Multidimensional Signaling and the Rise of Cultural Politics*

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Abstract

In turbulent times, political labels become increasingly uninformative about politicians' true policy preferences or their ability to withstand the influence of special interest groups. We offer a model in which politicians use *campaign rhetoric* to signal their political preferences in multiple dimensions. In equilibrium, the less popular types try to pool with the more popular ones, whereas the more popular types seek to separate themselves. The ability of voters to process information shapes politicians' campaign rhetoric. If the signals on the cultural dimension are more precise, politicians signal more there, even if the economy is more important to voters. The unpopular type benefits from increased conformity, which bridges the candidates' rhetoric and makes it more difficult for voters to make an informed decision.

Keywords: elections, multidimensional signaling, populism, culture, conformity.
JEL Classification: D72, D84, P00.

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Introduction

In the 20th century, the word *populism* was typically used in connection with irresponsible macroeconomic policies promised by left-wing candidates and pursued by left-wing elected officials around the world, most infamously in Latin America (Dornbusch and Edwards, 1990; Edwards, 2019). In the 21st century, populism has come to have a strongly cultural element, especially in the form of right-wing populism with nativist, anti-globalist and anti-immigrant characteristics. Often, it represents the broad rejection of established parties and established politics (Eichengreen, 2018; Guriev and Papaioannou, 2022).

Populism is economically costly: Funke, Schularick and Trebesch (2023) estimate the economic damage of populist leaders to be as much as 10% of GDP per capita in 15 years (relative to a non-populist counterfactual). Theories dealing with voters' disillusionment and elites' corruption can account for the rise of populism, but have not offered a systematic explanation for why this has taken the form of a cultural reaction to establishment politics over the last several decades. It is particularly surprising that cultural issues have become more prominent in political campaigns during a period that has witnessed major economic turbulence, increasing inequality, and dwindling labor market opportunities for many types of workers in the industrialized world. Cultural sensibilities are obviously important to voters, and there is no reason to think that they matter less than economic priorities. Nevertheless, the sudden prominence of cultural issues in the midst of major economic turbulence remains unexplained.

In this paper, we develop the argument that culture may feature prominently in political campaigns during economically turbulent periods, even when economic priorities are the most important ones for voters. This is because cultural signals are informative about both cultural and economic policies that politicians will pursue. Consequently, culture may become important in politics despite its secondary importance to voters –simply because a cultural focus produces a more reliable signal about economic policy, which is what voters care about, than economic campaign rhetoric itself.

The main contribution of the paper is to develop a novel and tractable model of multidimensional political signaling and to use this model to offer a new theory of the rise of cultural politics.

In our model, candidates from two parties compete in an election by offering *campaign*

rhetoric on multiple policy dimensions. We introduce the term "campaign rhetoric" to emphasize that these announcements are potentially informative about the policies that a candidate will implement if elected, but do not correspond to a commitment to a policy platform. They are informative about subsequent policies because it is costly for a politician to campaign on a rhetoric that is distant from his or her ideal (or bliss) point. Voters observe each candidate's campaign rhetoric with some random noise, which reflects the difficulty of parsing the candidate's rhetoric on each issue, especially during times when the meaning of certain policies may be in flux. Voters then attempt to infer the candidates' true preferences from their campaign rhetoric.

This modeling of multidimensional signaling is both tractable and realistic. It departs from the common (and implausible) assumption in many signaling models that agents can send perfectly clear signals, the only issue being whether the relevant incentive compatibility constraints for separation between types are satisfied. Instead, in our setting, the signals themselves are noisy and open to multiple interpretations. In addition, they are informative without constituting a full commitment to a particular policy platform. Noisy signals also circumvent the problem of standard signaling models in disciplining beliefs off-the-equilibrium path.[1]

Crucially, in our model candidates might use rhetoric on one issue as a way of signaling their position on another. Most relevant to our setting is the possibility that voters care about the economy but cannot properly understand the difference between different candidates' economic rhetoric, especially when some of the policy positions have become less informative or overly technical (e.g., on monetary policy, tax structure, or regulation of technology). At the same time, voters can easily see the difference between candidates on cultural issues (say, on abortion or immigration), even if they do not themselves care about these cultural issues that much per se. In these circumstances, candidates might exploit the cultural dimension to signal their stance on economic issues. In particular, culture might emerge as a key battleground, where either one type of candidate heavily distinguishes itself or both candidates take fairly extreme positions, driven by the desire of the less popular type to bridge their difference with the more popular one.

We next provide a stylized example to illustrate the most interesting configuration that this type of multidimensional signaling can generate and also explain the logic of how the model

[1] This modeling assumption follows Acemoglu, Egorov and Sonin (2013), in which the first-term policy was imperfectly observable to voters. The current model incorporates competition between parties and, critically, multidimensional, rather than one-dimensional, politics.

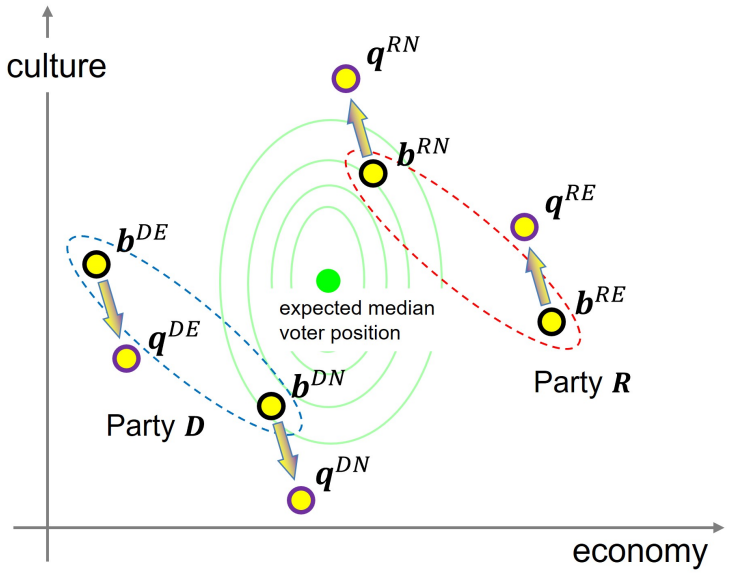


Figure 1: Candidates of two parties choose campaign rhetoric to signal their type. Arrows indicate the direction in which rhetoric departs from ideal points. In both parties, type N is ex ante more popular, and therefore, in each party type E tries to pool with type N, while type N tries to separate. Candidates' rhetoric converge to the median on the economic dimension and diverge on the cultural dimension. As the economic dimension is more noisy, candidates' campaign rhetoric on cultural issues diverges more from their true preferences than on economic ones.

works. Suppose that there are two policy dimensions, economy and culture, and two types of candidates from each party (R or D), and each candidate can have an "elite-captured" type (E) or alternately a "normal" type (N). The former has policy preferences on both the economic and cultural dimensions that are further away from those of the expected median voter position, while the normal type has preferences that are closer to those of the expected median voter. Given the lack of commitment to a policy, candidates from both parties would like to signal that they are not the elite-captured type.

Figure 1 depicts one configuration corresponding to this pattern. We can see that the preferences of RE and DE-type politicians are farther away relative to the (expected) median voter than are those of RN and DN types. The indifference curves plotted around the median voter position indicate that voters care much more about the economic dimension than about the cultural dimension. Suppose additionally that there is a large amount of noise in the economic campaign rhetoric, reflecting the complexity of current economic policy issues. Since the two types of politician also differ on their cultural preferences, an effective way in which candidates can signal that they are not the elite-capture type is to "pander" to voters on the cultural dimension. Interest-

ingly, this kind of pandering does not necessarily mean getting closer to the median voter position on culture, but may involve taking even more extreme cultural position, as the arrows in the figure indicate (while they deviate only little from politicians' preferred policy on the economic dimension, they diverge significantly on the cultural dimension). Therefore, in this example, even though voters care most about economic issues, culture becomes the main political signal, and for effective signaling, the cultural rhetoric of candidates from both parties becomes extreme. Moreover, this kind of extreme rhetoric is *popular* with voters, who (correctly) interpret this as a sign that the politician taking an extremist position on culture is unlikely to be elite-captured.

At the heart of this stylized example is the idea that the correlation between politicians' preferences over different issues may bring into prominence issues that voters care very little about. Figure 1 draws a specific instance of this tension, which applies if the elite-captured types of both parties have similar deviations from the position of the expected median voter on both cultural and economic dimensions. We believe that this is a plausible assumption in the context of politics over the last several decades where many voters came to suspect that (some) establishment politicians did not take measures to alleviate the burdens of increasing inequality and at the same time had more cosmopolitan and pro-immigration values than they themselves held. The argument also proceeds under the assumption that cultural signals are easier to interpret than the complexities of promised economic platforms and policies.

A special case of our model is when the two parties are ex ante identical (with each of them having two distinct types of candidates), all preferences are symmetric and signals are equally noisy across dimensions. In this case, the analysis takes a particularly simple form, where politicians pander to voters by moving along the line connecting the two candidate types. The hyperplane orthogonal to this line is ignored by voters. This effectively one-dimensional model provides some intuitive results, including "overpandering,"where both candidates commit to extreme platforms to signal that they are not beholden to special interests (Acemoglu, Egorov and Sonin, 2013; Kartik, Squintani and Tinn, 2015; Kartik and van Weelden, 2019).

Our basic model does not assume that the preferences are symmetric or signals are equally noisy across dimensions. In this case, the hyperplane that separates signals from the type of candidates that voters favor from the other type is not necessarily orthogonal to the line connecting the types. Our closed-form solution for equilibrium strategies allows for rich comparative stat-

ics: spillovers of the informativeness of campaign rhetoric on one dimension influences—and sometimes induces more extreme—choices on other dimensions. Voters' ability to cut through the noise on some issues plays a critical role. For example, campaign rhetoric is choosen to focus on dimensions of policy that are less important to voters if politician stances on these dimensions can be observed with less noise.

We subsequently study the full model without imposing the assumption that the two parties are identical, which corresponds to the case depicted in Figure 1. As well as characterizing the equilibrium, in this case we are able to carry out a full set of comparative static exercises, showing, for example, how greater concern for office and a stronger preference by voters for the normal type exacerbate signaling motives. Our model also enables us to illustrate how differences in the precision of campaign rhetoric in different dimensions influence the nature of political competition. Similarly to the pattern already presented in Figure 1, in this case, campaign rhetoric can converge on one dimension, while diverging and exhibiting overpandering on the other, or even show richer behaviors across other dimensions (see Figure 5 below).

