Mystifying but Not Misleading: When does Political Ambiguity *Not* Confuse Voters?*

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Abstract

The purpose of political campaigns in democracies is to provide voters with information that allows them to make "correct" choices, that is, vote for the party/candidate whose proposed policy or "position" is closest to their ideal position. In the world where political talks are often ambiguous and imprecise, it then becomes important to understand whether correct choices can still be made. In this paper we identify two elements of *political culture* that are key to answering this question: (i) whether or not political statements satisfy a so-called "grain of truth" assumption, and (ii) whether or not politicians make statements which are comparative, that is contain information about politicians' own position relative to that of their adversaries. The "grain of truth" assumption means that statements, even if vague, do not completely misrepresent the true positions of the parties. We find that only in case when political campaigning is comparative and has a grain of truth, voters will always make correct choices as if they were fully informed. Therefore, imprecision of political statements should not be a problem as long as comparative campaigning is in place.

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1 Introduction

For a well functioning democracy it is important that voters are able to determine which politician (political party or presidential candidate) would best represent their political views. Without accurate information, voters may make "wrong" choices and it is not clear whether the party or candidate with the largest vote share best represents the majority opinion of the population. This is ever more relevant as politicians are notorious for making statements that are ambiguous and stretch the truth. During political campaigns, they try to convince the electorate of the policy or reforms that they intend to implement once their party is in power, and in general, hardly any restriction can be imposed on truthfulness and precision of the provided information.[1] In such environment a key concern is whether the ambiguity of political statements disorients voters and leads to "wrong" choices or whether under some conditions voters are still able to detect which party or candidate they like best.

This paper proposes an analytical framework to study this issue. It considers political campaigns where candidates' statements can be vague and identifies two conditions on these campaigns that are generically necessary and sufficient for "correct" voting decisions in *any* equilibrium. The first condition is that the statements are comparative in nature in that they involve a discussion of not only own intended policies but also the intended policies of the adversaries. We will refer to this case as *comparative political campaigning.* The second condition is what we call a "grain of truth" condition. The "grain of truth" condition basically requires that candidates should not be able to blatantly lie about either their own or their adversaries' positions making statements that are unrestricted in any way. But it leaves them the possibility to be vague and not disclose these positions precisely. Only when both conditions hold, will voters be able to always decipher their preferred party, the one they would have also chosen had they received full information about the candidates' intended policies. Thus, this paper draws attention to the features of political discourse that must be present in any democratic society: it is important that candidates make comparative statements (even if they are vague) and that they are not able to blatantly lie and get away with it. We show that in this case (and only then) the nature of fuzziness in the politicians'

[1] The fact that politicians' talks can be and often are ambiguous is well known and documented in the literature (Downs, 1957; Kelley, 1960; Page, 1976; Campbell, 1983; Edelman, 1985; Laslier, 2006). It is sometimes attributed to rational seeking of support, approval or votes. A recent example of political ambiguity is a statement made by the ex-Minister of Finance of Greece, Yanis Varoufakis, who declared that the government was proud of the "degree of creative ambiguity" used in drafting reforms set as the condition for prolonging the country's bailout program (source: *http://www.theguardian.com/world/2015/feb/28/greece-poll-surge-syriza-alexis-tspiras*).

statements is such that voters can always deduce which of the parties they prefer and make correct choices.

To analyze information disclosure in political campaigns we consider a simple spatial model of elections. Two political parties have positions on a line segment which represents a space of different policies or reforms that a party can advocate. Focusing on the incentives for information disclosure, in the base model we regard the positions themselves as fixed, and we address strategic choice of positions in an extension.[2] In either case, we examine the situation where political parties know not only their own position, but also that of their adversary. This reflects the fact that political parties usually have a strong interest in learning their chances of success in the elections and have therefore an incentive to find out the true, intended policy of their rival. Voters do not know the positions of the parties and have to rely on the statements that are disclosed. They do not believe these statements at face value, and consider which party has an incentive to deliver which statement. Voters derive utility from voting for the party whose true position is closest to their ideal policy and only vote if their idiosyncratic cost of voting does not exceed this utility.[3] Parties choose the information they release about their political positions by announcing a subset of positions on the unit line. They do so with the incentive to maximize their share of votes in the total voter turnout, which – at least in electoral systems with *proportional representation* – determines their share in political power, such as a percentage of parliamentary seats won.[4] In footnotes and in the final section we compare our results in this setting with the results we would obtain under an alternative *majority rule* specification. The latter is more appropriate for modeling presidential elections, where candidates only care about whether or not they win the campaign.

We perform an equilibrium analysis of this model. First, suppose that the grain of truth condition does not hold and each party is free to make any statement it likes. In that

[2]Thus, the main body of our paper studies the mirror image of traditional spatial models of elections, going back to Hotelling (1929) and Black (1948). While in that literature political parties choose their positions and the electorate is immediately informed about them, in the central case of our model positions cannot be chosen, but what is disclosed about them is a result of strategic competition between the parties.

[3]It is easy to show that all our arguments continue to hold in case when voting is not costly. We also note that the assumption of utility derived directly from voting is standard in the literature on "expressive" voting (Schuessler, 2000; Glaeser et al., 2005; Brennan and Buchanan, 1984; Brennan and Lomasky, 1984, 1993; Glazer, 1987; Brennan and Hamlin, 1998, 2000). The idea of expressive voting goes back to Buchanan (1954) and Tullock (1971) and is central to the public-choice perspective on political economy (Mueller, 2003; Hillman, 2009, 2010). It also finds support in experimental literature, which reveals extensive prevalence of decisions predicated on expressive utility (Tyran, 2004; Feddersen et al., 2009; Fischer, 1996).

[4]Proportional representation is used in the majority of countries. For the examples and detailed information on voting systems see the ACE Electoral Knowledge Network at $http://aceproject.org/epic-en/CDMap?question=ES005\&set_language=en$.

case, the model transforms into a cheap talk game where a very large set of outcomes can be supported in equilibrium.[5] To see this, note that if in equilibrium both parties do not disclose any information, then upon observing a deviation to a more precise statement, voters can have arbitrary beliefs, and these beliefs can always be chosen so that the deviation is not gainful. It is also clear that if statements are completely uninformative, then voters may easily make the wrong choice, i.e., a choice they would regret had they received perfect information about political positions. The main part of the paper therefore focusses on political cultures that do satisfy the grain of truth condition and analyzes the second dimension of political culture: whether or not politicians make comparative statements. We show that without comparative campaigning, there exists a continuum of equilibria with disclosure statements ranging from full disclosure to full nondisclosure. To see why parties may create maximum fuzziness in this case, consider that voters know that candidates are aware not only about their own position, but also about the position of their adversary. If one party unexpectedly discloses its own position, voters may believe that the party does so only because it knows that the position of the adversary is closer to the median voter than its own. Given such beliefs, parties are better off under maximal fuzziness. It is then straightforward that a nondisclosure equilibrium in this case often results in wrong voting choices. We say that such equilibrium is *ex-post inefficient*, in the sense that some voters may regret the choices they made after the true policies of the parties become transparent. Moreover, the overall vote shares obtained by politicians in such nondisclosure equilibria are often different from those that they would obtain under full information. Therefore, also the resultant division of power and implemented government policy in this case may differ from those that would prevail under full disclosure.

