \psi_{j,NP_m}^k \right) \right]. \tag{B.1}$$

Here, ρ_0^k is the proportion of voters who are k-oriented and see no positions on any issue, ρ_j^k is the proportion of voters who only observe a position for party j on issue k. $\rho_{A,0}^k$ is the proportion of voters who witness no parties' campaigns, but observe a (possibly projected) position for each party on issue k – it is a projected position for a party with probability $\underline{\mathcal{M}}$. ψ_j^k is now defined as the proportion of such voters, who witness no campaigns but see (possibly projected) party positions on k, who vote for party j. ρ_{A,P_m}^k is the proportion of voters who witness party m's campaign on issue k, and observe a projected position for party m and a (possibly projected) position for each other party. ψ_{j,P_m}^k is the proportion of such voters who vote for party j. Finally, ρ_{A,NP_m}^k is the proportion of voters who witness party m's campaign on issue k, and observe the true position of party m and a (possibly projected) position for each other party. ψ_{j,NP_m}^k is the proportion of such voters who vote for party j.

Our assumptions imply that the formulae for the ρ terms in the vote share function are as follows:

$$\rho_0^k = \tilde{\pi}_k \left[1 - \sum_j (1-\gamma_0)\eta_j^k C(P_j^k) - \sum_m \sum_j \left(\frac{\gamma_0}{K}\right) \eta_j^m C(P_j^m) \right] (1-\gamma_1), \tag{B.2}$$

$$\rho_j^k = \hat{\pi}_k \eta_j^k C(P_j^k)(1-\gamma_2), \tag{B.3}$$

$$\rho_{A,0}^k = \rho_0^k \left(\frac{\gamma_1}{1-\gamma_1} \right), \tag{B.4}$$

$$\rho_{A,P_m}^k = \rho_m^k \left(\frac{\gamma_2}{1-\gamma_2} \right) \mathcal{M}(P_m^k), \tag{B.5}$$

$$\rho_{A,NP_m}^k = \rho_m^k \left(\frac{\gamma_2}{1-\gamma_2} \right) (1 - \mathcal{M}(P_m^k)). \tag{B.6}$$

We now provide a formula for the ψ terms in the vote share function. To this end, let

$\mathcal{B}$ denote the power set of $\{1, 2, ...J\}$ and let $B \in \mathcal{B}$ denote a member of this set. Let $\psi^k_{j,B}$ denote the vote share of party j if all the parties in B show a projected position, and the parties not in B do not. Let $|B|$ denote the cardinality of B.

Then, our assumptions imply that, for any $j, m \in \{1, ..., J\}$ and $B \in \mathcal{B}$:

$$
\begin{aligned}
\psi^k_{j,B} = &\mathbf{1}\Big\{ j \in B \Big\}... \\
&\times \int_{\underline{\theta}}^{\overline{\theta}} \left[\mathbf{1}\Big\{ |\theta^k_j - x| \leqslant \min_{m \in B} |\theta^k_m - x| \Big\} \mathbf{1}\Big\{ |\theta^k_j - x| \leqslant \min_{m \notin B} |\hat{\Omega}(\theta^k_m, x) - x| \Big\} \right] f^k(x^k_i) \ \partial x^k_i \\
&+ \mathbf{1}\Big\{ j \notin B \Big\} \int_{\underline{\theta}}^{\overline{\theta}} \left[\mathbf{1}\Big\{ |\hat{\Omega}(\theta^k_j, x) - x| \leqslant \min_{m \in B} |\theta^k_m - x| \Big\} ... \right. \\
&\left. \times \mathbf{1}\Big\{ |\hat{\Omega}(\theta^k_j, x) - x| \leqslant \min_{m \notin B} |\hat{\Omega}(\theta^k_m, x) - x| \Big\} \right] f^k(x^k_i) \ \partial x^k_i,
\end{aligned}
$$

$$
\begin{aligned}
\psi^k_{j,P_m} &= \sum_{b \in \mathcal{B}} \mathbf{1}\{m \in b\} \underline{\mathcal{M}}^{|b|-1} (1 - \underline{\mathcal{M}}^{J-|b|}) \psi^k_{j,b}, \\
\psi^k_{j,NP_m} &= \sum_{b \in \lfloor} \mathbf{1}\{m \notin b\} \underline{\mathcal{M}}^{|b|-1} (1 - \underline{\mathcal{M}}^{J-|b|}) \psi^k_{j,b}, \\
\psi^k_{j,0} &= \underline{\mathcal{M}} \psi^k_{j,P_m} + (1 - \underline{\mathcal{M}}) \psi^k_{j,NP_m}.
\end{aligned}
$$

B.3 Equilibrium Party Strategies

We now show, in Propositions 5-6 below, that all results from the baseline model carry through almost unchanged to the imprecise messages model.