We additionally explore the consequences of "social pressure" on candidates' choices, modeled as an extra cost of deviating from certain social norms on policy platforms. For example, declaring a strongly anti-immigrant policy (or, say, an extreme laisser-faire policy on the economic dimension) may go against established social norms, and politicians choosing campaign rhetoric of this sort would incur additional costs due to push-back from media and civil society or unwillingness of their staffers to work on this platform. When the cultural dimension is less noisy than the economic one, social pressure may make the rise of cultural politics harder, but conversely, the relaxation of certain norms may facilitate signaling on the cultural dimension.[2]

To the best of our knowledge, ours is the first multidimensional signaling model in a political economy context.[3] We next discuss several literatures that relate to our contribution.

Multidimensional signaling has appeared in the economic theory literature in several contexts such as taxation (Riley and Zeckhauser, 1983), advertising (Milgrom and Roberts, 1986), multimarket diversification (Chen, 1997), or common agency (Martimort and Stole, 2002). In

[2]This analysis also opens the way to a new approach to political entrepreneurship, whereby such entrepreneurs influence politics by challenging and changing social norms that create pressure on campaign rhetoric.

[3]There are several models of politics with multidimensional policies, such as Calvert (1985) Austen-Smith and Banks (2000) and Austen-Smith and Banks (2005). Besley and Persson (2019) study a dynamic model of multidimensional politics to explore how political cleavages, policies, and social identities evolve over time.

contrast with these and other models, which typically feature two-dimensional type space, we do not specifically focus on separating and pooling equilibria. As voters receive noisy information about politicians' platforms, they form posteriors about politician types, which are neither fully pooling nor separating. The advantage of our approach is that it works with any number of signaling dimensions and allows us to focus on tractable comparative statics rather then equilibrium refinements.

Within the political economy, the literature on signaling in elections has grown since the pioneering contributions in Banks (1990) and Harrington (1993). In Smart and Sturm (2006), politicians always choose a policy that signals that they are not biased, even at the cost of deviating from voters' interests. In Callander and Wilkie (2007), politicians differ with respect to their propensity to misinform voters about their true preferences. In Agranov, Eilat and Sonin (2025), informed elites signal to the uninformed median voter the quality of a candidate standing for election. Within this strand, we are most closely related to Kartik and McAfee (2007), where a candidate's platform is a signal to voters about their character. As a result, a candidate signaling high valence might win on an unpopular platform over an opponent who caters to the median voter's preferences.

In another popular approach, politicians make policy choice in the first period to signal their type, and then voters decide to re-elect or not re-elect them assuming that the second-period policy will be determined by the elected politician's type. For the voter's decision-making, the first-period policy choice in these models is what the campaign rhetoric is in ours.[4] In Canes-Wrone, Herron and Shotts (2001), Martinelli (2001), Martinelli and Matsui (2002), Heidhues and Lagerlof (2003), Laslier and Straeten (2004), Maskin and Tirole (2004), political candidates or elected officials choose to pander to the electorate. In Acemoglu, Egorov and Sonin (2013), candidates demonstrate their independence from special interests by taking positions more extreme than those of the median voter. In all of these models, the competition is between the incumbent and a challenger, whereas in our model, it is between candidates from two parties. (Voters know which party a candidate belongs to but not their type; candidates from each party signal to separate from or pool with different types in their own party.)

[4] Our approach with costly campaign rhetoric has some similarities to the "career concerns" models in Persson and Tabellini (2000), Besley (2006) and Fox and Shotts (2009).

Additionally, our electoral campaign also has the flavor of "strategic ambiguity" (Shepsle, 1972; Alesina and Cukierman, 1990; Prat, 2005; Fox, 2007), since candidates' campaign rhetoric can obfuscate information that voters need. In this way, we are also similar to Hodler, Loertscher and Rohner (2010), where the incumbent uses inefficient policies to increase voters' information asymmetry.[5]

Finally, the literature on "modern populism" has been growing rapidly (see, e.g., Bellodi, Morelli and Vannoni, 2024). Early contributions include Sachs (1989), in which high inequality leads to policies that make all social groups worse off (voters are shortsighted), and Alesina (1989), in which redistributive policies are captured by special interests. A comprehensive review by Guriev and Papaioannou (2022) surveys about 100 papers dealing with populism, most of which are empirical. Among the theoretical papers surveyed, there are no workhorse models of modern populism.[6] We aspire to offer such a model.

The rest of the paper is organized as follows. Section 2 briefly surveys recent evidence on the rise of cultural politics. Section 3 introduces our basic model. In Section 4, we analyze the equilibria of the model and study the comparative statics. In Section 5 we discuss how candidates adjust their campaign rhetoric in the presence of social pressure. In Section 6 we relax the assumption that the parties are identical and discuss the robustness of our findings, while Section 7 concludes.

2 The Rise of Cultural Politics

Across advanced democracies, the structure of political conflict has changed notably over the past several decades. Comparative electoral data, survey research, and cross-national studies show that cultural topics, including immigration, identity, gender, religion, race, and national

[5] In Kartik and van Weelden (2019), candidates have prior policy-relevant information and the authors demonstrate that there is a hard limit to the information that might be aggregated in elections. In our model, politicians exploit the fact that voters have trouble parsing information along some policy dimensions, even if they care about these dimensions more than about others.

[6] Several important theoretical contributions on populism depart from the rational choice paradigm. For example, Bernhardt, Krasa and Shadmehr (2022) analyze demagogues who appeal to short-sighted voters, while in Bonomi, Gennaioli and Tabellini (2021), voters optimally choose their beliefs and preferences. Levy, Razin and Young (2022) allow for various misperceptions to explain the recurring waves of populism. Szeidl and Szucs (2025) offer a model of populism as a conspiracy theory. Short-sightedness and mistaken interpretations can be easily incorporated into our multidimensional signaling framework.

belonging, have become major campaign themes for parties and candidates, and voters are increasingly paying attention to these cultural issues.

Drawing on the World Values Survey and large-scale cross-national electoral databases, Inglehart and Norris (2019) argue that, since the late twentieth century, voters' positions on cultural values, attitudes toward immigration, women's rights, and multiculturalism have become stronger predictors of voting choice than income, occupation, or redistributive preferences. Using time-series data across more than thirty democracies, they find a consistent increase in the explanatory power of cultural values for party identification and a corresponding decline in the explanatory power of economic variables.

The realignment of voters by education rather than income or social class, documented in Gethin, Martínez-Toledano and Piketty (2022), is also related to this broader change. There is a striking pattern where highly-educated voters, once stalwarts of right-leaning parties, have become the main source of support for culturally liberal, left-leaning parties. In the meantime, the traditional working class has shifted its support to the center-right and sometimes the hard-right. This pattern holds in nearly all advanced democracies and is strongest in areas where immigration and globalization have become politically salient. Relatedly, using data from the *Chapel Hill Expert Survey*, Rovny et al. (2025) document that European party systems have evolved toward a multidimensional structure in which the cultural or libertarian-authoritarian axis is now more prominent than traditional economic divides.

In the United States, this realignment has increasingly taken the form of racial, ethnic, and cultural identities that play the defining role in voting patterns (Bonomi, Gennaioli and Tabellini, 2021; Noy and Rao, 2025). Mutz (2018) documents using large-scale survey data that perceptions of threat to group status among whites, Christians, and men—rather than personal economic hardship—best explain the support for Donald Trump in 2016 (see also Rothwell and Diego-Rosell, 2016, and Schaffner, 2022). Similarly, Sides, Tesler and Vavreck (2018) show that attitudes towards race, immigration, and national identity strongly predict voting patterns in the 2016 election, while traditional economic indicators do not. Mason (2018) documents how partisan, racial, and religious identities have merged into "mega-identities," driving affective polarization and identity-based voting. It is on the basis of these trends that Gamm et al. (2024) refer to partisan polarization on cultural issues as a "defining feature of contemporary American politics".

Interestingly, and consistent with our account of the rise of cultural politics, voters continue to report that they care a lot about economic issues, and supporters of both parties have similar concerns, centered on issues of unemployment, jobs, wages, affordability and healthcare, and often support similar policies, including minimum wages, low taxes and jobs programs. Moreover, the fraction of voters who report that the economy is "extremely important" to their presidential vote has increased from 38% in 1996 to 52%in 2024,[7] while voters also report paying much more attention to cultural issues.

The recent work by Noy and Rao (2025) further supports the idea that there has been much more cultural polarization than polarization on economic issues. Figure 2, taken from Noy and Rao (2025), illustrates this pattern. The vertical axis records "stance polarization," measuring how much the two parties disagree on a given policy issue, while the horizontal axis is for "usage polarization," corresponding to how much of a usage gap there is between the two parties on that specific issue. The topics are extracted by the authors from campaign advertisements, and support and usage are coded from surveys of candidates' and voters' attitudes, in particular, VoteSmart, the American National Election Studies, and the Cooperative Election Studies, with the help of a large language model and former political staffers. Green dots indicate economic issues, while red dots are for cultural ones.

The pattern that emerges from Figure 2 is intriguing: while there are differences in the frequency with which different economic topics are discussed by Republican and Democratic candidates, their stances are very similar (e.g., they all support creating jobs and oppose increasing taxes etc.). This indicates limited polarization on economics, consistent with our theoretical mechanism. In contrast, the stances of politicians from the two parties are highly polarized on cultural issues, even though they still discuss the same cultural issues such as abortion and guns.

These developments are not limited to the United States. Gidron and Hall (2017) find similar evidence throughout Western Europe: people who report perceived social status decline are significantly more likely to support populist and culturally conservative parties. In the UK, a strong degree vs. non-degree gap tied to immigration and identity appears to have played a major role in the Brexit referendum (Goodwin and Heath, 2016). Additionally, analyses of expert surveys and party manifestos show that critical competition has shifted to cultural topics, with left-leaning

[7] Economy Most Important Issue to 2024 Presidential Vote, *Gallup*, October 9, 2024.



Figure 2: Usage vs. stance polarization on economic and cultural issues. This figure is replicated from Noy and Rao (2025). The vertical axis measures the polarization in terms of the stance taken by Democratic and Republican candidates for political office, while the horizontal axis is for differences in usage of these topics by these politicians. Green dots are for economic topics while red dots are for cultural ones. The figure shows much greater polarization on cultural topics between the two parties.

parties emphasizing identity and the environment, while rightist parties stress nation, order, and tradition (Bakker et al., 2015; Hooghe and Marks, 2018). In France, Germany and other European countries, studies of recent elections demonstrate that support for far-right and nationalist parties aligns closely with measures of cultural threat and ethno-national attachment (Rovny and Polk, 2019; Rovny and Whitefield, 2019; Jocker, van der Brug and Rekker, 2025). Complementing these trends, Le Corre Juratic (2025) documents that polarization and voter mobilization in Europe are increasingly driven by competition along the cultural dimension rather than the economic one, concluding that "the main line of political conflict for parties and voters is shifting towards the cultural dimension."