Under comparative campaigning, the situation is different. In that case, each party can always guarantee itself and the other party the vote shares belonging to full disclosure. If these vote shares are distorted due to some nondisclosing statements, it then must be the case that at least one of the parties has an incentive to disclose both its own and the adversary's position. This leaves open the possibility of existence of some special types of nondisclosure equilibria where parties' vote shares are the same as under full disclosure. We show that if such equilibria exist, then for a *generic* combination of parties' positions, the voters will still be able to deduce their most preferred party and hence, vote as they would do under full information. Moreover, as parties vote shares in these equilibria are the same as under

[5]See, Crawford and Sobel (1982) and the subsequent literature on cheap talk games.

full disclosure, the resultant government policy is also the same. Thus, we conclude that vagueness of statements in political campaigns is only guaranteed to not mislead voters if these statements are comparative and have a grain of truth. Essentially, the imprecision of political statements that are at least "minimally truthful" does not appear to be a problem as long as politicians are able to correct their opponent whenever that is in their own interest.

In an extension of the model, we show that the main thrust of our results continues to hold when political parties can choose their positions. In that case, the median voter theorem applies and both parties' positions are perfectly deduced by voters when parties engage in comparative political campaigning. Without comparative campaigning a continuum of nondisclosure equilibria exist where parties choose positions that are different from the median voter.[6] Thus, in the former case, voters can always vote for the "right" party, while in the latter, they may make choices that are different from the ones they would have made under full information.

There appears to have been little research on the strategy of political disclosure and the role of comparative statements. Recent exceptions that are most closely related to our work are Schipper and Woo (2015) and Demange and Van der Straeten (2013).[7] Both papers assume that politicians do not lie, but may make statements that are either ambiguous or completely uninformative on one of the candidates. Schipper and Woo (2015) report an unraveling result: all issues that voters may not have been aware of are raised, and all information on candidates' positions (on all issues) is revealed to voters even in the absence of comparative campaigning. The reason why comparative political campaigning is not necessary to rule out other equilibria in Schipper and Woo (2015) is that they consider the possibility of microtargeting of specific voters and allow for just a few voters, whereas we consider situations where microtargeting is not possible and each voter's influence on the election outcome is negligibly small. Comparative campaigning is also examined in Demange and Van der Straeten (2013), but in their model information about the opponent is "leaked involuntarily" rather than chosen strategically. More generally, the element of strategic interaction between parties, which is key in our analysis, is omitted from their model, as parties

[6]When comparative campaigning is not allowed, one needs to impose an additional restriction on out-of-equilibrium beliefs, such as passive beliefs (in the sense of McAfee and Schwartz, 1994), to obtain the median voter result. Without such a restriction on beliefs, a continuum of equilibria exists.

[7]Other models of political disclosure and ambiguity include Downs (1957), Shepsle (1972), Page (1976), McKelvey (1980), Alesina and Cukierman (1990), Glazer (1990), Aragones and Neeman (2000), Aragones and Postlewaite (2007), Meirowitz (2005), Laslier (2006), Callander and Wilson (2008) and Jensen (2009). An informal discussion is also provided in Brams (1976) and Brams (1978), while an empirical study of political disclosure is offered by Djankow et al. (2010).

choose disclosure strategies taking into account the effect on voters of their own strategy only. Also, both papers, Schipper and Woo (2015) and Demange and Van der Straeten (2013), take the positions of political parties as given and do not study the interaction between strategic position choices and disclosure statements.

Our paper is also complementary to the literature on positive and negative political campaigning most recently represented by Polborn and Yi (2006), Mattes (2008), Li and Li (2013) and Bhattacharya (2014). Positive campaigning means that a political candidate reveals (usually favorable) information about himself, while negative campaigning indicates (usually detrimental) information about the rival. In our model, non-comparative statements can be thought as representing the case of positive campaigning, while the notion of comparative statements, providing information about *both* competing candidates, is new.[8] Moreover, in our paper we are primarily interested in the extent of information disclosure under different kinds of political campaigns and to that end we allow for a continuum of possible disclosure strategies. By contrast, in the "two-type models" of the aforementioned papers the range of disclosure outcomes is much more limited. For example, in Polborn and Yi (2006) candidates either remain silent or provide correct, precise information on their own or the opponent's characteristic, and in Bhattacharya (2014) the information is fully revealed only about the true type of the "focal" candidate, who is the target of both candidates' campaigns, and nothing is revealed otherwise.

Finally, our paper is related to a large literature on disclosure of product characteristics by firms. This literature goes back to Grossman and Hart (1980), Grossman (1981), Jovanovic (1981), Milgrom (1982) and more recently, Daughety and Reinganum (1995) and Board (2003) that address the necessity of disclosure laws forcing firms to reveal the quality and/or ingredients of the products they produce or the production technologies they adopt. Lately this literature has been extended to address the question of disclosure of horizontal product attributes, rather than vertical attributes such as quality (see, e.g., Anderson and Renault, 2009; Sun, 2011; Celik, 2014; Koessler and Renault, 2012, and Janssen and Teteryatnikova, 2016). Our paper builds on the analysis of Janssen and Teteryatnikova (2016), but excludes the price setting stage, that is key in competition between firms, and adds the cost of voting,

[8] In the extension, Li and Li (2013) allow or the possibility of "contrast campaigns" where a candidate can run both, a positive and a negative campaign at the same time. However, in line with the overall theme of the paper, this extension analyzes the choice of the campaign type, rather than the extent of disclosure in this case relative to others. It demonstrates that the main finding of the paper, that comparative advantage determines the high type's choice of positive versus negative campaign is not due to the restriction that only one kind of campaign may be used.

that is essential in voting behaviour. The absence of price competition makes the analysis cleaner and allows us to focus on the essential mechanism underlying the incentives to disclose. This enables the analysis of welfare implications of nondisclosure and parties' position choice.

The rest of the paper is organized as follows. The next section describes the model. Section 3 describes a full disclosure equilibrium that exists with and without comparative political campaigning and with and without the grain of truth condition. It also introduces the notion of equilibrium ex-post efficiency and explains that without the grain or truth assumption, inefficient voting is common. We then focus on the scenario where the grain of truth condition holds. Sections 4 and 5 provide the analysis of the two main cases considered – with and without comparative campaigning. Section 6 presents the model extension, where parties' positions are chosen strategically. Finally, section 7 concludes with a brief discussion.

2 Model

Consider elections where two parties compete for votes by making statements about their intended policy or policy platform. The policy platform of each party is represented by a position on the unit interval.[9] Policy platforms with values close to 0 can be regarded as left-wing positions, while policy platforms with values close to 1 as right-wing positions. Voters have preferences over policies and the ideal policy of a voter is also represented by a position on the unit interval. We denote by $x_1, x_2 \in [0,1]$ the positions of the two parties and by $\lambda \in [0,1]$ the position of a voter. We focus on disclosure decisions of the political parties and in the central case of this model consider policy positions themselves as exogenously given. Political parties know not only their own position, but also the position of the adversary. This reflects the fact that politicians usually have a strong interest in learning their prospects for success in the elections so that they find ways to learn the true position of their adversary. On the other hand, voters do not know the true positions of the political parties and have to rely on the statements that are disclosed. Notice that since parties know their own position and the position of the adversary, the *type* of each party is the *pair* of positions, (x_1, x_2). In what follows, the first element in the pair (x_1, x_2) stands for the position of party 1, and the second element for the position of party 2.