The following two lemmas are useful in the proofs of these propositions:

Lemma 4. *For all parameter values, and any $j \in \{1, ..., J\}$ and $k \in \{1, ..., K\}$, it holds that $\psi^k_{j,P_j} > \psi^k_{j,NP}$.*

Proof. To show this, we claim that, for a set $\mathcal{B}$ with $j \notin \mathcal{B}$, $\psi_{j,\{j \cup \mathcal{B}\}} > \psi_{j,\mathcal{B}}$. Given this, that $\psi^k_{j,P_j} > \psi^k_{j,NP}$ then follows from the definitions of ψ^k_{j,P_j} and $\psi^k_{j,NP}$. We prove this claim for the set $\mathcal{B} = \{1, ..., j-1, j+1, ...J\}$. The argument for other $\mathcal{B}$ is similar. Given the definition of $\psi_{j,B}$, and the continuity and full support of F, the result follows if the following two conditions hold.

(i) $\forall x \in (\underline{\theta}, \overline{\theta})$, $\big(|\theta_j^k - x| \leqslant \min_{m\neq j} |\theta_m^k - x|\big) \Rightarrow \Big(|\hat{\Omega}(\theta_j^k, x) - x| \leqslant \min_{\neq j} |\theta_m^k - x|\Big)$.

(ii) $\exists x \in (\underline{\theta}, \overline{\theta})$ s.t. $|\hat{\Omega}(\theta_j^k, x) - x| > \min_{m\neq j} |\theta_m^k - x|$ and $|\theta_j^k - x| \leqslant \min_{m\neq j} |\theta_m^k - x|$.

Condition (i) follows immediately since $|\hat{\Omega}(\theta_j^k, x) - x| > |\theta_j^k - x|$. To show (ii), consider a party m, such that there is no party r for which θ_j^r is in the convex hull of θ_j^k and θ_j^m (i.e. there is no r that stands between m and j on issue k). Consider a voter i, such that x_i^k is the midpoint of θ_m^k and θ_j^k on k. For this voter, it follows that $|\hat{\Omega}(\theta_j^k, x) - x| > \min_{m\neq j} |\theta_m^k - x|$ and $|\theta_j^k - x| \leqslant \min_{m\neq j} |\theta_m^k - x|$. $\square$

The next lemma defines q_j^k for the model with imprecise messages. This has an additional term $q_{j,p}^k$ which represents a 'projection incentive' for parties to emphasize an issue to project a false position. However, q_j^k still satisfies similar properties to before, as shown in the lemma. In the imprecise messages model, the comparative statics of q_j^k with respect to changes in ψ_j^k is slightly complicated by the fact that the relevant measure of the popularity of party j's position is variously ψ_{j,P_j}^k, ψ_j^k or ψ_{j,NP_j}^k, depending on whether voters observe true or projected party positions. Therefore, to study comparative statics, we assume that $\psi_{j,P_j}^k = \psi_j^k + \varphi_j^k$ for some $\varphi_j^k > 0$ (which implies that $\psi_j^k = \psi_{j,NP_j}^k + \frac{\mathcal{M}\varphi_j^k}{1-\mathcal{M}}$). We study the effects on q_j^k of varying ψ_j^k while holding constant φ_j^k.

Lemma 5. *Fix φ_j^k and suppose that $\psi_{j,P_j}^k = \psi_j^k + \varphi_j^k$. Define q_j^k as:*

$$q_j^k := [q_{j,r}^k + q_{j,s}^k + q_{j,p}^k(\mathcal{M}(P_j^k) - \underline{\mathcal{M}})]\frac{C(P_j^k)}{\underline{C}}, \tag{B.7}$$

where $q_{j,r}^k$ and $q_{j,s}^k$ are defined as in (13) *and* (14)*, and $q_{j,p}^k$ is defined as:*

$$q_{j,p}^k := \hat{\pi}_k \gamma_2 (\psi_{j,P_j}^k - \psi_{j,NP_j}^k) = \frac{\hat{\pi}_k \gamma_2 \varphi_j^k}{1 - \underline{\mathcal{M}}}$$

with $\hat{\pi}_k$ defined as before. Then e_j^k, $\hat{\pi}_k$, q_j^k, $q_{j,s}^k$ and $q_{j,r}^k$ satisfy the properties in Lemma 1, and $q_j^k > 0$, $q_{j,p}^k > 0$ for all j and k. If $\frac{\partial q_j^k}{\partial P_j^k} = 0$ then q_j^k also satisfies Lemma 2.

Proof. That $\hat{\pi}_k$, $q_{j,r}^k$ and $q_{j,s}^k$ continue to satisfy the properties of Lemma 1 is immediate, because these are defined as before so the argument in the proof of Lemma 1 goes through unchanged. Using that $q_{j,r}^k + |q_{j,s}^k| \geqslant q_{j,r}^k + q_{j,s}^k \geqslant q_{j,r}^k - |q_{j,s}^k|$ and then substituting in (A.2) and (A.3) and using that $(\gamma_0\tilde{\pi})\gamma_1 < \gamma_1$ implies that:

$$\hat{\pi}_k\left[1 - \frac{1-\gamma_1}{J}\right] > q_{j,r}^k + q_{j,s}^k > \hat{\pi}_k\left[1 - \gamma_2 - \frac{1-\gamma_1}{J} - (\gamma_0\tilde{\pi}_k)\gamma_1\right]. \tag{B.8}$$