3 Model Setup

We consider two parties, R and D, that compete in a presidential-style election. We simplify the exposition by assuming initially that the two parties are identical. This assumption will be relaxed in Section 6.

In each party, there are two types of politicians, E and N—elite-captured and normal. For

simplicity, we assume that the two types are equally common; that is, $\Pr(t_i = E) = \Pr(t_i = N) = \frac{1}{2}$, $i \in \{R, D\}$. The ideal points of these two types are given by the n-dimensional vectors $\mathbb{b}^t = (b_1^t, \ldots, b_n^t)$, with $\mathbb{b}^E \neq \mathbb{b}^N$. The utility of politicians of type $t \in \{E, N\}$ from the policy vector $\mathbb{p} = (p_1, \ldots, p_n)$ is given by

$$U^t(\mathbb{p}) = -\sum_{k=1}^{n} \left(p_k - b_k^t\right)^2.$$

A randomly selected politician represents each party, and the type of politician is their private information.

There is no commitment to policy, and once a politician is elected, they are free to choose the policy vector without any restrictions. Consequently, elected politicians will implement their ideal policies, $\mathbb{b}^E$ and $\mathbb{b}^N$, for the two types of politicians.

There is a continuum of voters and the preferences of voter i are given by

$$W_j(\mathbb{p}) = -\sum_{k=1}^{n} \kappa_k \left(p_k - v_k^j\right)^2,$$

where recall that $\mathbb{p}$ is the policy vector, $v^j = (v_1^j, ..., v_n^j)$ is the ideal point of voter j' and the κ's capture the weights that voters attach to different policy dimensions (relative to the weights given to them by politicians). Voter ideal points on issue k are given by

$$v_k^j = d_k + \varepsilon_k^j + \delta_k,$$

where d_k's denote a common influence on voter preferences, which will also be expected voter's ideal point on issue k; $(\varepsilon_1^j, ..., \varepsilon_n^j)$ is the vector of idiosyncratic shocks of the voter j, with each ε_k^j distributed normally as $\mathcal{N}(0, \nu_k^2)$; and δ_k is an aggregate preference shock, distributed as $\mathcal{N}(0, \omega_k^2)$.

Taking into account that politicians will choose their ideal points when elected, we can compute the likelihood that a majority of voters will prefer one politician to the other. In particular, the majority prefers a politician of type N (as opposed to type E) if and only if

$$-\sum_{k=1}^{n} \kappa_k \left(d_k + \delta_k - b_k^N\right)^2 > -\sum_{k=1}^{n} \kappa_k \left(d_k + \delta_k - b_k^E\right)^2.$$

We denote the probability of this event by θ, so

$$\theta = F\left(\frac{\sum_{k=1}^{n}\kappa_k\left(b_k^N - b_k^E\right)\left(d_k - \frac{b_k^E + b_k^N}{2}\right)}{\sqrt{\sum_{k=1}^{n}\left(\kappa_k\omega_k\left(b_k^N - b_k^E\right)\right)^2}}\right),$$

where $F(\cdot)$ is the cdf of the standard normal distribution.

Because the type of politician is their private information, voters cannot make this calculation directly. Instead, before they cast their ballot, they see each candidate's *campaign rhetoric*. Thus, campaign rhetoric stands for explanations and implicit signals that a politician sends about their stance.

Campaign rhetoric is relevant because politicians incur a cost when they campaign with a rhetoric that is very different from their ideal point. This is the feature that will make the campaign rhetoric (imperfectly) informative about the policies that politicians will choose.

We represent the campaign rhetoric by $\mathbb{q}^{it}$ for the politician of the party i of type t. The cost of choosing this campaign rhetoric for a politician of ideal point $\mathbb{b}^t = \left(b_1^t, \ldots, b_n^t\right)$ is

$$C^t\left(\mathbb{q}\right) = \sum_{k=1}^{n}\beta_k\left(q_k - b_k^t\right)^2,$$

where $\beta = (\beta_1, \ldots, \beta_n)$ parameterizes the difficulty of misrepresenting one's true preferences (or alternatively true policy plans that will be implemented later) across different issues. It is because of this cost that campaign rhetoric can be informative about politician type.[8]

Because policy issues are sometimes quite complex, direct communication is imperfect and media reports and analyses are noisy and prone to misinterpretation, voters observe a noisy version of the campaign rhetoric of each candidate. Specifically, we assume that there is a common noise across voters (we do not rule out idiosyncratic shocks, but they will cancel out in the aggregate). Specifically, voters get a multidimensional signal $\mathbb{s}^i$ from the candidate of the party i, and we assume that

$$\mathbb{s}^i = \mathbb{q}^i + \xi^i, \qquad i \in \{R, D\}.$$

[8]Note that using costs of misrepresentation, $\beta = (\beta_1, \ldots, \beta_n) \in \mathbb{R}_+^n$, one can nest classic environments as particular cases of our model—*cheap talk* corresponding to the case where these costs are very low, and *full commitment to campaign platforms* being approximated by the case where these costs tend to infinity.

The noise vectors ξ^R and ξ^D are independent and have an identical multivariate normal distribution with a diagonal matrix of covariates. We denote the diagonal elements of this matrix by σ_k^2, so $\xi_k^i \sim \mathcal{N}\left(0, \sigma_k^2\right)$. We refer to $\frac{1}{\sigma_k^2}$ as the *precision* of the signal.

In general, the utility of a politician of type $t \in \{E, N\}$ who runs a campaign $\mathbb{q}$, impacted by noise realization ξ, and when policy $\mathbb{p}$ is ultimately implemented, can be calculated as

$$V^t\left(\mathbb{p}, \mathbb{q}, \xi\right) = U^t\left(\mathbb{p}\right) - C^t\left(\mathbb{q}\right) + W\mathbb{1}_{w=1}, \tag{1}$$

where $\mathbb{1}_{w=1}$ is the indicator that the politician won the election and W is the utility (rent) received by a politician when they are in power. Each politician seeks to maximize this expected utility, with the expectation taken over the noises that the politician and their opponent will face the opponent's actions (induced by their type, which is the random variable).

The timing of the game is as follows:

1. Nature randomly and independently chooses two politicians R and D, one from each party, of types $t^R, t^D \in \{E, N\}$.
2. The two politicians simultaneously choose campaign rhetoric vectors $\mathbb{q}^{Rt^R}$ and $\mathbb{q}^{Dt^D}$.
3. Nature draws voter preferences and noise realizations ξ^R and ξ^D.
4. Each voter observes signals $\mathbb{s}^i = \mathbb{q}^i + \xi^i$, $i \in \{R, D\}$ and forms posterior beliefs about politicians' types t^R and t^D.
5. Each voter votes for their preferred candidate. The candidate who wins a majority is elected. All draws and indifferences are decided by tossing fair (and independent) coins.
6. The elected politician chooses the policy vector $\mathbb{p}$ to implement.

We are looking for Perfect Bayesian equilibrium (PBE) in pure strategies. Throughout, we maintain the following technical assumption.

Assumption 1. $W + \sum_{k=1}^n \left(b_k^N - b_k^E\right)^2 < 4\sqrt{2\pi e}\,\min_k\{\beta_k \sigma_k^2\}$.

This assumption guaranties that the optimization problem that each politician faces is convex, and thus ensures the uniqueness of equilibrium. Intuitively, the assumption says that the

instrumental benefits of deploying campaign rhetoric (in the form of an election win and the enactment of preferred policy) are not too large relative to the cost of misrepresentation. If this assumption did not hold, the equilibrium we focus on would exist but might not be unique.

4 Analysis

We first solve for a pure-strategy equilibrium in a closed form, which we then use to derive comparative static results.

4.1 Equilibrium Strategies of Candidates

When casting their ballots, voters know the ideal points of all possible types $\mathbb{b}^t$, $t \in \{N, E\}$ and know that once elected, each politician will implement their ideal point. In addition, given their idiosyncratic preferences, each voter can compute whether they prefer politicians of type N or type E. Finally, in a pure-strategy equilibrium voters correctly conjecture the equilibrium strategies of all candidates $\mathbb{q}^{ti}$, $t \in \{N, E\}$, $i \in \{R, D\}$. But voters do not know the actual types of the candidates, which they try to infer from noisy realizations of campaign rhetoric $\mathbb{s}^i$, $i \in \{R, D\}$. Therefore, each candidate chooses their campaign rhetoric so that voters consider them to be more likely to be the popular type than the candidate of the other party. Naturally, candidates of the ex ante unpopular type choose their rhetoric to look more like candidates of the popular type, while candidates of the popular type try to distinguish themselves.

Let us fix the strategy of party D and consider the strategy choices of the two types of politicians of party R, represented by the campaign rhetoric vectors $\mathbb{q}^{RN}$ and $\mathbb{q}^{RE}$.

We first note that in equilibrium $\mathbb{q}^{RN} \neq \mathbb{q}^{RE}$. To see this, suppose that both types of candidates from party R have chosen the same campaign rhetoric $\mathbb{q}^{RN} = \mathbb{q}^{RE}$. Then, the signals that voters receive about the candidates from party R are not informative. However, if the signals are non-informative, then they do not affect the probability of winning, and each candidate would simply minimize their personal cost, choosing their ideal points $\mathbb{b}^N$ and $\mathbb{b}^E$. Since $\mathbb{b}^N \neq \mathbb{b}^E$, this means that they would choose different points, yielding a contradiction.

If $\theta = \frac{1}{2}$, so voters are equally likely to prefer either type, politicians cannot increase the probability of being elected by distorting their rhetoric. Then, the politician of type N will choose

$\mathbb{q}^{RN} = \mathbb{b}^N$, and similarly the politician of type E will choose $\mathbb{q}^{RE} = \mathbb{b}^E$.

For candidates from party D, the logic is the same.

We summarize these results in our first proposition.

Proposition 1. *In a pure-strategy PBE, the two types of politicians choose different campaign rhetoric* $\mathbb{q}^{iN} \neq \mathbb{q}^{iE}$, *for* $i \in \{R, D\}$. *Furthermore, if* $\theta = \frac{1}{2}$, *then* $\mathbb{q}^{iN} = \mathbb{b}^N$ *and* $\mathbb{q}^{iE} = \mathbb{b}^E$, $i \in \{R, D\}$.