[9] An alternative approach to representing a policy platform, which may include more than one issue of interest to voters, would be to consider a position (and disclosure decision) of a party on each issue independently. Such approach is, in fact, equivalent to our simpler single-position approach here as soon as we assume that in order to maximize the percentage of seats won, political parties need to get the most favorable outcome on each issue. This assumption is reasonable when politicians do not know precisely how voters make their final decision based on the combination of most favored positions on the individual issues.

The value of a voter's favourite policy, λ, follows a continuous distribution with full support on $[0,1]$, symmetric around the middle point 0.5.[10] We denote the probability density function of this distribution by g and the cumulative distribution function by G, so that $G(0)=0$, $G(1)=1$ and $G(0.5)=\int_0^{0.5} g(\lambda)d\lambda = 0.5$. In this continuous setting, an individual vote is not decisive in determining the outcome of an election. Therefore, following a convention in the literature on "large" elections, we assume that voters vote "expressively" and derive utility from voting for the party whose true position is closer to theirs.[11] Namely, let voter's utility, or benefit, from voting for party i located at x_i be $b_i = -t(\lambda - x_i)^2$, where $t(\lambda - x_i)^2$ can be thought of as a cost of mismatch between the policy of party i, x_i, and voter's ideal policy, λ. By the same token, utility from voting against party j located at x_j is equal to $-b_j$. Thus, the overall utility from voting for party 1 and against party 2 is given by $u_1 = t(\lambda - x_2)^2 - t(\lambda - x_1)^2$ and the overall utility from voting for party 2 and against party 1 is $u_2 = t(\lambda - x_1)^2 - t(\lambda - x_2)^2 = -u_1$.[12] The maximum of these two utilities does not exceed the upper bound $\overline{u}$, which is the largest value that either of u_1, u_2 can reach across all $\lambda \in [0,1]$ and all $x_1, x_2 \in [0,1]$. It is easy to see, that in our framework, $\overline{u} = t$.

Given such preferences and given the information about positions of the two parties, voters support the party whose policy platform is perceived as closest to their ideal policy. Voting is costly, and therefore, people vote only if their cost of voting, c, does not exceed the utility gain.[13] Namely, a voter with position λ votes when

$$c \leq \max\{tE\left((\lambda - x_2)^2|\mu_2\right) - tE\left((\lambda - x_1)^2|\mu_1\right), tE\left((\lambda - x_1)^2|\mu_1\right) - tE\left((\lambda - x_2)^2|\mu_2\right)\}, \quad (1)$$

where $tE\left((\lambda - x_i)^2|\mu_i\right)$ is the expectation of the mismatch cost associated with the position of party i, conditional on voter's belief about this party's position.

The cost of voting c is independent of voters' political preferences and drawn from the uniform distribution with full support on $[0,\overline{c}]$. We consider $\overline{c} \geq \overline{u}$, so that for every voter

[10] The assumption of symmetry around 0.5 is imposed for expositional purposes and is not crucial for the results. The changes one would need to introduce under an *arbitrary* distribution with full support on $[0,1]$ are nominal and have to do with the fact that the median voter is located at $E(\lambda)$ instead of 0.5.

[11] Models of "expressive" voting where people receive utility directly from voting include Schuessler (2000), Glaeser (1987) and Glaeser et al.(2005). Deriving utility from voting for the closest party may also reflect voters' preference for the policy regime where the favourite party's influence is stronger. However, this latter interpretation of utility requires citizens to overestimate the relevance of their vote to political outcomes.

[12] The main idea here is that voters prefer the party closest to them. This specific utility formulation, where voters derive utility not only from voting for the closer party but also against the farther, is not necessary in our framework. It is borrowed from Glaeser et al. (2005) and appears most convenient in a model where voting may be costly, as is assumed here.

[13] One can show that all our arguments go through also in case when voting is not costly, that is, $c = 0$ for all voters.

position $\lambda \in [0,1]$, there is a positive probability that the voter will abstain and a positive probability that she will vote. A voter's (realized) cost of voting is known to the voter but not known to the political parties who only know the cost distribution.

We denote by τ_1 and τ_2 the voter turnout for party 1 and party 2, respectively. Then $\pi_1 = \frac{\tau_1}{\tau_1+\tau_2}$ and $\pi_2 = \frac{\tau_2}{\tau_1+\tau_2}$ can be interpreted as respective shares of party 1 and party 2 in political power, or a percentage of parliamentary seats won by each party. Such a rule by which divisions in an electorate are reflected proportionately in the elected body is typical for electoral systems with *proportional representation*. In what follows we consider π_1 and π_2 as the pay-offs of party 1 and party 2, respectively.

The timing of the game in our benchmark model is as follows. At stage 0, Nature *independently* selects position x_1 for party 1 and x_2 for party 2 from a non-atomic density function $f(x)$.[14] Parties learn both positions but voters do not. At stage 1, both parties make statements about their positions. These statements may be precise and include just one point or vague and include multiple positions. Under *non-comparative political campaigning*, politicians provide information only about the position of their own party, and then a statement of each party is a subset of the unit segment, $S_i \subseteq [0,1]$, $i = 1,2$. Under *comparative political campaigning*, politicians can provide information about both parties' positions, and then a statement of each party is a subset of the unit square, $S_i \subseteq [0,1] \times [0,1]$. Notice that in the different cases $S_i = [0,1]$ or $S_i = [0,1] \times [0,1]$ can be interpreted as full nondisclosure of information by party i or a situation where a party remains silent. In the following, the two cases – with and without comparative campaigning – will be examined separately, but unless stated otherwise, the same notation and definitions apply throughout. The statements made by both parties are either not restricted in any sense or restricted by the *grain of truth* condition. The grain of truth condition means that $x_i \in S_i$ for $i = 1,2$ when there is no comparative campaigning and $(x_1, x_2) \in S_i$ for $i = 1,2$ when there is. The grain of truth condition ensures that even when political statements about the parties' proposed policies are fuzzy, plain lying (which is reporting a statement that does not contain the true position) about the parties' policies is not possible, or so costly that it is never optimal to do so.[15] Alternatively, if the grain of truth condition does not hold, then political statements are regarded as pure "cheap talk", without any restrictions imposed on them. Finally, at stage

[14]The probability measure function is called non-atomic if it has no *atoms*, i.e., measurable sets which have positive probability measure and contain no set of smaller but positive measure.

[15]In line with this idea, Banks (1990) and Callander and Wilkie (2007) explicitly model the cost of misrepresenting one's policy intentions.

2, voters observe the statements of the two parties and, given their cost of voting c, decide whether to vote and, if so, for which party. Voting decisions determine the pay-offs of the political parties and *ex-ante*, expected pay-offs/utility of voters. *Ex-post* pay-offs of voters are realized at the end of the game, when the outcomes of elections are implemented and uncertainty about the parties' true, intended policies is resolved. All aspects of the game are common knowledge.