Now, Lemma 4, along with the fact that $\psi_{j,P_j}^k \in [0,1]$ and $\psi_{j,NP_j}^k \in [0,1]$ implies that $1 \geqslant \psi_{j,P_j}^k - \psi_{j,NP_j}^k > 0$. Then, the definition of $q_{j,p}^k$ above immediately implies that $\hat{\pi}_k\gamma_2 \geqslant q_{j,p}^k > 0$. Substituting this into (B.8), and using that $J \cdot K \geqslant \frac{\overline{C}}{\underline{C}} \geqslant \frac{C(P_j^k)}{\underline{C}} \geqslant 1$, we obtain (A.4). That $q_j^k > 0$ follows from (A.4) and the fact that, in the imprecise messaging model, we assume that $1 - \gamma_2 - \frac{1-\gamma_1}{J} - \gamma_1 > 0$.

It remains to show that the newly defined q_j^k still satisfies Lemma 2. The argument of that lemma implies that those comparative static results hold for $q_{j,r}^k + q_{j,s}^k$, since this was q_j^k. Since $\frac{\partial q_j^k}{\partial P_j^k} = 0$, it remains only to show that $q_{j,p}^k$ satisfies the same comparative statics, in which case they hold for $q_j^k = q_{j,r}^k + q_{j,r}^k + q_{j,p}^k$. Using the definition of $q_{j,p}^k$ above and differentiating, holding constant φ_j^k, it follows immediately that $\frac{\partial q_{j,p}^k}{\partial \psi_j^k} = 0$, $\frac{\partial q_{j,p}^m}{\partial \psi_j^k} = 0$, $\frac{\partial q_{j,p}^k}{\partial \tilde{\pi}_k} - \frac{\partial q_{j,p}^k}{\partial \tilde{\pi}_n} = \frac{\partial q_{j,p}^k}{\partial \tilde{\pi}_j^k} = \frac{q_{j,p}^k}{\tilde{\pi}_k} \geqslant 0$ and $\frac{\partial q_{j,p}^m}{\partial \tilde{\pi}_k} - \frac{\partial q_{j,p}^m}{\partial \tilde{\pi}_n} = 0$. □

Now, we show that the equilibrium of the model looks similar to the baseline model, except with the new value of q_j^k.

Proposition 5. *There exists a unique equilibrium for all parameter values. The equilibrium choices of $\{e_j^k\}_{j=1,k=1}^{J,K}$ solve the first order condition (15) as in the baseline model, where λ_j and q_j^k satisfy (16) and(B.7). Equilibrium choices of $\{P_j^k\}_{j=1,k=1}^{J,K}$ satisfy $P_j^k \in$*

$(0,1)$, *$\forall k, j$ and solve the first order conditions:*

$$\frac{\partial q_j^k}{\partial P_j^k} = 0. \tag{B.9}$$

Proof. Substitute (B.2)-(B.6) terms into (B.1) and simplify. We obtain that V_j satisfies

$$V_j = \text{terms that don't depend on j's strategy} + \sum_{k=1}^{K} \underline{C} q_j^k \eta(e_j^k), \tag{B.10}$$

which is almost the same as (11).

Then, we argue that each party has a unique optimal choice of $\{e_j^k\}_{k=1}^K$, for given party positions and given choices of $\{P_j^k\}_{k=1}^K$, and that these choices solve (15) and (16). For given choices of $\{P_j^k\}_{k=1}^K$, the values of $\{q_j^k\}$ are given, for each k. The proof for this is essentially identical to the proofs of Lemma 3 and Proposition 1 – since the vote share function is almost identical to (11), the argument of Lemma 3 goes through virtually unchanged and, using this, the proof of Proposition 1 shows that each party has a unique optimal e_j^k unique optimal choice of $\{e_j^k\}_{k=1}^K$, for given party positions and given choices of $\{P_j^k\}_{k=1}^K$.

Then, to prove the Proposition, it remains to show that, for given party positions, each party has a unique optimal choice of $\{P_j^k\}_{j=1,k=1}^{J,K}$ that satisfy $P_j^k \in (0,1)$, $\forall k, j$ and solve (B.9).

To show that the unique optimal choices of $\{P_j^k\}_{j=1,k=1}^{J,K}$ solve (B.9), note that $q_j^k > 0$ for all j and k, as shown in Lemma 5. Then, equation (B.10) and (B.7) imply that V_j is continuously differentiable and jointly strictly concave in $\{e_j^k\}_{k=1}^K$ and $\{P_j^k\}_{j=1,k=1}^{J,K}$. Then, the Kuhn Tucker conditions are sufficient to characterize a unique optimal strategy. The argument of Proposition 1 implies that there exist $\{e_j^k\}_{k=1}^K$ that solve the Kuhn Tucker conditions, which are given by the solution to (15) and (16). It is immediate that, for $P_j^k \in (0,1)$, the Kuhn Tucker first order condition for P_j^k is (B.9). Then, it remains only to show that there exists, for each k and j, a value of $P_j^k \in (0,1)$ that solves this condition.