We next consider the case $\theta \neq \frac{1}{2}$. Without loss of generality, let us focus on the case where $\theta > \frac{1}{2}$, which means that type N is an ex ante more popular type than type E. Candidates from both parties will try to signal to voters that they belong to this more popular type. Within each party, type N candidates try to separate themselves from type E candidates, while type E tries to pool with type N.

Take again party R (for party D, the analysis is similar). Consider a pure-strategy equilibrium where the two types of politicians choose rhetoric $\mathbb{q}^{RN}$ and $\mathbb{q}^{RE}$, respectively. By Proposition 1, $\mathbb{q}^{RN} \neq \mathbb{q}^{RE}$. Now consider candidates from the two parties with rhetoric vectors $\mathbb{q}^R$ and $\mathbb{q}^D$. Given these choices citizens receive signals $\mathbb{s}^i = \mathbb{q}^i + \xi^i$, for $i \in \{R, D\}$. Using the densities of normal distributions at points $\mathbb{s}^i - \mathbb{q}^i$, for $i \in \{R, D\}$, the citizens estimate the posterior of candidate from party R to be type N (which voters are more likely to prefer as $\theta > \frac{1}{2}$) as

$$\Pr\left(t^R = N \mid \mathbb{q}^R + \xi^R = \mathbb{s}^R\right) = \left(1 + e^{\sum_{k=1}^{n} \frac{\left(s_k^R - q_k^N\right)^2 - \left(s_k^R - q_k^E\right)^2}{2\sigma_k^2}}\right)^{-1}.$$

The posterior about candidate from party D is similar. Thus, we derive that

$$\Pr\left(t^R = N \mid \mathbb{q}^R + \xi^R = \mathbb{s}^R\right) > \Pr\left(t^D = N \mid \mathbb{q}^D + \xi^D = \mathbb{s}^D\right)$$

if and only if

$$\sum_{k=1}^{n} \frac{\left(s_k^R - q_k^N\right)^2 - \left(s_k^R - q_k^E\right)^2}{2\sigma_k^2} < \sum_{k=1}^{n} \frac{\left(s_k^D - q_k^N\right)^2 - \left(s_k^D - q_k^E\right)^2}{2\sigma_k^2}$$

or, equivalently, if and only if

$$\sum_{k=1}^{n} \frac{1}{\sigma_k^2} \left(q_k^N - q_k^E\right) \left(s_k^R - s_k^D\right) > 0. \tag{2}$$

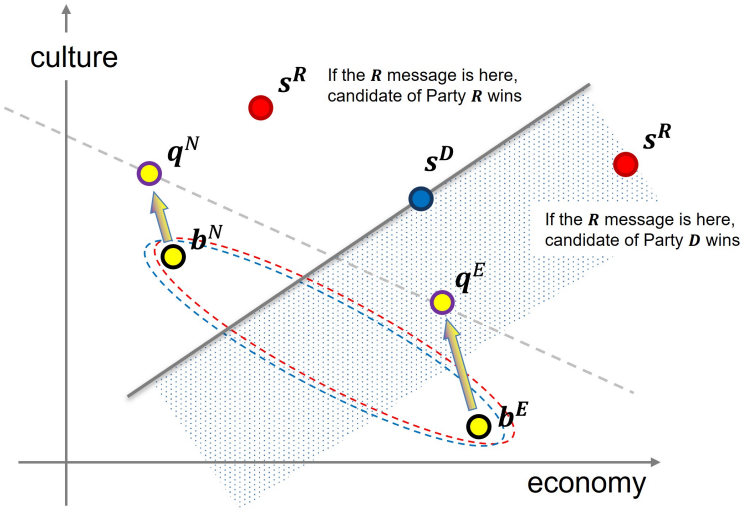


Figure 3: The candidate of party R chooses campaign rhetoric to signal their type. Upon observing the campaign rhetoric s^R (with noise) voters use their posterior to determine whether the candidate is more likely to be type N or type E. Each voter will support the candidate that is more likely to be their more preferred type given the signals. Parameters σ_k, $k = 1, ..., n$, determine the slope of the separating hyperplane through s^D; in the symmetric case, the hyperplane is orthogonal to the $\mathbb{q}^N - \mathbb{q}^E$ vector.

Condition (2) relates the equilibrium choice of campaign rhetoric of the two types of candidates of each party, $\mathbb{q}^N$ and $\mathbb{q}^E$, to the observed signals $\mathbb{s}^R$ and $\mathbb{s}^D$. The electoral impact of signals from issues for which there is less noise (σ_k's are low) is higher than the impact of issues for which the noise is larger (σ_k's are high). Observing the signals $\mathbb{s}^R$ and $\mathbb{s}^D$, the voters form their posteriors about candidates of each party.[9] The candidate from party R is perceived to be more likely to be of type N than the candidate from the party D if the former's observed rhetoric lies further in the direction of the vector $\mathbb{q}^N - \mathbb{q}^E$ than that of the candidate from party D.

Suppose next that voter preferences are symmetric and signals have equal noises across dimensions. Then the characterization of equilibrium is particularly simple and involves politicians pandering to voters along the line connecting the two candidate types. The orthogonal hyperplane is ignored by voters.[10]

We can use this logic to solve the problem of the candidate of the party $i \in \{R, D\}$. Suppose this candidate's rhetoric is $\mathbb{x}$. Since only the projection of this vector on the line connecting $\mathbb{q}^N$

[9] When candidates choose their optimal strategies, their aim is to influence these voter posteriors.

[10] If signal noises had different precision on different policy dimensions and people cared about some dimensions more than others, voters would still be indifferent between signals lying on a hyperplane, but in the present case, because of symmetry, only the projection of the observed n-dimensional signals on the line that goes through types ideal points matters (see Figure 3).

and $\mathbb{q}^E$ matters, the probability of being elected is constant for any two rhetoric vectors $\mathbb{x}$ and $\mathbb{x}'$ for which $\sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} x_k = \sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} x'_k$ (recall equation (2)). Therefore, for any noise ξ, the distribution of values $\sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} (x_k + \xi_k)$ and $\sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} (x'_k + \xi_k)$ is identical, and from (2) this is what determines the probability of being elected (given the other candidate's strategy).

Thus, the problem of maximizing the expectation of (1) can be simplified to a two-step maximization: we first maximize the same expression under the constraint that $\sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} x_k$ is equal to some constant K, and then do the general maximization by optimizing over K. This two-step maximization problem is easier to work with than the original problem because given the same probability of being elected, the expectations of the first and last terms are constant. Type $t \in \{N, E\}$ candidates (from either party), therefore, minimize the following expression:

$$\min_{\mathbb{x}} \mathbb{E}_\xi C^t(\mathbb{x}) \quad \text{subject to} \quad \sum_{k=1}^n \frac{q_k^N - q_k^E}{\sigma_k^2} x_k = K. \tag{3}$$

Introducing Lagrange multipliers λ^t for $t \in \{N, E\}$ and differentiating with respect to x_k, the first-order conditions yield

$$x_k^t = b_k^t + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^t, \qquad \text{for each } k \text{ and } t \in \{N, E\}. \tag{4}$$

As the constraints are binding, multipliers λ^N and λ^E are non-zero.

The expression (4) is intuitive. If the issue weights, the β_k's, were the same for all dimensions k—for example, if politician preferences were identical across all issues—then the vector $\mathbb{x} - \mathbb{b}^t$ would be orthogonal to the constraint in the minimization problem (3). We can thus see that the solution (4) is given by the projection of the preference vector of candidate i, $\mathbb{b}^t$, onto the hyperplane that holds the probability of electing one candidate vs. the other fixed. When the candidates have different preferences on different issues, the orthogonal projection is appropriately amended, yielding the expression (4). Figure 3 illustrates this logic.

The full derivation of equilibrium strategies is provided in the Appendix. In equilibrium, $\mathbb{x} = \mathbb{q}$. This, in turn, implies that in equilibrium $q_k^N - q_k^E = b_k^N - b_k^E$ for all k and therefore, $\lambda^N = \lambda^E$. Consequently, in what follows we use λ without a superscript to denote the equilibrium value of these multipliers. The next proposition gives a closed-form solution for equilibrium strategies.

Proposition 2. *In equilibrium, candidates of types N and E from each party $i \in \{R, D\}$ choose campaign rhetoric vectors*

$$q_k^{iN} = b_k^N + \frac{b_k^N - b_k^E}{2\beta_k \sigma_k^2}\lambda, \qquad q_k^{iE} = b_k^E + \frac{b_k^N - b_k^E}{2\beta_k \sigma_k^2}\lambda$$

where

$$\lambda = \frac{2\theta - 1}{4\sqrt{\pi \sum_{k=1}^{n} \left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2}} \left(W + \left(W - \sum_{k=1}^{n} \left(b_k^N - b_k^E \right)^2 \right) e^{-\frac{1}{4}\sum_{k=1}^{n} \frac{\left(b_k^N - b_k^E\right)^2}{\sigma_k^2}} \right).$$

One big advantage of this characterization is the ease with which we can carry out comparative statics, as we show next.

4.2 Comparative Statics

We now turn to comparative statics. For simplicity, we again discuss the results for the candidates of party R (the results are analogous for party D). To simplify terminology, from now on we refer to candidates choosing rhetoric away from their ideal points as "signaling."

Our initial set of comparative static results are straightforward. First, we establish the intuitive result that that signaling across all dimensions increases when politicians have stronger incentives to get elected, coming from either direct benefits from office or the desire to impact actual policies.

Second, the signaling effect also becomes stronger when voters have a more pronounced preference for one type of politician, since the less popular type becomes more likely to lose the election without"the fog of the campaign"—which they attempt to create with the more intense signaling in order to pool with the popular type. Interestingly, this behavior by the less popular type in turn induces the popular type to campaign further away from their ideal positions as well, so that they can more successfully separate themselves.

Finally and intuitively, there is more signaling when the costs of campaign rhetoric deviating from their own preferences, the β_k's, are small. Proposition 3 summarizes these results.

Proposition 3. *1. Relative to the candidate's ideal point $\mathbb{b}^t$, campaign rhetoric is shifted*

coordinate-wise in the direction of the ideal point of the type that a majority of voters is more likely to prefer (type N if $\theta > \frac{1}{2}$).

2. *This shift is stronger when W is high (benefits from office are high); when θ is further away from $\frac{1}{2}$ (it is more predictable which type is preferred by a majority); and the β_k's are small (candidates' costs of campaign rhetoric are low).*

The next proposition presents comparative static results that are more important for our theory of the rise of cultural politics.