To solve the game, we apply the concept of a *strong perfect Bayesian equilibrium* (Fudenberg and Tirole, 1991), where the only restriction on voters' beliefs off-the-equilibrium path is that they are identical across voters. The formal definition relies on the following specification of the strategy spaces. The strategy of party i is denoted by $s_i(x_i, x_j)$, where the image of s_i belongs to all subsets of $[0,1]$ (for non-comparative campaigning), or to all subsets of $[0,1]\times[0,1]$ (for comparative campaigning). The vector $v(\lambda, c, S_i, S_j)$ denotes the voting strategy of a voter with position λ and cost of voting c, when the parties' statements are S_i and S_j, respectively. We say that $v = \emptyset$ if the voter abstains, $v = (1,0)$ if the voter votes for party 1 and $v = (0,1)$ if she votes for party 2. Finally, $\mu_i(z|S_i, S_j)$ is the probability density that voters assign to $x_i = z$ when the parties announce S_i and S_j. Given this notation, we can now state the definition of a strong perfect Bayesian equilibrium as follows.

Definition A strong perfect Bayesian equilibrium of the game is a set of strategies s_1^*, s_2^* of the two parties, strategy v^* of a voter, and the probability density functions μ_1^*, μ_2^* that satisfy the following conditions:

(1) For all S_1 and S_2, v^* is a voter's best voting decision as defined below:[16]

$$v^*(\lambda, c, S_1, S_2) = \\ = \begin{cases} (1,0) & \text{if } tE\left((\lambda - x_2)^2|\mu_2^*\right) - tE\left((\lambda - x_1)^2|\mu_1^*\right) \geq c \\ (0,1) & \text{if } tE\left((\lambda - x_1)^2|\mu_1^*\right) - tE\left((\lambda - x_2)^2|\mu_2^*\right) \geq c \\ \emptyset & \text{if } c > \max\{tE\left((\lambda - x_2)^2|\mu_2^*\right) - tE\left((\lambda - x_1)^2|\mu_1^*\right), \\ & \qquad tE\left((\lambda - x_1)^2|\mu_1^*\right) - tE\left((\lambda - x_2)^2|\mu_2^*\right)\} \end{cases} \tag{2}$$

(2) Given (1) and given the statement made by the adversary, s_i^* is the statement that maximizes the pay-off of party i, $i = 1, 2$.

[16]In fact, a voter chooses party i if $tE\left((\lambda - x_j)^2|\mu_j^*\right) - tE\left((\lambda - x_i)^2|\mu_i^*\right) \geq \max\{c, tE\left((\lambda - x_i)^2|\mu_i^*\right) - tE\left((\lambda - x_j)^2|\mu_j^*\right)\}$, but given that $c \geq 0$, this inequality is equivalent to $tE\left((\lambda - x_j)^2|\mu_j^*\right) - tE\left((\lambda - x_i)^2|\mu_i^*\right) \geq c$. Indeed, if $tE\left((\lambda - x_j)^2|\mu_j^*\right) - tE\left((\lambda - x_i)^2|\mu_i^*\right) \geq c$, then $tE\left((\lambda - x_i)^2|\mu_i^*\right) - tE\left((\lambda - x_j)^2|\mu_j^*\right) \leq 0$.

(3) For all S_1 and S_2, a voter updates her beliefs, μ_1^*, μ_2^*, regarding the positions of the parties in the following way:[17]

   (i) according to Bayes' rule on the equilibrium path,

   (ii) arbitrary off the equilibrium path.

   All voters have identical beliefs on and off the equilibrium path.

This definition implies that (1) for any observed statements of the two political parties, people either abstain or vote for the party, whose perceived position, given the updated beliefs, maximizes their ex-ante, expected utility; (2) parties anticipate the best response choices of the electorate to any pair of the parties' statements and choose the statements that maximize their share in political power; (3) voters update beliefs about parties' positions using Bayes' rule for any statements that occur with positive probability along the equilibrium path, and beliefs off the equilibrium path are arbitrary but identical across voters. Importantly, if statements satisfy the grain of truth condition, then even if they occur off the equilibrium path, voters should assign positive probability only to those positions of the parties that are a part of the statements. In other words, when campaigning is non-comparative, voters should only assign positive probability to the positions of a party that are included in its statement. And similarly, when campaigning is comparative, positive probability should only be assigned to the pairs of positions that belong to the intersection of the two statements. Note that the intersection of the two parties' statements in this case is not empty due to the same grain of truth condition.

Next, we define the *indifferent* voter as a voter whose overall utility from voting for either of the two parties is the same, given the information that is disclosed through parties' statements. Denote the position of this voter by $\widehat{\lambda}$. Note that depending on the realization of the cost of voting for the indifferent voter, she may actually prefer to abstain. Nevertheless, the position of this voter marks the important threshold between voters who *never* vote for a

[17] Note that due to the fact that the probability density function f from which the parties' positions are drawn is non-atomic, the ex-ante probability of any specific position is zero. In this case, the Bayes' rule should be applied as follows. Suppose that position z of party i belongs to the set of types $S = \{y, z\}$ that, given the equilibrium strategy, could make statement S_i. Then the probability of the event $x_i = z$ should be updated as

$$\mu_i^*(z|S_1, S_2) = \lim_{\varepsilon \to 0} \frac{F(z+\varepsilon) - F(z)}{F(z+\varepsilon) - F(z) + F(y+\varepsilon) - F(y)}.$$

Using l'Hôpital's rule,

$$\mu_i^*(z|S_1, S_2) = \lim_{\varepsilon \to 0} \frac{f(z+\varepsilon)}{f(z+\varepsilon) + f(y+\varepsilon)} = \frac{f(z)}{f(z) + f(y)}.$$

given party and those who – conditional on voting – *always* vote for this party. For example, voters to the left of $\widehat{\lambda}$ never vote for the party that is perceived to have the further right position, even if their cost of voting is low. On the other hand, voters to the right of $\widehat{\lambda}$ always vote for this party, provided they vote at all. Formally, $\widehat{\lambda}$ is defined by

$$tE\left((\widehat{\lambda}-x_2)^2|\mu_2\right)-tE\left((\widehat{\lambda}-x_1)^2|\mu_1\right)=tE\left((\widehat{\lambda}-x_1)^2|\mu_1\right)-tE\left((\widehat{\lambda}-x_2)^2|\mu_2\right)$$

or

$$E\left((\widehat{\lambda}-x_1)^2|\mu_1\right)=E\left((\widehat{\lambda}-x_2)^2|\mu_2\right). \tag{3}$$

The solution of this equation is given by:

$$\widehat{\lambda}=\frac{E\left(x_2^2|\mu_2\right)-E\left(x_1^2|\mu_1\right)}{2\left(E\left(x_2|\mu_2\right)-E\left(x_1|\mu_1\right)\right)}. \tag{4}$$

Note that since $E\left(x_2^2|\mu_2\right)-E\left(x_1^2|\mu_1\right)=var\left(x_2|\mu_2\right)-var\left(x_1|\mu_1\right)+E^2\left(x_2|\mu_2\right)-E^2\left(x_1|\mu_1\right)$, equation (4) suggests that voters dislike uncertainty about political positions of the parties. Indeed, for any $E\left(x_2|\mu_2\right)>E\left(x_1|\mu_1\right)$, larger variance of the second party's statement relative to that of the first moves the position of the indifferent voter to the right, closer to the position of the second party, so that more people vote for party 1. In fact, such outcome is typical for preferences based on convex mismatch costs. The specific, quadratic formulation is used to simplify the analysis and to make sure that(4) defines a unique value of $\widehat{\lambda}$. The indifferent voter's position is not well-defined only when (i) $\widehat{\lambda}$ lies outside the $(0,1)$ interval, in which case no voter is indifferent and everyone prefers the same party, or (ii) equality (3) holds for *any* $\widehat{\lambda}$, in which case all voters are indifferent between the two parties.