To show this, differentiate (B.7) with respect to e_j^k and substitute into (B.9). We obtain:

$$C'(P_j^k)(q_{j,r}^k + q_{j,s}^k + q_{j,p}^k(\mathcal{M}(P_j^k)) - \mathcal{M}_0) + C(P_j^k)\mathcal{M}'(P_j^k)q_{j,p}^k = 0 \tag{B.11}$$

It remains to show that (B.11) has a solution $P_j^k \in (0,1)$. We show that the left hand side of (B.11) is strictly decreasing in P_j^k, that it is positive at $P_j^k = 0$ and that it is negative at $P_j^k = 1$. Then, by the intermediate value theorem there exists a solution $P_j^k \in (0,1)$.

First we show that the left hand side of (B.11) is strictly decreasing in P_j^k. The derivative of the left hand side with respect to P_j^k is $C''(P_j^k)q_j^k + 2C'(P_j^k)\mathcal{M}'(P_j^k)q_{j,p}^k + C(P_j^k)\mathcal{M}''(P_j^k)q_{j,p}^k$. This is negative for all $P_j^k \in (0,1)$, since $q_j^k > 0$, $q_{j,p}^k > 0$, $C'' < 0$, ,$C' > 0$, $\mathcal{M}' > 0$, and $\mathcal{M}'' < 0$. To show that the left hand side of (B.11) is positive at $P_j^k = 0$, note that $q_{j,r}^k + q_{j,s}^k + q_{j,p}^k(\mathcal{M}(P_j^k)) - \mathcal{M}_0 = q_j^k > 0$, $C'(0) > 0$, and $\mathcal{M}'(0) = 0$. To show that the left hand side of (B.11) is negative at $P_j^k = 1$, note that $C'(1) = 0$, $C(1) > 0$, $q_{j,p}^k > 0$ and $\mathcal{M}'(1) < 0$. □

We now establish that our qualitative predictions from the baseline model generalize to the imprecise messages model. As in Lemma 5, when studying comparative statics, we assume $\psi_{j,P_j}^k = \psi_j^k + \varphi_j^k$ and study the effects of varying ψ_j^k while holding constant φ_j^k.

Proposition 6. *Fix φ_j^k and suppose that $\psi_{j,P_j}^k = \psi_j^k + \varphi_j^k$. Then the results of Propositions 2,3 and 4 continue to hold in the imprecise messages model.*

Proof. The arguments of the proofs of 3 and 4 go through unchanged, since the first order condition is the same as before, and q_j^k still satisfies the properties of Lemma 1. This follows from Lemma 5, since (B.9) is satisfied in equilibrium.

The argument of the proof of 2 goes through unchanged except that, since we now assume $(1-\gamma_1)\left(\frac{J-1}{J}\right) > \gamma_2$, it follows from simple rearrangement, using $\psi_j^k \in [0,1]$ and

$\gamma_2 \geqslant \gamma_1$, that condition (17) cannot ever be satisfied, so it is unnecessary to show that parties place zero emphasis on low ψ_j^k issues in that case. □

Appendix C If Voters Maximize Expected Utility

We now discuss the assumptions of the model with voters that maximize expected utility (instead of being ambiguity averse). This is completely identical to the baseline model discussed in the main text with two exceptions. The first exception is that we specify that nature chooses each party's position on each issue k at the start of play according to the cumulative distribution function G, so that, for $\theta, \tilde{\theta} \in \Theta$, $\text{Prob}(\theta \leqslant \tilde{\theta}) = G(\tilde{\theta})$. We assume that G is symmetrical across parties, so that $G(\theta_1, \theta_2, ...) = G(\theta_2, \theta_1, ...)$. The function G is common knowledge across parties and voters.

The second exception is that we assume that voters are expected utility maximizing rather than ambiguity averse. Our assumptions about the probabilities of voters witnessing campaigns and observing party positions are identical to the baseline model in the main text. In this section of the appendix, we retain the assumption that $\delta = 0$, as in the main text.[24]

Then, under our assumptions, a voter who observes only party j's position on issue k votes for party j if and only if:

$$U(|x_i^k - \theta_j^k|) \geqslant \int_{\{\tilde{\theta} \in \Theta : \tilde{\theta}_j^k = \theta_j^k\}} \max_{m \neq j} U(|x_i^k - \theta_m^k|) d\mu_i(\tilde{\theta}|\theta_j^k),$$

where

$$\mu_i(\tilde{\theta}|\theta_j^k) = \text{Prob}(\theta \leqslant \tilde{\theta}|\text{Voter } i \text{ observes only } \theta_j^k). \tag{C.1}$$

24. In Appendix D we instead relax the assumption that $\delta = 0$ while retaining the assumption of amibiguity averse voters. For reasons of simplicity we do not study a model with both expected utility maximizing voters and $\delta > 0$.