Proposition 4. *An increase in signal precision in one dimension (lower $\sigma^2_{k_0}$)*

1. *reduces signaling in all other dimensions, meaning that $|q^{it}_k - b^{it}_k|$ goes down for all $k \neq k_0$, $i \in \{R, D\}, t \in \{N, E\}$;*

2. *may have a nonmonotone effect on signaling in that dimension, $|q^{it}_{k_0} - b^{it}_{k_0}|$ (provided that $\sigma^2_{k_0}$ is not too high; when it is sufficiently high, the effect is positive).*

The most important result in this proposition (part 1) is that politicians naturally gravitate away from using campaign rhetoric in dimensions that voters find difficult to parse, and as a result, politicians rely more intensively on other dimensions for signaling purposes.

Technically, this proposition makes use of the fact that the multiplier λ is decreasing in $\sum_{k=1}^{n} \left(\frac{b^N_k - b^E_k}{\sigma_k}\right)^2$. Now, suppose that for some issue k_0, the variance of the signal, σ_{k_0}, decreases, making this signal more precise. Then, the multiplier λ decreases, which means that for every $k \neq k_0$, campaign rhetoric of the N-type politician on dimension k, q^N_k, becomes closer to their ideal point b^N_k, and the rhetoric of the E-type politician, q^E_k, becomes closer to their ideal point, b^E_k. Intuitively, when it is possible to effectively signal one's type using rhetoric on a specific dimension, there is less need to engage in costly signals on other dimensions. Consequently, in the case where the cultural dimension provides a way for politicians of type N to more clearly distinguish themselves, both types of politicians shift the focus of politics towards culture. Interestingly, for the dimension that becomes more central to campaign rhetoric (in this instance $k = k_0$), the lower noise has a nonmonotone effect: if the variance is small to start with, it may reduce signaling on that dimension, while with large enough variance, there is more signaling. Intuitively, with sufficiently low variance, even more limited signaling can be informative enough

that there is not a need to signal more. However, the more interesting case may be the one where, despite the higher precision of this dimension, there is still need for using this dimension more intensively.

The next proposition looks at the effects of the proximity of the ideal point of different types of politicians on campaign rhetoric.

Proposition 5. *An increase in polarization in one dimension (an increase in distance* $|b^N_{k_0} - b^E_{k_0}|$ *on issue* k_0*):*

1. *reduces signaling on other dimensions; that is,* $|q^{it}_k - b^{it}_k|$ *decreases for all* $k \neq k_0$, $i \in \{R, D\}$, $t \in \{N, E\}$*;*

2. *has a nonmonotone effect on signaling on dimension* k_0 *(provided that the positions of the two types are not too close; if they are, the effect is positive).*

The intuition for this result is related to the previous proposition: closer ideal points on one dimension increase signaling on other dimensions, but decrease signaling on that dimension if the points were close to begin with. If for some dimension k_0, the distance between the two ideal points $|b^N_{k_0} - b^E_{k_0}|$ increases, then the distance between the ideal points $\mathbb{b}^N$ and $\mathbb{b}^E$ increases as well. Thus, the multiplier λ goes down, so for every other dimension $k \neq k_0$, the equilibrium rhetoric of both types of candidates moves closer to their ideal points. Intuitively, when the possible types of politicians are quite different, it becomes more costly for the less popular type to pool with the more popular one. In turn, this allows the more popular type to reduce their signaling in order to separate themselves.

Proposition 5 has important implications for our main focus. Suppose again that there are two dimensions, economic and cultural and that the elite-captured type is to the left of the normal type on both issues. Suppose also that the majority of voters are more likely to prefer the normal type. Now, a further leftward shift of the ideal cultural position of the elite-captured politician will typically shift the cultural rhetoric of both types to the right, but make the economic rhetoric of both types move to the left—because the elite-captured politicians will now try to pool and the normal politician will try to separate using the cultural direction, and there is less need for signaling using economics.

Finally, we look at the probability of winning. The candidate of type N wins for sure if both candidates are of this type, giving the following expression for the probability that the candidate of type N wins:

$$\Pr(N \text{ wins}) = \frac{1}{4} + \frac{1}{2}\left(1 - \theta + (2\theta - 1)\, G\left(\sum_{k=1}^{n} \frac{\left(b_k^N - b_k^E\right)^2}{\sigma_k^2}\right)\right),$$

where $G(\cdot)$ is the cdf of $\mathcal{N}\left(0, 2\sum_{k=1}^{n}\left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2\right)$.

Suppose again that type E is less popular, so $\theta > \frac{1}{2}$. The probability of winning is higher for candidate N if θ is higher (more advantage) or if σ_k^2 is higher for some k (politicians' campaign rhetoric on this issue becomes noisier for voters). The last effect is particularly pronounced on dimensions where the candidates' ideal policies are more different, so the less popular politician benefits from noise on the dimension of biggest disagreement. The probability of winning is also higher if $\left|b_k^N - b_k^E\right|$ is smaller.

Proposition 6. *The probability of winning for the less popular candidate is higher if their disadvantage is small; if there is more noise, particularly on the dimension of the biggest policy disagreement; and if the ideal policies are closer.*

One important implication of this proposition is that, in terms of our previous discussion, when the information about candidates' cultural rhetoric is much more precise than that on the economic dimension (and the disagreement is strong), then the less popular candidate type would benefit most from increasing amount of noise on that dimension.

4.3 The Rise of Cultural Politics

We next illustrate how the rise of cultural politics can be accounted using our theory. Let us start from a situation in which both the cultural and economic dimension have intermediate costs of campaign rhetoric deviating from their ideal points and intermediate precisions of signals. From the characterization in Proposition 2, this configuration implies that, to begin with, the equilibrium difference between candidates' campaign rhetoric and their ideal point is similar in each of the two dimensions. That is, $|q_1^t - b_1^t|$ is not very different from $|q_2^t - b_2^t|$, $t \in \{N, E\}$.

Now, the economy becomes more complex—for example, because of globalization or the introduction of new digital technologies—while the culture parameters do not change. The com-

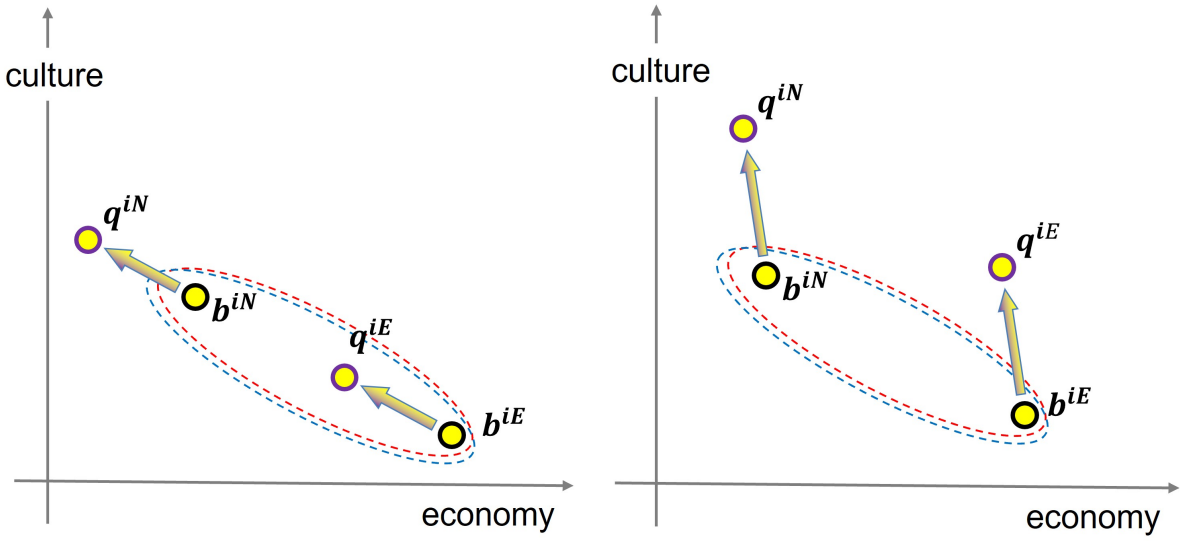


Figure 4: The implications of the economic dimension becoming more complex (with more noise). The left panel shows the baseline were noise is symmetric on both issues, while the right panel shows the case after noise on the economic issue increases. On the right, candidates are predominantly using cultural rhetoric in their campaigns.

plexity of the economic issues leads to higher σ_1, reducing the precision of the signal from economic campaign rhetoric. In response to this change, candidates of both types change their campaign rhetoric, increasing cultural signaling. For type E this is an attempt to pool with the more popular type N, while type N tries to separate themselves using cultural rhetoric. Simultaneously, there is less signaling on economics because the economic campaign rhetoric that candidates choose is likely to be distorted in the eyes of the voters, and hence it becomes less worthwhile for them to pay the cost of deviating from their ideal policies on this dimension. Figure 4 illustrates this dynamic. The result is the rise of cultural politics—more focus on cultural issues in campaigns and less emphasis on economics. Notably, this result continues to apply even if economics becomes more important for voters at the same time.

5 Social Pressure and Conformity

So far, we have assumed that the only cost that the candidates bear when campaigning is the personal cost of deviating from their true policy preferences. In practice, another important cost is associated with adopting a campaign rhetoric that is in contradiction with established social norms of policy or acceptable positions. Deviations from such social norms may get strong nega-

tive reactions from media and civil society or pushback from staffers and campaign activists. This is particularly relevant, since populist parties sometimes break such social norms. In this section, we introduce social pressure costs, parameterized in terms of deviations from social norms by extending the setup of Section 3.

Suppose that, in addition to the campaign cost for politicians, there is a social pressure cost of campaigning. These costs come from deviating from some established social norms, which we measure here by the policy vector $\mathbb{h} = (h_1, ..., h_n)$ and an "issue sensitivity" vector $\eta = (\eta_1, ..., \eta_n)$, determining how costly it is to deviate from different components of the social norm. The social pressure cost is therefore equal to

$$S(\mathbb{q}, \xi) = \sum_{k=1}^{n} \eta_k (q_k + \xi_k - h_k)^2 .$$

Note that these costs depend on the realization of the campaign rhetoric (as they include the ξ_k's), but this has no material effect on choices of campaign rhetoric, since the expectations of these random variables are equal to zero.

Overall, the utility of a politician of type t who ran a campaign $\mathbb{q}$, which was distorted by noise realization ξ, if policy $\mathbb{p}$ is implemented, equals

$$V^t(\mathbb{p}, \mathbb{q}, \xi) = U^t(\mathbb{p}) - C^t(\mathbb{q}) - S(\mathbb{q}, \xi) + W\mathbb{I}_{w=1}, \tag{5}$$

where $\mathbb{I}_{w=1}$ is the indicator that the politician won the election. Each politician seeks to maximize their expected utility, as before.