For convenience, we will employ subscripts L and R for the party with the further left and further right perceived position, respectively, so that $E\left(x_L|\mu_L\right)<E\left(x_R|\mu_R\right)$. Then, as soon as $\widehat{\lambda}$ is well-defined, the turnout for the party that is perceived as further left, τ_L, is equal to the expected share of voters to the left of $\widehat{\lambda}$ whose cost of voting does not exceed the overall utility from voting for their preferred, left party. Similarly, the turnout for the party that is perceived as further right, τ_R, is equal to the expected share of voters to the right of $\widehat{\lambda}$ whose cost of voting does not exceed the overall utility from voting for their preferred, right party. Since the costs of voting for all voters are i.i.d. and the distribution of costs is

uniform on $[0, \bar{c}]$, the turnout for each party is given by:

$$\tau_L = \int_0^{\widehat{\lambda}} \frac{E(u_L|\mu_L, \mu_R)}{\bar{c}} g(\lambda) d\lambda, \tag{5}$$

$$\tau_R = \int_{\widehat{\lambda}}^1 \frac{E(u_R|\mu_L, \mu_R)}{\bar{c}} g(\lambda) d\lambda. \tag{6}$$

Here $E(u_L|\mu_L, \mu_R)$ and $E(u_R|\mu_L, \mu_R)$ denote the expected overall utility of a voter with position λ from voting for the party with the further left and further right perceived position, respectively, and $\frac{E(u_i|\mu_L,\mu_R)}{\bar{c}}$ is the probability that the cost of voting c does not exceed the expected overall utility from voting for party i, given the parties' statements and voters' beliefs.

Next, we observe that using (4), the expected overall utility of a voter λ from voting for the party with the further left and further right perceived position can be expressed in terms of $\widehat{\lambda}$:

$$\begin{aligned}
E(u_L|\mu_L, \mu_R) &= tE\left((\lambda - x_R)^2|\mu_R\right) - tE\left((\lambda - x_L)^2|\mu_L\right) = \\
&= t\left(2\lambda\left(E(x_L|\mu_L) - E(x_R|\mu_R)\right) + E\left(x_R^2|\mu_R\right) - E\left(x_L^2|\mu_L\right)\right) \\
&= 2t\left((\widehat{\lambda} - \lambda)\left(E(x_R|\mu_R) - E(x_L|\mu_L)\right)\right), \\
E(u_R|\mu_L, \mu_R) &= tE\left((\lambda - x_L)^2|\mu_L\right) - tE\left((\lambda - x_R)^2|\mu_R\right) = \\
&= 2t\left((\lambda - \widehat{\lambda})\left(E(x_R|\mu_R) - E(x_L|\mu_L)\right)\right) = -E(u_L|\mu_L, \mu_R).
\end{aligned}$$

Thus, the turnouts of the two parties in (5) – (6) become:

$$\tau_L = \frac{2t\left(E(x_R|\mu_R) - E(x_L|\mu_L)\right)}{\bar{c}} \int_0^{\widehat{\lambda}} (\widehat{\lambda} - \lambda) g(\lambda) d\lambda, \tag{7}$$

$$\tau_R = \frac{2t\left(E(x_R|\mu_R) - E(x_L|\mu_L)\right)}{\bar{c}} \int_{\widehat{\lambda}}^1 (\lambda - \widehat{\lambda}) g(\lambda) d\lambda. \tag{8}$$

This leads to the following pay-offs of the two parties:

$$\pi_L = \frac{\tau_L}{\tau_L + \tau_R} = \frac{\int_0^{\widehat{\lambda}} (\widehat{\lambda} - \lambda) g(\lambda) d\lambda}{\int_0^{\widehat{\lambda}} (\widehat{\lambda} - \lambda) g(\lambda) d\lambda + \int_{\widehat{\lambda}}^1 (\lambda - \widehat{\lambda}) g(\lambda) d\lambda}, \tag{9}$$

$$\pi_R = \frac{\tau_R}{\tau_L + \tau_R} = \frac{\int_{\widehat{\lambda}}^1 (\lambda - \widehat{\lambda}) g(\lambda) d\lambda}{\int_0^{\widehat{\lambda}} (\widehat{\lambda} - \lambda) g(\lambda) d\lambda + \int_{\widehat{\lambda}}^1 (\lambda - \widehat{\lambda}) g(\lambda) d\lambda} = 1 - \pi_L. \tag{10}$$

Note that these pay-off functions are *uniquely determined* by $\widehat{\lambda}$, and π_L is strictly increasing in $\widehat{\lambda}$, while π_R is strictly decreasing in $\widehat{\lambda}$.[18] This is confirmed by a simple comparative

[18] The same is not necessarily true for the turnout rates τ_L and τ_R. Indeed, while larger $\widehat{\lambda}$ increases the

static exercise that uses the Leibniz rule of integral differentiation (see Appendix). Another important property of these pay-off functions is that the sum of the parties' pay-offs, $\pi_L + \pi_R$, is always equal to 1, irrespective of the parties' statements and voters' beliefs. Moreover, it is easy to see that for any probability density function g that is symmetric around 0.5, the pay-offs of the two parties are the same if the indifferent voter is located in the middle of the interval: $\widehat{\lambda} = 0.5$ implies that $\pi_L = \pi_R = 0.5$.

In cases when $\widehat{\lambda}$ is not well-defined, the pay-offs of both parties are either the same if all voters are indifferent, or the pay-off of the party that is strictly preferred by all voters is one, while the pay-off of the other party is zero. In the former case $\pi_L = \pi_R = 0.5$, while in the latter $\pi_L = 1$, $\pi_R = 0$ or $\pi_L = 0$, $\pi_R = 1$.

We also observe that the representation of turnout rates in (7) – (8) implies that $\tau_L > \tau_R$, if and only, if $\widehat{\lambda} > 0.5$.[19] Then since $\pi_L > \pi_R$ is equivalent to $\tau_L > \tau_R$, or alternatively, since π_L is strictly increasing in $\widehat{\lambda}$, π_R is strictly decreasing in $\widehat{\lambda}$ and at $\widehat{\lambda} = 0.5$ $\pi_L = \pi_R = 0.5$, it follows that $\pi_L > \pi_R$ if and only if $\widehat{\lambda} > 0.5$. Intuitively, the further right the location of the indifferent voter, the larger the pool of voters who favour the left-wing policy, and the larger the relative turnout and the gain for the party that is perceived as further left.