To characterize μ_i, consider an issue k-oriented voter and apply Bayes's rule to equation (C.1), to obtain:

$$\mu_i(\hat{\theta}|\theta_j^k) = \frac{\int_{\{\tilde{\theta}\in\Theta:\tilde{\theta}_j^k=\theta_j^k,\tilde{\theta}\leqslant\hat{\theta}\}} \rho_j^k(\tilde{\theta})dG(\tilde{\theta})}{\int_{\{\tilde{\theta}\in\Theta:\tilde{\theta}_j^k=\theta_j^k\}} \rho_j^k(\tilde{\theta})dG(\tilde{\theta})}, \tag{C.2}$$

where $\rho_j^k(\tilde{\theta})$ denotes the equilibrium value of ρ_j^k given party positions $\tilde{\theta}$. Since equation (C.2) applies equally to any voter i who observes only one party's position, it follows that $\mu_i(\tilde{\theta}|\theta_j^k)$ is the same for all i and so we henceforth omit the i subscript.

For each j and k, we let ϕ_j^k denote the proportion of the voters who only observed party j's position on issue k that choose to vote for party j. Unlike under ambiguity aversion, $\phi_j^k \in (0,1)$ will be typical. ϕ_j^l is given by:

$$\phi_j^X = \int_{x\in\Theta} \mathbf{1}\left\{U(|x_i^k-\theta_j^k|) \geqslant \int_{\{\tilde{\theta}\in\Theta:\tilde{\theta}_j^k=\theta_j^k\}} \max_{m\neq j} U(|x_i^k-\theta_m^k|)d\mu_i(\tilde{\theta}|\theta_j^k)\right\} f_X(x_i)\partial x_i \tag{C.3}$$

Voters who observe all parties' positions behave in exactly the same way as in the baseline model. Also, similar to before, we assume that voters who obtain the same expected utility from voting for multiple parties will vote for each of these parties with equal probability. Therefore, a voter who observes no party positions votes for each party with probability $\frac{1}{J}$, and fraction $1-\phi_j^k$ of the voters who observed only party j's position on issue k will instead vote for each other party with probability $\frac{1}{J-1}$.

Let $V_j(\theta,s)$ denote party j's vote share given positions θ and party strategies. Our assumptions imply that, in the case of expected utility maxmising voters, $V_j(\theta,s)$ is given by:

$$V_j(\theta,s) = \sum_{k=1}^{K}\left(\frac{\rho_0^k}{J} + \rho_A^k\psi_j^k + \rho_j^k\phi_j^k - \frac{\rho_n^k(1-\phi_n^k)}{J-1} + \sum_{n=1}^{J}\frac{\rho_n^k(1-\phi_n^k)}{J-1}\right), \tag{C.4}$$

where the ρ and ψ coefficients take the same values as in the baseline model.

In this model, we define an equilibrium as a strategy profile s for the parties, a voter belief function μ and values of $\{\phi_j^k\}_{j=1,k=1}^{J,K}$, for each $\theta \in \Theta$, such that:[25]

1. Each ϕ_j^k is consistent with equation (C.3), given $\mu(\cdot|\cdot)$.

2. $\mu(\cdot|\cdot)$ is consistent with equation (C.2) given parties' emphasis strategies.

3. Each party's strategy maximizes its vote share V_j, given by (C.4), given the strategy of the other parties, and given the values of $\{\phi_j^k\}_{j=1,k=1}^{J,K}$.

C.1 Numerical Simulations

We are unable to derive analytical results for the model with expected utility maximizing voters. Here we show a few numerical simulations to indicate that the results are identical to the baseline model with ambiguity averse voters, provided that parties are not too extreme. Further numerical results are available upon request.

For the results below, we adopt the following parametrization. We assume that $J = K = 2$ and that voter ideal points are uniformly distributed on the square $[-1, 1]^2$, so that $F(x_i^1, x_1^2) = \frac{(x_i^1+1)(x_i^2+1)}{4}$. We assume, for the expected utility case, that both parties' positions are uniformly distributed on the square $[-2, 2]^2$.