We start by defining the "induced ideal points" $\mathbb{a}^N$ and $\mathbb{a}^E$ that satisfy

$$\min_{\mathbb{q}} \mathbb{E}_\xi C\left(\mathbb{b}^t, \mathbb{q}\right) + S(\mathbb{q}, \xi) = \min_{\mathbb{q}} \mathbb{E}_\xi C\left(\mathbb{a}^t, \mathbb{q}\right)$$

for $t \in \{N, E\}$, respectively. It is straightforward to show that for type $t \in \{N, E\}$ and issue $k \in \{i, \ldots, n\}$ these solutions satisfy

$$a_k^t = \frac{\beta_k}{\beta_k + \eta_k} b_k^t + \frac{\eta_k}{\beta_k + \eta_k} h_k. \tag{6}$$

Notice that since $\mathbb{b}^N \neq \mathbb{b}^E$ and $\beta_k > 0$, we have $\mathbb{a}^N \neq \mathbb{a}^E$, so the induced ideal points of the two types are different. Therefore,

$$a_k^N - a_k^E = \frac{\beta_k}{\beta_k + \eta_k}\left(b_k^N - b_k^E\right).$$

Repeating thee same steps as our previous analysis using the induced ideal points $\mathbb{a}^t$ instead of ideal points $\mathbb{b}^t$, we obtain the following characterization of the equilibrium in the presence of social pressure, which is the direct analogue of Proposition 2.

Proposition 7. *In equilibrium, candidates of types N and E choose campaign rhetoric vectors*

$$\begin{aligned} q_k^N &= \frac{\beta_k}{\beta_k + \eta_k} b_k^N + \frac{\eta_k}{\beta_k + \eta_k} h_k + \frac{\beta_k \left(b_k^N - b_k^E\right)}{2\left(\beta_k + \eta_k\right)^2 \sigma_k^2}\lambda, \\ q_k^E &= \frac{\beta_k}{\beta_k + \eta_k} b_k^E + \frac{\eta_k}{\beta_k + \eta_k} h_k + \frac{\beta_k \left(b_k^N - b_k^E\right)}{2\left(\beta_k + \eta_k\right) \sigma_k^2}\lambda \end{aligned}$$

where

$$\lambda = \frac{2\theta - 1}{4\sqrt{\pi \sum_{k=1}^n \left(\frac{\beta_k\left(b_k^N - b_k^E\right)}{\left(\beta_k + \eta_k\right)\sigma_k}\right)^2}} \left(W + \left(W - \sum_{k=1}^n \left(b_k^N - b_k^E\right)^2 \right) e^{-\frac{1}{4}\sum_{k=1}^n \frac{\left(\beta_k\left(b_k^N - b_k^E\right)\right)^2}{\left(\beta_k + \eta_k\right)^2 \sigma_k^2}} \right).$$

This result is identical to Proposition 2, except that now social pressure due to deviations from established social norms also affects campaign rhetoric. This gives us new comparative statics. Consider the possible effects of an increase in η_{k_0}, which corresponds to the salience of issue k_0 increasing. Similarly to the logic of Proposition 6, this change favors the less popular candidate, because it prevents the more popular type from signaling intensively on this dimension to distinguish themselves. This advantage is larger in dimensions where signals were quite precise to start with (that is, where σ_k^2 is small, so that the more popular type was relying on this dimension for signaling); where the difference in policy positions is large (that is, where the distance $\left|b_k^N - b_k^E\right|$ is large, so that campaign rhetoric in this dimension was already informative); and in dimensions where social norms did not previously matter much (that is, η_k was small to begin with, so that previously this dimension was broadly unconstrained). In addition, the effect of β_k on the candidates' chance of victory is nonmonotone.

We summarize these results in the following proposition.

Proposition 8. *The less popular candidate benefits from an increase in social pressure on a specific issue (increased η_{k_0} for some k_0). This effect is stronger for issues k in which the policy difference between candidate types ($\left|b_k^N - b_k^E\right|$) is large and information is relatively precise (σ_k^2 is low). On each issue, the marginal effect of social pressure is larger at low levels.*

All other comparative statics results emphasized in the previous section—in particular, those with respect to β_k, σ_k^2, and $|b_k^{iN} - b_k^{iE}|$—continue to apply as before.

The presence of social pressure adds another new effect as well: now a change in the cost of campaigning on one dimension, β_{k_0}, affects the other dimensions, through the common multiplier λ.

Finally, our approach raises additional interesting issues. First, it highlights the possibility that relaxation of social norms related to cultural topics that populist candidates care about may be an important precursor to the rise of (right-wing populist) cultural politics. Second, it points to an important role of political entrepreneurship as altering social norms and thus opening up new space for campaigning and signaling.

6 Heterogeneous Parties

We have so far focused on a special case of our framework because it enabled us to derive closed-form characterization of equilibrium strategies and thus sharp comparative statics with clear intuition. In what follows, we demonstrate that relaxing the simplifying assumptions of the special case does not alter our main qualitative findings. Most importantly, in this section we relax the assumption that two parties are identical, imposed throughout Sections 3-5.

6.1 Setup with Heterogeneous Parties

Suppose that Party R has politicians of two types, RN and RE, with equal probability, while Party D has politicians of types DN and DE, with equal probability as well. Suppose initially that these ideal points of candidates, $\mathbb{b}^{RN}, \mathbb{b}^{RE}, \mathbb{b}^{DN}$, and $\mathbb{b}^{DE}$ form a regular tetrahedron in the n-dimensional Euclidean space.[11] Given that we do not put any restriction on location of the

[11] Regularity means here that all edges of the tetrahedron have the same length.

tetrahedron vertices relative to the coordinate axes, this assumption does not imply that projections on lower-dimensional subspaces are regular or even symmetric. The setup of Sections 3-5, in which two parties are identical, is a particular case of this setup.[12] Alternatively, the proof in this section works, with minimal modifications, when $\mathbb{b}^{RN}$, $\mathbb{b}^{RE}$, $\mathbb{b}^{DN}$, and $\mathbb{b}^{DE}$ form a plane rectangle (in an n-dimensional Euclidean space).

To simplify things, let us assume that the pivotal voter prefers parties with equal probabilities and candidates RN and DN within parties with probability θ.[13] The same argument as before establishes that politicians of different types from the same party choose different campaign rhetoric. If $\theta = \frac{1}{2}$, then they choose their ideal points. From now on, we will assume that $\theta > \frac{1}{2}$.

The analysis closely follows the case of two identical parties. Consider the problem that citizens face when they observe the rhetoric of candidates. Citizens know the party affiliation of each of the two candidates, but do not know the type of each candidate. Denote the signals that citizens receive from the two candidates by $\mathbb{s}^R = \mathbb{q}^R + \xi^R$ and $\mathbb{s}^D = \mathbb{q}^D + \xi^D$.

Using the densities of normal distributions at points $\mathbb{s}^R - \mathbb{q}^R$, the citizens estimate the posterior of candidate from Party R to be type RN as

$$\Pr\left(t^R = RN \mid \mathbb{q}^R + \xi^R = \mathbb{s}^R\right) = \left(1 + e^{\sum_{k=1}^{n} \frac{\left(s_k^R - q_k^{RN}\right)^2 - \left(s_k^R - q_k^{RE}\right)^2}{2\sigma_k^2}}\right)^{-1};$$

the posterior for candidate from Party D is similar. Thus,

$$\Pr\left(t^R = RN \mid \mathbb{q}^R + \xi^R = \mathbb{s}^R\right) > \Pr\left(t^D = DN \mid \mathbb{q}^D + \xi^D = \mathbb{s}^D\right)$$

if and only if

$$\sum_{k=1}^{n} \frac{1}{\sigma_k^2}\left(s_k^R\left(q_k^{RN} - q_k^{RE}\right) - s_k^D\left(q_k^{DN} - q_k^{DE}\right)\right) > 0. \tag{7}$$

Consider the problem of candidate from Party $i \in \{R, D\}$ choosing rhetoric $\mathbb{x}$. Similar to before, but now recognizing the differences between the candidates from the two parties, the probability of being elected is constant for any two rhetoric vectors $\mathbb{x}$ and $\mathbb{x}'$ such that $\sum_{k=1}^{n} \frac{q_k^{iN} - q_k^{iE}}{\sigma_k^2} x_k =$

[12] Identical parties in an $n-$dimensional space are an orthogonal projection of a suitably-oriented regular tetrahedron in a $n+2-$dimensional space.

[13] This assumption can be relaxed as well or it can be easily micro-founded, as we did for parameter θ in Section 3 for the case of identical parties.

$\sum_{k=1}^{n} \frac{q_k^{iN}-q_k^{iE}}{\sigma_k^2} x_k'$ for $i \in \{R, D\}$. Therefore, the maximization problem can again be conveniently simplified into a two-step one: first maximize candidate utility (or minimize cost) subject to the constraint that $\sum_{k=1}^{n} \frac{q_k^{iN}-q_k^{iE}}{\sigma_k^2} x_k$ is constant for $i \in \{R, D\}$, and then optimize over this constant. The candidate of type t from party i, therefore, solves

$$\min_{\mathbb{x}} \mathbb{E}_\xi C^t(\mathbb{x}) \quad \text{subject to} \quad \sum_{k=1}^{n} \frac{q_k^{iN} - q_k^{iE}}{\sigma_k^2} x_k = K. \tag{8}$$

Introducing Lagrange multipliers λ^{it} for $i \in \{R, D\}$ and $t \in \{N, E\}$, and differentiating with respect to x_k, we arrive at the following:

$$x_k^{RN} = b_k^{RN} + \frac{q_k^{RN} - q_k^{RE}}{2\beta_k \sigma_k^2} \lambda^{RN}, \qquad x_k^{RE} = b_k^{RE} + \frac{q_k^{RN} - q_k^{RE}}{2\beta_k \sigma_k^2} \lambda^{RE}; \tag{9}$$

$$x_k^{DN} = b_k^{DN} + \frac{q_k^{DN} - q_k^{DE}}{2\beta_k \sigma_k^2} \lambda^{DN}, \qquad x_k^{DE} = b_k^{DE} + \frac{q_k^{DN} - q_k^{DE}}{2\beta_k \sigma_k^2} \lambda^{DE}; \tag{10}$$

Once again, the constraints are binding, so the Lagrange multipliers λ^{it}, $i \in \{R, D\}$ and $t \in \{iN, iE\}$, are positive. We next argue that these multipliers are all the same, and in particular $\lambda^{iN} = \lambda^{iE} = \lambda^i$ for $i \in \{R, D\}$. The assumptions about the likelihood of which candidate is popular imply that the median voter ends up supporting one of RN and DN with probability $\theta > \frac{1}{2}$, and one of RE and DE with probability $1 - \theta$. Within each pair, the ex ante probability with which a candidate from each party is elected is equal.