The final observation about the parties' pay-offs in (9) – (10) is that since both pay-offs are fully determined by $\widehat{\lambda}$, they only depend on *expected* or *perceived* positions of the two parties but *not* on their actual positions. This observation is key as it implies that voter beliefs can be used to "punish" a deviating party.

3 Full disclosure equilibria and ex-post efficiency

In this section we discuss the notion of ex-post efficiency and consider the simplest ex-post efficient equilibrium, where the true, intended policies of both parties are fully revealed.

Observe that when parties' true, intended policies are fully revealed, voters are able to make fully-informed choices and thereby, maximize not only their ex-ante but also *ex-post* utility from voting, the two being the same in this case. In this sense, any fully disclosing

pool of voters who prefer the left party, the probability of voting by these voters might decline. For example, if an increase in $\widehat{\lambda}$ is associated with the fact that the perceived location of the left party moves to the right, closer to the location of the right party, so that the difference $E(x_R|\mu_R) - E(x_L|\mu_L)$ declines, then some of the voters to the left of $\widehat{\lambda}$ may lose interest in voting at all, as their preference for the left party is not strong enough to outweigh the cost of voting. This is also suggested by the representation of τ_L and τ_R in (7) – (8).

[19] Indeed, $\tau_L > \tau_R$ means that $\int_0^{\widehat{\lambda}} (\widehat{\lambda} - \lambda) g(\lambda) d\lambda > \int_{\widehat{\lambda}}^1 (\lambda - \widehat{\lambda}) g(\lambda) d\lambda$. Simple algebra suggests that the latter is equivalent to $\widehat{\lambda} > \int_0^1 \lambda g(\lambda) d\lambda$, where the right-hand side is the mean ideal policy of voters. This mean ideal policy is equal to 0.5 as distribution g is symmetric around 0.5.

equilibrium is *ex-post efficient*. Similarly, a non-fully revealing equilibrium is ex-post efficient whenever voters' choices are not distorted by uncertainty. This is the case when for any type of parties that, according to the equilibrium strategy, could make a given non-fully revealing statement(s), voters' *ex-post* utility from voting, obtained after the uncertainty about this type has been resolved, is maximized (that is, equal to the utility that would obtain under full disclosure). This requires that the following two conditions hold: (i) the position of the indifferent voter (if it is well-defined) under the equilibrium non-fully revealing statements is the same as under full disclosure, and (ii) for any type that, given the equilibrium strategy, could make these non-fully revealing statements, parties' relative positions with respect to each other (who is left and who is right) are the same as their relative *perceived* positions under the non-fully revealing statements.[20] Other non-fully revealing equilibria are inefficient because there exists at least one pair of parties' positions for which with positive probability some or all voters make "wrong" choices, so that their ex-post utility from voting is lower than under full disclosure.[21]

Note that this "utilitarian" notion of efficiency is, in fact, stronger than an alternative definition, concerned with the resultant policy that the elected government will implement. Indeed, as soon as all voters make the same choices as they would have made under full information, the resultant government policy, which can be defined as $x_1\tau_1 + x_2\tau_2$, also turns out to be the same as under full information.[22] The converse, on the other hand, is not always true.[23]

In what follows we discuss under which conditions on political campaigns *any* equilibrium, even if not fully-revealing, is ex-post efficient. This allows us to address the main question of

[20]Formally, condition (ii) means that for *any* (x_1, x_2) that could make the equilibrium non-fully revealing statements, either $x_1 < x_2$ (and hence, perceived position of party 1 is smaller than perceived position of party 2) or $x_2 < x_1$ (and hence, perceived position of party 2 is smaller than perceived position of party 1).

[21]Given the probabilistic nature of voting in this model, choices of voters in such inefficient equilibria may happen to be the same as under full disclosure, but only for a specific realization of random voting costs or for a specific allocation of votes in case when nonrevealing equilibrium leaves all or some voters indifferent between the two parties. For example, if the position of the indifferent voter under a nonrevealing equilibrium is larger than under full disclosure but the costs of voting for all people with positions between the "two indifferent voters" appear to be too high, these voters abstain and hence, do not make "wrong" choices.

[22]Such definition of the policy is common in papers on elections with proportional representation. See, for example, Herrera et al. (2014, 2015), Lizzeri and Persico (2001) and Kartal (2014).

[23]For example, if parties' true positions x_1, x_2 are symmetric around 0.5 and $x_1 < x_2$, then an equilibrium is ex-post efficient if and only if all voters to the left of the median voter vote for party 1 and all voters to the right of the median voter vote for party 2. This results in policy $0.5x_1 + 0.5x_2 = 0.5$, which is identical to the one under full disclosure. However, the same policy obtains also in case when all voters make the opposite choices, which is inefficient according to our definition. Under the majority rule elections, the same observation holds: equilibrium ex-post efficiency implies that the resultant policy, i.e., the winning candidate is determined "correctly" (just as under full disclosure), while the opposite is not necessarily true.

this paper and understand when vagueness of political statements does not confuse voters. In our model, the first condition is straightforward: all political statements must satisfy the grain of truth condition. Indeed, the alternative to that is a cheap talk game, where any type of political parties can make any statements, with no restrictions imposed, and a large variety of equilibria obtain.[24] In particular, complete nondisclosure, where both parties report that their positions are anywhere between 0 and 1 (in comparative or non-comparative context) is an equilibrium outcome. A deviation from such nondisclosure strategies can be easily discouraged because voters regard parties' statements off the equilibrium path as absolutely uninformative and can interpret them in either way. For example, if they believe that only the party with the less popular position, farther from the median voter, may have incentives to deviate, no party would ever be tempted to do so.[25] Clearly then, with equilibrium statements that are completely uninformative, voters will often make "mistakes" and vote for the party that they would not have chosen under full disclosure. Thus, the grain of truth condition in our model is a minimal requirement for any equilibrium to be ex-post efficient.

In the rest of the analysis we focus on the second and less straightforward condition for equilibrium ex-post efficiency. Namely, we consider political elections where statements *do satisfy the grain of truth condition* and study whether or not the comparative nature of statements helps voters' ability to make "right" choices. We show that even though the simplest ex-post efficient equilibrium – with full disclosure – exists irrespective of whether political campaigning is comparative or not, only in the former case, *all* equilibria are (generically) ex-post efficient. This then implies that the comparative nature of political campaigns together with the grain of truth condition are (generically) necessary and sufficient for voters' ability to make "correct" choices in any equilibrium.

Under full disclosure, the position of the indifferent voter is determined according to (4) by the middle point of the segment connecting x_L and x_R. It is well-defined for any $x_L \neq x_R$:

$$\widehat{\lambda} = \frac{x_L + x_R}{2}. \tag{11}$$

A straightforward but important implication of this representation of $\widehat{\lambda}$ is that under full disclosure the party that is located closer to 0.5, the median voter position, obtains a strictly larger pay-off. Indeed, using the observation made in the previous section, that $\pi_L > \pi_R$ if

[24] See the seminal paper by Crawford and Sobel (1982) for reference on cheap talk games.