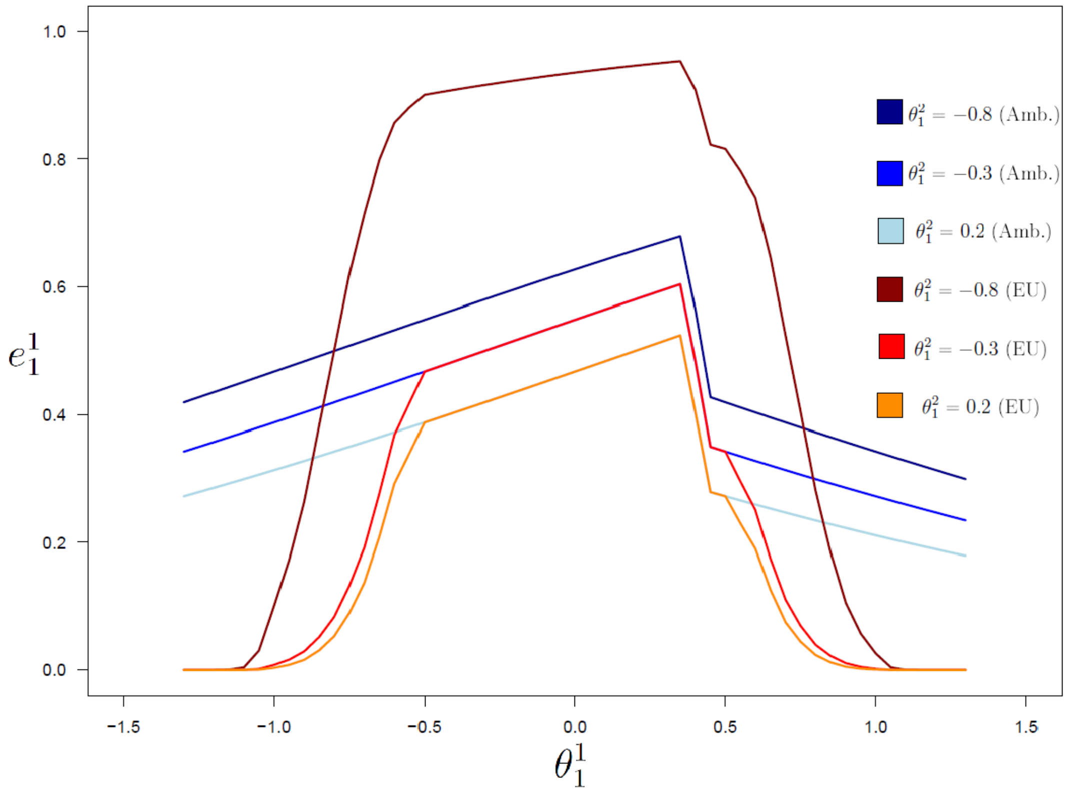
We assume that the function η takes the form $\eta(e) = 0.3(1 - (1 - e)^{1.3})$. We set $\gamma_1 = \gamma_2 = 0.5$, and set $(1 - \gamma_0)\tilde{\pi}_2 = 0.3$ and $U(x) = -x^2$. Note that this parametrization implies that voters are risk averse (concave U) and have high uncertainty about parties' positions. These assumptions ensure that the expected utility case behaves reasonably similarly to the ambiguity aversion case.

In Figures 3 and 4, we show the predictions of the expected utility and ambiguity aversion models for Party 1's emphasis on issue 1. For the purposes of all the figures, we

25. The definition of equilibrium employed here is exactly the definition of a Perfect Bayesian Equilibrium of the game where nature chooses party positions, parties choose emphasis and then voters vote, except that we restrict attention to Perfect Bayesian Equilibria in which indifferent voters vote for each party with equal probability.

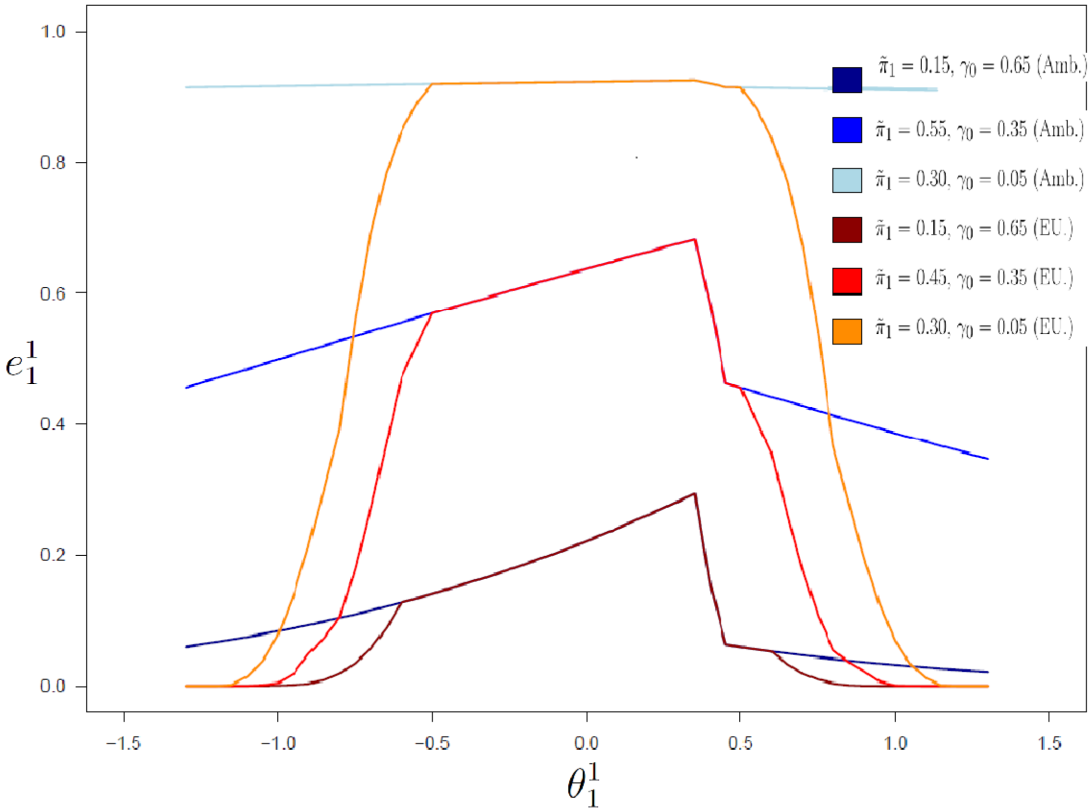
set $\theta_2^1 = \theta_2^2 = 0.4$. In Figure 3, we set $\tilde{\pi}_1 = \tilde{\pi}_2 = 0.5$ and $\gamma_0 = 0.4$ and vary θ_1^1 (on the x axis) and θ_1^2 (in the legend). In Figure 4, we fix $\theta_1^2 = -0.4$ and vary θ_1^1 (on the x axis) and γ_0 and $\tilde{\pi}_1$ (in the legend), with $\tilde{\pi}_2 = 1 - \tilde{\pi}_1$.