Using this information, we can proceed as follows. Consider candidate RN, who is ex ante as popular as candidate DN and more popular than candidates RE and DE. With probability $\frac{1}{2}$, candidate RN meets candidate DN, in which case the probability RN wins the election is $\Pr(\Pr(RN \text{ is popular}) > \Pr(DN \text{ is popular}))$; with probability $\frac{1}{2}$, the opponent is candidate DE, in which case the relevant probability is $\Pr(\Pr(RN \text{ is popular}) > \Pr(DE \text{ is popular}))$. Now consider candidate RE. Similarly, with probability $\frac{1}{2}$, candidate RE faces candidate DN, in which case the relevant probability is $\Pr(\Pr(RE \text{ is popular}) > \Pr(DN \text{ is popular}))$; with probability $\frac{1}{2}$, the opponent is candidate DE, in which case the relevant probability is $\Pr(\Pr(RE \text{ is popular}) > \Pr(DE \text{ is popular}))$. Note that $\Pr(\Pr(RE \text{ is popular}) > \Pr(DE \text{ is popular})) = \Pr(\Pr(RN \text{ is popular}) > \Pr(DN \text{ is popular}))$ and $\Pr(\Pr(RE \text{ is popular}) > \Pr(DN \text{ is popular})) = \Pr(\Pr(RN \text{ is popular}) > \Pr(DE \text{ is popular}))$.

Since the disutility of losing to candidates DN and DE is the same for either candidate RN or candidate RE, we have that both RN and RE face the same optimization problem. Therefore, $\lambda^{RN} = \lambda^{RE} = \lambda^{R}$. Similarly, $\lambda^{DN} = \lambda^{DE} = \lambda^{D}$. From (9)-(10), it follows that $\mathbb{q}^{RN} - \mathbb{q}^{RE} = \mathbb{b}^{RN} - \mathbb{b}^{RE}$ and $\mathbb{q}^{DN} - \mathbb{q}^{DE} = \mathbb{b}^{DN} - \mathbb{b}^{DE}$, and, therefore, we have $\lambda^{R} = \lambda^{D} = \lambda$.

Proposition 9. *In equilibrium, candidates choose campaign rhetoric vectors*

$$q_k^{iN} = b_k^{iN} + \frac{b_k^{iN} - b_k^{iE}}{2\beta_k \sigma_k^2}\lambda, \qquad q_k^{iE} = b_k^{iE} + \frac{b_k^{iN} - b_k^{iE}}{2\beta_k \sigma_k^2}\lambda, \qquad i \in \{R, D\}.$$

As in the case of identical parties, the multiplier λ is a function of parameters β_k, σ_k^2, and $|b_k^{iN} - b_k^{iE}|$, $k = 1, ..., n$. The comparative statics with respect to β_k, σ_k^2, and $|b_k^{iN} - b_k^{iE}|$ are similar to those in the case of identical parties, and we do not repeat them to economize on space.

6.2 Robustness

What happens if the ideal points $\mathbb{b}^{RN}, \mathbb{b}^{RE}, \mathbb{b}^{DN}$, and $\mathbb{b}^{DE}$ form a generic tetrahedron in the n-dimensional Euclidean space, but not necessarily a regular one? Note first that there always exists a linear transformation of the Euclidean space that maps one tetrahedron onto another one, and this transformation can be used to establish the existence (and, in some circumstances, uniqueness) of an appropriate equilibrium if the tetrahedron is not regular.

In fact, the regularity requirement does not impose too stringent conditions as the points $\mathbb{b}^{RN}, \mathbb{b}^{RE}, \mathbb{b}^{DN}$, and $\mathbb{b}^{DE}$ that form the regular tetrahedron can be located arbitrarily relative to the coordinate hyperplanes. Thus, Figure 1, in which candidates of two nonidentical parties diverge in their campaign rhetoric on the cultural dimension but converge on the economic dimension, is a particular case of a regular tetrahedron in three-dimensional Euclidean space, projected onto an appropriate two-dimensional plane.[14]

By similar logic, the case of identical parties that we considered in Section 3 is a particular case of the more general model with heterogeneous parties. To see this, take any two ideal points of candidates, $\mathbb{b}^{N}$ and $\mathbb{b}^{E}$ in the $n-$dimensional policy space. Consider a tetrahedron in the $n+2-$dimensional space with vertices in $(\mathbb{b}^{N}, t, -t)$, and $(\mathbb{b}^{E}, t, t)$, which will be candidates

[14] Any four points on a two-dimensional plane are an orthogonal projection of a regular tetrahedron located in a five-dimensional Euclidean space.

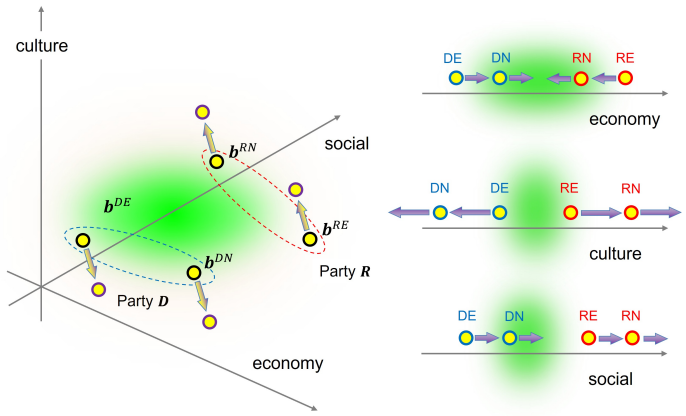


Figure 5: Candidates choose campaign rhetoric in 3-dimensional space. Parties' platforms converge to the median on the economic dimension, diverge on the cultural dimension, and over-pander on the social dimension.

frrom party R, and $(\mathbb{b}^N, -t, t)$, and $(\mathbb{b}^E, -t, -t)$, which will be candidates from party D. If we let $t = \frac{1}{2}\sqrt{|\mathbb{b}^N - \mathbb{b}^E|}$, this tetrahedron is regular, as in the setup with heterogeneous parties. At the same time, projecting this tetrahedron on the initial $n-$dimensional space gives two identical parties, each of which has two candidates with ideal points $\mathbb{b}^N$ and $\mathbb{b}^E$ as in the main setup with identical parties. We obtain our special case by finally assuming that the costs of signaling on the "artificial" dimensions are high, so that only the two initial dimensions will be used for signaling.

There is another interesting possibility that this example points to. Focusing on campaign rhetoric on the economic dimension may make the analyst conclude that there is Downsian convergence—despite lack of commitment to policies. However, there will be divergence on the cultural dimension. Even though voters may not care much about cultural policies, this divergence is very consequential, because it is determining which candidate gets elected.

Finally, it is straightforward to construct an example of party competition across three or more political issues so that the paries' rhetoric converges on the first and the second issues, while diverging and leading to overpandering on the third one. Figure 5 illustrates this case, focusing on an example with the three dimensions corresponding to economic, social and cultural policies. As noise on the economic dimension is high, candidates' rhetoric is in the vicinity of their policy preferences. The same is true on the social dimension. Even though these issues may be most important to them, voters cannot infer which candidate will be pursuing the policies that they prefer. In the case where the more popular types within each party have fairly close prefer-

ences on these two dimensions, there is a version of Downsian convergence on both dimensions. However, on the cultural dimension, which is again assumed to be more precise and thus used predominantly for signaling, there is once more divergence which determines which candidate gets elected.

The tractability of our framework would allow other examples with various diverse patterns of convergence and divergence across dimensions to be constructed easily.

7 Conclusion

One of the most significant political developments of the last two decades is the rising prominence of cultural issues in many industrialized, and some developing, nations, often led by anti-establishment right-wing parties. This has happened despite the fact that economic concerns remain a priority for many voters. In this paper, we argue that this pattern can be understood as a result of the changing nature of political messaging. To formalize these intuitions, we develop a new model of multi-dimensional signaling.

Our model is, to the best of our knowledge, the first framework that allows for multi-dimensional political signaling and, as we show, is quite tractable. We achieve this by departing from the standard signaling assumption, where signals are perfectly observed by the uninformed parties (here the voters). Instead, we assume that campaign rhetoric, which candidates choose as a signal, is only imperfectly observable. This not only is realistic, but also leads to a pattern in which both the more and less popular candidates use signaling—for the former as a way of separating themselves and for the latter in an attempt to pool with the more popular type.

We start with a particular straightforward case in which the two parties are identical, but our model retains tractability and allows for closed-form solutions for equilibrium strategies in a far more general environment.

Another major contribution of the paper is a new theory of the rise of cultural politics. This builds on our ability to analyze multidimensional signaling and leverages our tractable comparative statics. Consider our canonical application with two-dimensional policies, one corresponding to economic policy and the other one to cultural policy. Suppose that economics is what voters care about. However, reflecting the complexities associated with policy-making in a world

where the nature of economic relations and risks are changing rapidly in the face of globalization and new digital technologies, it is difficult for voters to parse whether a given economic campaign rhetoric is in line with their preferences. Put differently, the precision of the signals sent by economic campaign rhetoric is low. In contrast, cultural signals are easy to understand—for example, there can be clear signals that are anti-immigrant, nationalist, anti-cosmopolitan, etc. As a result, politicians gravitate towards cultural issues for signaling, even though it is still economics that voters care about most.

Paradoxically, there could be a type of policy convergence in economics, while there is divergence on cultural messaging both between the two parties and away from the cultural positions most preferred by the median voter. Alternately, the desire of the less popular type to mimic the more popular type may be so strong that both types may take fairly extreme positions on the cultural dimension. Despite the divergence of the cultural campaign rhetoric from the median voter's preferences, cultural politics may be *popular*, meaning that it actually wins elections. Further divergence between the cultural preferences of the less and more popular types and additional increases in the precision of cultural signals intensify cultural signaling.

The tractability of our model enables several interesting directions for future research.

First, the model remains tractable with an arbitrary number of policy and campaign rhetoric dimensions. Exploring further how different dimensions interact with each other is an interesting theoretical direction.