[25] Admittedly, these are special out-of-equilibrium beliefs that support the described equilibrium. However, as we explain in more detail later (section 5), such beliefs cannot be ruled out by standard equilibrium refinements such as the Intuitive Criterion (Cho and Kreps, 1987) and D1 (Cho and Sobel, 1990).

and only if $\widehat{\lambda} > 0.5$, we obtain that under full disclosure $\pi_L > \pi_R$ if and only if $x_L + x_R > 1$. Note that the sum of two positions is greater than 1 in two cases: either when both $x_L \geq 0.5$ and $x_R > 0.5$, or when $x_L \leq 0.5 < x_R$ and positions x_L, x_R are not exactly symmetric around 0.5 but such that x_L is closer to 0.5 than x_R. In both cases, the position of the left party is closer to 0.5 than the position of the right party. Similar considerations apply in the analogous cases, where both $x_L < 0.5$ and $x_R \leq 0.5$, or $x_L < 0.5 \leq x_R$ and positions x_L, x_R are not exactly symmetric but such that x_R is closer to 0.5 than x_L. The remaining case (with unequal positions) is when x_L and x_R are exactly symmetric around 0.5. In this case, $x_L + x_R = 1$, that is, the indifferent voter is located precisely in the middle of the unit interval, and the pay-offs of both parties are the same, $\pi_L = \pi_R = 0.5$.

If, on the other hand, positions of the two parties are identical, then $\widehat{\lambda}$ is not well-defined, as all voters are indifferent. In this case, again, the pay-offs of the parties are the same, $\pi_L = \pi_R = 0.5$.

The following proposition establishes the existence of a full disclosure equilibrium, which under the grain of truth condition obtains irrespective of whether political campaigning is comparative or not:[26]

Proposition 1. *Whether or not comparative political campaigning is used, full disclosure is always an equilibrium outcome.*

The proof of Proposition 1 is straightforward.[27] Suppose that both parties of any type disclose their true position (or type) precisely. If comparative campaigning is used, then the precise statement of each party indicates the positions of both parties, and hence, unilateral deviations to nondisclosing statements do not change voter beliefs about the positions, and so, no party can benefit from deviating. If comparative campaigning is not used, then the precise statement of each party indicates only its own position and not the adversary's position. In this case, if a party deviates from the fully disclosing strategy and makes a statement that does not reveal its position precisely, voter out-of-equilibrium beliefs become important. But then given the grain of truth condition, that statements must contain the true position, and the fact that parties' pay-offs depend on expected rather than actual positions, these beliefs can always be constructed so that for any not fully revealing statement, the deviating party's pay-off is not larger than its equilibrium pay-off.

[26]Under the majority rule elections, such as for example, presidential elections, where the candidate gaining the largest vote share wins (pay-off is 1), and the other candidate looses (pay-off is 0), the same proposition and proof apply.

[27]The details are available from the authors.

In the next two sections we now consider a possibility of not fully disclosing equilibria and their ex-post efficiency in two scenarios – with and without comparative political campaigning.

4 Comparative political campaigning

In case of *comparative political campaigning* parties provide information not only about their own policy or policy platform but also about the policy of their adversary. This means that the statement of each party specifies not just the set of own possible positions but the set of possible positions of both parties. We find that in this case, nondisclosure may be an equilibrium outcome. However, any nondisclosure equilibrium has an important property that generally speaking, uncertainty associated with nondisclosure does not affect optimal voting behaviour that one should expect under full disclosure. That is, for any *generic* combination of parties' positions, nondisclosure does not distort voters' decisions and the equilibrium is ex-post efficient. Moreover, for absolutely any pair of parties' positions, nondisclosure does not distort the resultant government policy: it remains the same as under full disclosure.[28]

Proposition 2. *In case of comparative political campaigning, there does not exist an equilibrium where the set of types that (a) do not fully disclose and (b) make a statement inducing inefficient voters' choices has a positive measure. Thus, for all generic pairs of positions of the two parties, the equilibrium is ex-post efficient. Moreover, for all pairs of positions, the resultant equilibrium policy of the elected government is the same as under full disclosure.*

The idea of the proof is simple. Clearly, if the equilibrium is fully disclosing, then it is efficient. If equilibrium is not fully disclosing, then there exist at least two types (x_1, x_2) and (y_1, y_2) that pool by making the same statement, and voters cannot distinguish between the two types. In any such equilibrium, the pay-off of each party must be the same as its full disclosure pay-off (cf. (9) – (10) with $\widehat{\lambda} = \frac{x_L + x_R}{2}$). This follows from two observations. First, since parties know positions of each other, each of them can guarantee itself a full

[28]In case of presidential elections (majority rule principle) only the resultant policy, that is, the winning candidate is always determined "correctly", while the actual voters' choices might be different from those under full disclosure. For example, there exists an equilibrium where all types (x_1, x_2) such that $x_2 < x_1 < 0.5$ or $0.5 < x_1 < x_2$ (candidate 1 is located closer to 0.5 than candidate 2) pool, and where all types (x_1, x_2) such that $0.5 < x_2 < x_1$ or $x_1 < x_2 < 0.5$ (candidate 2 is located closer to 0.5 than candidate 1) pool. Such equilibrium is not ex-post efficient according to our definition because given the pooling statements, the location of the indifferent voter is not the same as for any actual pooling type, so that some voter choices might be distorted. However, the nature of pooling in this equilibrium (and in fact, in any nondisclosure equilibrium) is such that the candidate that is perceived as located closer to 0.5 is, in fact, located closer to 0.5. Therefore, the candidate that wins the election is the same as under full disclosure.

disclosure pay-off by revealing both positions precisely. Therefore, in any not fully revealing equilibrium, the pay-off to any type of a party must be at least as high as the pay-off to that type in the full disclosure equilibrium. Second, the pay-off to any type of a party cannot be strictly larger than the full disclosure pay-off since the sum of the parties' pay-offs is always equal to one. Indeed, if one party would get a pay-off in a nondisclosing equilibrium that is larger than its full disclosure pay-off, then the other party would have an incentive to fully disclose. This means that in case of comparative political campaigning, all equilibria are pay-off equivalent, and the pay-off of each type of a party is equal to its full disclosure pay-off.

Now, given that parties' pay-offs are uniquely determined by $\widehat{\lambda}$ (whenever it is well-defined), the equality of any equilibrium pay-off and full revelation pay-off implies that for every generic pooling type two conditions should hold: (i) the indifferent voter is the same under given nondisclosing equilibrium statements and under full disclosure, and (ii) relative positions of parties with respect to each other are the same as their relative *perceived* positions (suggested by the nondisclosing statements).[29]

Conditions (i) and (ii) immediately imply that any nondisclosure equilibrium is ex-post efficient. It is only when the indifferent voter is not well-defined, that this argument does not go through. In the proof we show that this can only be the case in equilibrium when *all* nondisclosing types are such that parties' positions are either equal to each other or exactly symmetric around 0.5. If there exists at least one type with positions that do not have this special relationship to each other (and the indifferent voter under nondisclosure is not well-defined), then for one of the two parties of this type, the full revelation pay-off is larger than the pay-off from nondisclosure. Hence, equilibrium nondisclosure with possible loss of efficiency can only occur if parties' positions are equal or symmetric around 0.5. These are the positions corresponding to types on the upward and downward sloping diagonals of the $[0,1]\times[0,1]$ square. For any *generic* combinations of positions in the $[0,1]\times[0,1]$ type space, nondisclosure does not mislead voters, and the equilibrium is ex-post efficient.[30] Moreover,

[29]Condition (ii) is not necessary only when the full revelation pay-offs of both parties are the same, equal to 0.5, for any pooling type. From our discussion in the previous section, it follows that this is the case when all pooling types are such that parties' positions are exactly symmetric around 0.5 ($\widehat{\lambda}=0.5$). Whenever such specific dependence between the parties' positions does not hold, condition (ii) must be satisfied.