Figure 3: e_1^1 as θ_1^1 and θ_1^2 vary, with EU and Ambiguity Averse Voters



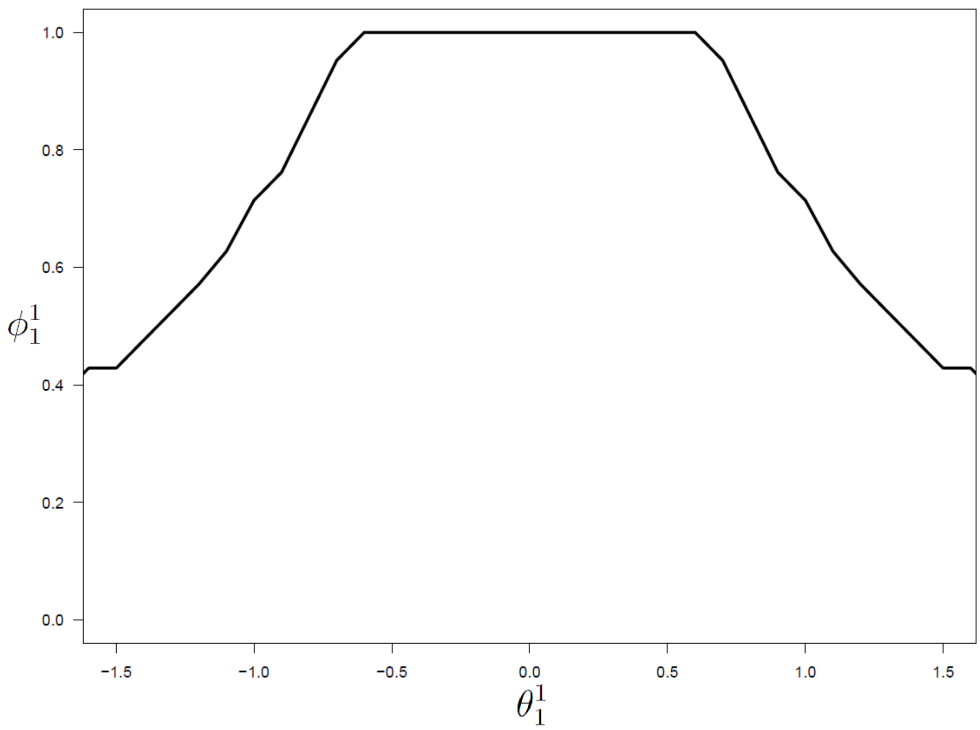
Inspection of these figures indicates that the model with expected utility maximizing voters implies identical equilibrium behavior to the model with ambiguity averse voters when party positions are not too extreme. When parties take more extreme positions, the model with ambiguity aversion and the model with expected utility maximizing voters make different predictions. The expected utility model implies that each party chooses to emphasize only one issue in its campaigns in this case. To understand the intuition for these results, Figure 5 plots the equilibrium value of ϕ_1^1 for different positions θ_1^1 of Party 1, given $\theta_1^2 = -0.4$, $\tilde{\pi}_1 = 0.5$, $\gamma_0 = 0.4$ and the same other parameter values as above.

Figure 4: e_1^1 as θ_1^1, γ_0 and $\tilde{\pi}_1$ vary, with EU and Ambiguity Averse Voters



When θ_1^1 is close to zero, we find that $\phi_1^1 = 1$. In that case, voter behavior is identical in the model with ambiguity aversion and the model with expected utility maximizing voters and so equilibrium party strategies are the same. When θ_1^1 is more extreme, $\phi_1^1 < 0.5$, in which case voters are always less likely to vote for a party if they see its position and so parties have no revelation incentive. Then, party strategies are driven by the salience incentive and parties only emphasize issues where they have a comparative advantage.

Figure 5: ϕ_1^1 as θ_1^1 varies



Appendix D If Voters Can Witness Multiple Campaigns

In this section, we discuss results of the model under the assumption that $\delta = 1$, which corresponds to the case where a voter witnessing the campaign of one party on one issue is completely independent (in probability terms) of whether the same voter witnesses campaigns by other parties and on other issues (although the probability of witnessing a campaign nevertheless depends on whether it is on the issue on which the voter is initially oriented). By contrast, the model has been studied thus far under the assumption of $\delta = 0$, where witnessing multiple campaigns are mutually exclusive events.