Second, our modeling of social pressure rooted in the cost of deviating from established social norms of rhetoric and policy opens the way to several new avenues of inquiry. Most straightforwardly, one could derive a model of political entrepreneurship working through efforts to change social norms. Equally interesting would be a dynamic model in which social norms themselves are endogenous and they change as a result of past campaign rhetoric. This would lead to a setup with two-way dynamic interactions between political outcomes and social norms.

Third, it is also straightforward to introduce into this framework other sources of noisy signals. For example, the media or investigative journalism can also act as another source of signals for voters. In this case, the quality of the media would have an important role in the form of politics that emerges. If the media clarifies the economic signals and reduces their imprecision, then cultural politics becomes less important. On the other hand, if the media goes after sensationalist

news and promotes more controversial statements, they could increase the visibility of cultural signals (especially extreme cultural rhetoric), facilitating the rise of cultural politics.

Social media as a source of (imprecise) political information can also change the equilibrium patterns of campaign rhetoric. An interesting direction of future research in this regard would be to incorporate into an extended framework of this type the incentives and market structure of different media outlets to derive more structured results on what types of information they will provide to voters (see Noy and Rao, 2025, for a first attempt in this vein). Such extensions would lead to a number of additional comparative statics which would be interesting to explore empirically. It would be particularly interesting to study the effects of the market share of different types of media outlets and the precision and reliability of the information they convey on equilibrium campaign rhetoric.

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Appendix

A1 Deriving Equilibrium Strategies

Introduce Lagrange multipliers λ^t, $t \in \{N, E\}$. First, (2) implies that the probability of being elected is constant for any two rhetorics x and x' such that $\sum_{k=1}^{n} \frac{q_k^A - q_k^B}{\sigma_k^2} x_k = \sum_{k=1}^{n} \frac{q_k^A - q_k^B}{\sigma_k^2} x'_k$. Thus, we can maximize (1) under the assumption that $\sum_{k=1}^{n} \frac{q_k^A - q_k^B}{\sigma_k^2} x_k$ is equal to some constant K, and then do general optimization. This maximization problem is easier because given the same probability of being elected, the expectations of the first and last terms are constant. As the new constraints are always binding, the Lagrange multipliers are non-zero, so we will use them as parameters afterwards.

Now, the optimal $\mathbb{x}$ must minimize, after taking expectations with respect to ξ, the function

$$\sum_{k=1}^{n} \beta_k \left(x_k - b_k^t\right)^2 - \lambda^t \left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} x_k - K \right).$$

Differentiating with respect to x_k, $k \in N$ yields first-order conditions:

$$2\beta_k \left(x_k - b_k^t\right) = \frac{q_k^N - q_k^E}{\sigma_k^2} \lambda^t,$$

which may be rewritten as

$$x_k^t = b_k^t + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^t, \tag{A1}$$

whereas λ^t could be found from the constraint.

Since the same argument applies to candidate from party D, this means that both candidates must be effectively choosing scalars λ^N and λ^E, with their rhetoric then given by vectors $\mathbb{x}^R$ and $\mathbb{x}^D$ such that

$$\begin{aligned} x_k^{RN} &= b_k^N + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^N, \qquad x_k^{RE} = b_k^E + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^E, \\ x_k^{DN} &= b_k^N + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^N, \qquad x_k^{DE} = b_k^E + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \lambda^E. \end{aligned}$$

Given a pair of candidates' choices $\left(\lambda^N, \lambda^E\right)$, the probability that a candidate from party R prevails can be calculated as follows. First, we need to calculate the probability that the candidate of party R of type N wins if the candidate of party D is of type B.

$$\begin{aligned} P^R\left(t^R = N, t^D = E, \lambda^N, \lambda^E\right) &= \theta \Pr\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(s_k^N - s_k^E\right) > 0 \right) + (1-\theta) \Pr\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(s_k^N - s_k^E\right) < 0 \right) \\ &= 1 - \theta + (2\theta - 1) \Pr\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(s_k^N - s_k^E\right) > 0 \right) \\ &= 1 - \theta + (2\theta - 1) \Pr\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(\left(b_k^N - b_k^E\right) + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \left(\lambda^N - \lambda^E\right) + \left(\xi_k^R - \xi_k^D\right) \right) > 0 \right) \\ &= 1 - \theta + (2\theta - 1)\, G\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(b_k^N - b_k^E + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \left(\lambda^N - \lambda^E\right) \right) \right), \end{aligned}$$

where $G(\cdot)$ is the cdf of $\mathcal{N}\left(0, 2\sum_{k=1}^{n}\left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2\right)$.

If the candidates of both parties F and S are of type N, and candidates of type N of both parties use the same λ^N, then the candidate of party R wins with probability $\frac{1}{2}$.

Now, suppose that in equilibrium, candidates of types N and E choose campaign rhetoric vectors $\mathbb{q}^N$ and $\mathbb{q}^E$ which, as we showed above, must satisfy

$$q_k^N = b_k^N + \frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}m^N, \qquad q_k^E = b_k^E + \frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}m^E$$

for some scalars m^N and m^E. Let us denote the policy disutility of a politician if the policy favored by the other type is implemented by

$$B = -U^N\left(\mathbb{b}^E\right) = -U^E\left(\mathbb{b}^N\right) = -\sum_{k=1}^{n}\left(b_k^N - b_k^E\right)^2.$$

Consider the maximization problem of the politician from party R. Suppose that $t^R = N$. (The other case is symmetric.) The candidate chooses the optimal λ^N.

$$\begin{aligned} Z^N\left(\lambda^N\right) &= \mathbb{E}_{t^D,\xi^i\xi^j}\left(U^N(\mathbb{p}) - C^N\left(b_k^N + \frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}\lambda^N\right) + W\mathbb{1}_{w^i=1}\right) \\ &= -\sum_{k=1}^{n}\beta_k\left(\frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}\lambda^N\right)^2 + \frac{1}{2}WP^N\left(\lambda^N, m^N\right) + \frac{1}{2}\left(WP^N\left(\lambda^N, m^E\right) - D\left(1 - P^N\left(\lambda^N, m^E\right)\right)\right). \end{aligned}$$

In the above formula, the term $\frac{1}{2}WP^N\left(\lambda^N, m^N\right)$ corresponds to the case when the candidate from party D is of the same type N, which happens with probability $\frac{1}{2}$. The term $\frac{1}{2}\left(WP^N\left(\lambda^N, m^E\right) - B\left(1 - P^N\left(\lambda^N, m^E\right)\right)\right)$ corresponds to the case when the candidate of party D is of a different type E, also with probability $\frac{1}{2}$. Note that the candidate gets policy disutility only after losing to the competitor of the other type.

Let us differentiate this function with respect to λ^N to obtain the first-order condition. (The second-order condition, guaranteeing the concavity of the function, is checked below.) We have

$$\begin{aligned} \frac{dZ^N\left(\lambda^N\right)}{d\lambda^N} &= -2\sum_{k=1}^{n}\beta_k\left(\frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}\right)^2\lambda^N \\ &\quad + \frac{1}{2}W(2\theta - 1)\left(\sum_{k=1}^{n}\frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k\sigma_k^4}\right)g\left(\sum_{k=1}^{n}\frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k\sigma_k^4}\left(\lambda^N - m^N\right)\right) \\ &\quad + \frac{1}{2}(W + B)(2\theta - 1)\left(\sum_{k=1}^{n}\frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k\sigma_k^4}\right)g\left(\sum_{k=1}^{n}\frac{q_k^N - q_k^E}{\sigma_k^2}\left(b_k^N - b_k^E + \left(\frac{q_k^N - q_k^E}{2\beta_k\sigma_k^2}\right)\left(\lambda^N - m^E\right)\right)\right), \end{aligned}$$

where $g(\cdot)$ is the pdf of $\mathcal{N}\left(0, 2\sum_{k=1}^{n}\left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2\right)$.

Now, since in equilibrium $\lambda^N = m^N$, the first-order condition is equivalent to

$$\begin{aligned} 0 &= -\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} m^N \\ &+\frac{1}{2} W (2\theta - 1) \left(\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} \right) g(0) \\ &+\frac{1}{2} (W + B)(2\theta - 1) \left(\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} \right) g\left(\sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(b_k^N - b_k^E + \frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \left(m^N - m^E \right) \right) \right). \end{aligned}$$

A similar calculation gives the first-order condition for candidates of type E, in which the only difference is that m^E replaces m^N. (In the last line, we used the symmetry of $g(\cdot)$ around 0; so, the formula looks exactly the same.)

A2 Second Order Conditions

Consider the second derivative of the maximization problem:

$$\begin{aligned} \frac{d^2 Z\left(\lambda^N\right)}{\left(d\lambda^N\right)^2} &= -\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} \\ &+\frac{1}{2} W (2\theta - 1) \left(\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} \right)^2 g'\left(\sum_{k=1}^{n} \frac{(q_k^N - q_k^E)^2}{2\beta_k \sigma_k^4} \left(\lambda^N - m^A \right) \right) \\ &+\frac{1}{2} (W + B)(2\theta - 1) \left(\sum_{k=1}^{n} \frac{\left(q_k^N - q_k^E\right)^2}{2\beta_k \sigma_k^4} \right)^2 g' \sum_{k=1}^{n} \frac{q_k^N - q_k^E}{\sigma_k^2} \left(b_k^N - b_k^E + \left(\frac{q_k^N - q_k^E}{2\beta_k \sigma_k^2} \left(\lambda^N - m^B \right) \right) \right). \end{aligned}$$

Note that the maximum value of the derivative of g, which is the density of the normal distribution $\mathcal{N}\left(0, 2\sum_{k=1}^{n} \left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2\right)$, is equal to $\frac{1}{\sqrt{2\pi e} 2 \sum_{k=1}^{n} \left(\frac{b_k^N - b_k^E}{\sigma_k}\right)^2}$. Thus, we have, taking into account that $\mathbb{q}^N - \mathbb{q}^E = \mathbb{b}^N - \mathbb{b}^E$,

$$\frac{d^2 Z\left(\lambda^N\right)}{\left(d\lambda^N\right)^2} \leq \sum_{k=1}^{n} \frac{\left(b_k^N - b_k^E\right)^2}{2\beta_k \sigma_k^4} \left(-1 + \frac{(W + B)}{4\sqrt{2\pi e}} \frac{\sum_{k=1}^{n} \frac{\left(b_k^N - b_k^E\right)^2}{\beta_k \sigma_k^4}}{\sum_{k=1}^{n} \frac{\left(b_k^N - b_k^E\right)^2}{\sigma_k^2}} \right)$$

If $\frac{d^2 Z(\lambda^N)}{\left(d\lambda^N\right)^2} < 0$, the maximand is concave. □