Unfortunately we are unable to derive analytical results for the model with $\delta = 1$. In this section, we present numerical results to indicate that, in the case with 2 parties and 2 issues, the model with $\delta = 1$ yields strikingly similar predictions to the model with $\delta = 0$. Continuity arguments suggest that parametrizations of the model in intermediate cases, with $\delta \in (0, 1)$ are likely to yield results in between those of the $\delta = 0$ and $\delta = 1$ cases. Therefore, our findings in this section indicate that the overall implications of the model are not significantly affected by the value of δ.

Our assumptions for this model are identical to those in Section 3 in the main text. However, in contrast to Section 4 we set $\delta = 1$, although, for simplicity, we continue to assume ambiguity aversion on the part of voters.

Based on the assumptions in Section 3, it is relatively straightforward, although tedious, to calculate the probability that a voter with any particular ideal point and issue orientation would vote for a party j in the $\delta = 1$ case with 2 parties and 2 issues, given a particular strategy profile and issue positions of the parties. Based on this, one can numerically calculate the vote share that each party obtains for each set of issue positions θ and each strategy profile s.

Nevertheless, writing the vote share function for each party is very cumbersome, since there are many cases to consider (e.g. cases where a voter sees one issue position, on issue 1, for each party, where a voter sees both issues positions for party 1 and a position on issue 2 for party 2 and so on). For this reason, we do not write down a vote share function for this model, and instead numerically calculate the vote share each party obtains in each case, and then compute the equilibrium strategies of the parties by numerically optimizing each party's strategy to maximize its vote share (given its opponent's strategy).

Figures 6 and 7 below show the results we obtain for the $\delta = 1$ model, for the same parameter values studied in Appendix C.1. Comparing Figures 6 and 7 with Figures 3 and 4 respectively, from Appendix C.1, it is apparent that the results for the $\delta = 1$ model are qualitatively and quantitatively very similar to those obtained for the model with $\delta = 0$ and ambiguity aversion. This suggests that predictions of the model are not particularly sensitive to the value of δ. Further numerical results are available upon request.

Figure 6: e_1^1 as θ_1^1 and θ_1^2 vary, with Ambiguity Averse Voters and $\delta = 1$

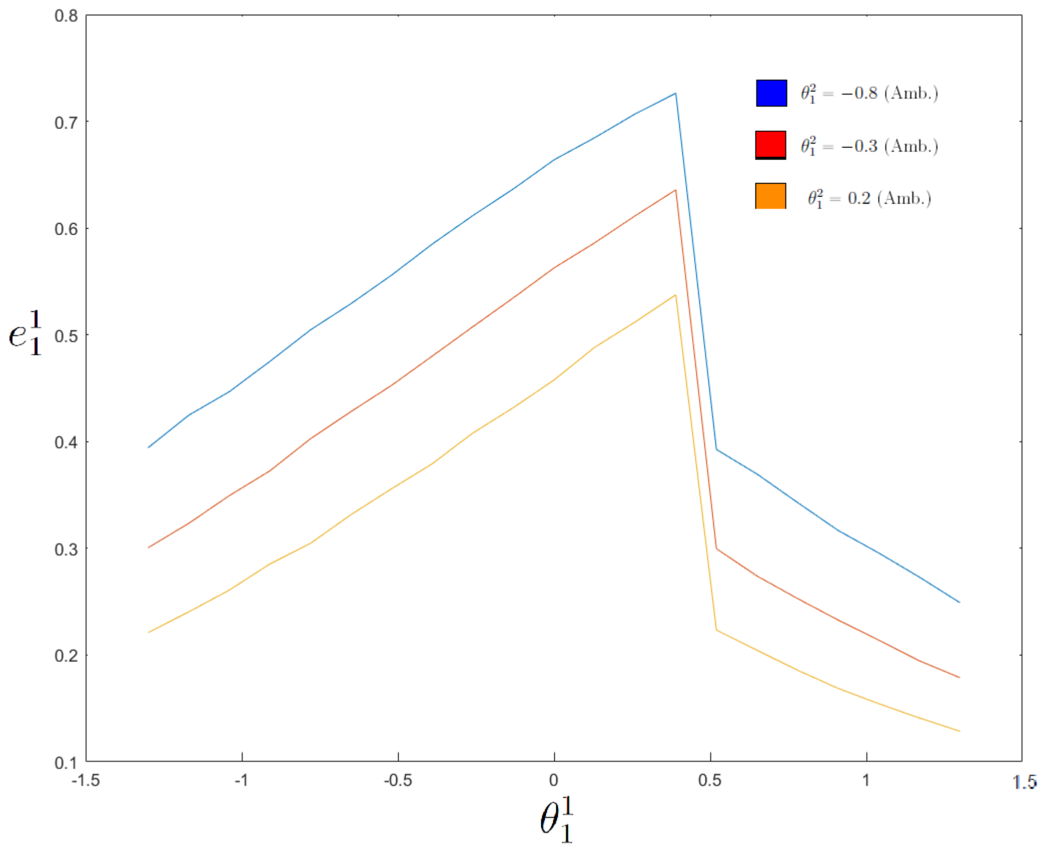


Figure 7: e_1^1 as θ_1^1, γ_0 and $\tilde{\pi}_1$ vary, with Ambiguity Averse Voters and $\delta = 1$