[30]Note that symmetric or equal positions of the two parties are non-generic due to the assumption that both positions are drawn independently from a non-atomic probability distribution. To see whether such positions can actually be an outcome of a strategic choice by parties, in section 6 we address an alternative model specification with strategic positions. The conclusions derived from that model are conceptually similar, and full disclosure turns out to be the unique equilibrium outcome under comparative campaigning.

we observe that even those equilibria that involve pooling in a non-generic set of types, – where parties' positions are equal or symmetric around 0.5, – are such that the actual policy implemented by the elected government is the same as under full disclosure. That is, even if some or all voters vote for a party that they would not have chosen when provided with full information, the overall support of each party is the same as under full disclosure (equal to a half of all votes). Therefore, the resultant government policy is unaffected by nondisclosure.

Note that according to Proposition 2, it is the inefficiency and not nondisclosure that is non-generic. The nondisclosure of parties' types is, in fact, common; it just does not distort voters' choices.[31] Consider one example of such equilibrium, where *any* type in $[0,1]\times[0,1]$ pools with some other types but voters' choices are the same as under full disclosure. In particular, suppose that any type $(x_1,x_2)\in[0,1]\times[0,1]$ such that $x_1<x_2$ pools with any other type (y_1,y_2) such that $y_1<y_2$ and $x_1+x_2=y_1+y_2$. That is, all types on any downward sloping segment $x_1+x_2=const$ above the 45-degree line pool with each other. Symmetrically, suppose that all types on any downward sloping segment $x_1+x_2=const$ below the 45-degree line also pool. Finally, let all types exactly on the 45-degree line, where $x_1=x_2$ for any type, pool with each other. This results in the situation, where no type in the whole unit square fully reveals parties' positions, as schematically shown on Figure 1 below. Yet, we claim that the induced voters' choices are the same as under full disclosure, so that the equilibrium is ex-post efficient.

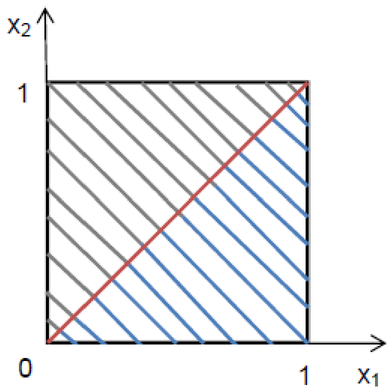

Figure 1: An equilibrium where any type in $[0,1]\times[0,1]$ pools with some other types but voters' choices are not distorted. Pooling types belong to all downward sloping segments above and below the 45-degree line and to the 45-degree line.

To see why the described strategy profile is an equilibrium, note first, that no type can

[31] From our discussion above it follows that any such not fully disclosing equilibrium is *weak*, in the sense that nondisclosure is never strictly preferred to full disclosure by either of the pooling types.

imitate the strategy of another type because we are now dealing with the scenario where parties' statements satisfy the grain of truth condition. Note also, that for a party of any type the nondisclosure equilibrium pay-off is exactly the same as its full revelation pay-off and is the same as the full revelation pay-off of any other type making the same equilibrium statement. On the 45-degree line this pay-off is equal to 0.5 for both parties, and on any downward sloping segment the pay-offs of the parties are given by (9) and (10) with $\widehat{\lambda} = \frac{x_1+x_2}{2}$, which is the same for any (x_1, x_2) on the given segment.[32] This second observation implies that a simple set of voter out-of-equilibrium beliefs rules out incentives for deviation. For example, suppose that after a deviating statement voters are certain that the true type is a particular type in the intersection of the deviating statement and the equilibrium nondisclosure statement of the other party. As this type is one of the equilibrium pooling types to which a given deviating type belongs, it follows that the resulting deviation pay-off of the party is exactly equal to its equilibrium pay-off.

A further simple argument confirms that given this nondisclosure equilibrium, the voters' choices are the same as under full disclosure. Indeed, the nature of pooling among types in this equilibrium is such that the indifferent voter associated with a nondisclosing statement is the same as the indifferent voter associated with full disclosure of any pooling type. For nondisclosure on the downward sloping segments, both above and below the 45-degree line, the position of the indifferent voter is $\widehat{\lambda} = \frac{1}{2}(x_1 + x_2)$ (which is the same for all types on a given segment); for nondisclosure along the 45-degree line, *all* voters are indifferent between parties 1 and 2. Moreover, the pooling strategy is also such that the relative actual positions of the two parties at any pooling type are the same as their relative perceived positions given a nondisclosing statement: on downward sloping segments above the 45-degree line party 1 is always located to the left of party 2, the opposite is true on downward sloping segments below the 45-degree line, and on the 45-degree line both parties have the same location. Therefore, nondisclosure in the described equilibrium does not mislead voters' choices, even though it "involves" the whole type space, where no single type is fully revealed.

There do, however, exist nondisclosure equilibria, where pooling in a non-generic set of

[32]The latter follows from the fact that for any type (x_1, x_2) on a segment, $x_1 + x_2 = const$, so that the indifferent voter $\widehat{\lambda}$ associated with full disclosure is the same for all types, and thus, it is also the same as the indifferent voter associated with the given nondisclosure statement (the whole segment). Then, since parties' pay-offs are fully determined by the position of the indifferent voter, each type's nondisclosure equilibrium pay-off is equal to its full revelation pay-off and equal to the full revelation pay-off of any other type on the same segment.

types may misguide voters. One example of such equilibrium is provided in the Appendix.[33] According to Proposition 2, all equilibria of this kind are very peculiar in the sense that types that pool and mislead voters' choices are such that parties' positions have very special relationship to each other. For all generic combinations of the parties' positions, voters' choices are not distorted. Thus, generically all equilibria are ex-post efficient, even if they are not fully revealing.

5 Non-comparative political campaigning

Let us now consider the case where parties do *not* engage in comparative political campaigning.[34] Thus, a statement of each party includes information about its own policy only. Formally, this means that while the type space is two-dimensional, the action space (statements) is one-dimensional. This leads to the situation where a party of one type can imitate the one-dimensional equilibrium statement of another type but voters can still detect the deviation as their beliefs depend on statements of both parties. To see this, consider as an example a situation where types reveal $\Phi \subseteq [0,1]$ if and only if both positions $x_1, x_2 \in \Phi$, whereas the other types fully disclose the parties' positions. A party whose position is in Φ could then disclose Φ even if its adversary's position is not in Φ, thus imitating a type with both positions in Φ. Similarly, a party of a type with both positions in Φ could fully reveal its own position, imitating the statement of a type whose own position (but not that of the adversary) is in Φ. However, as voters observe the statements made by *both* parties, the proposed equilibrium strategies are constructed so that a voter can always deduce a unilateral deviation.

When no comparative campaigning is used, we find that there exists an infinite set of not fully disclosing equilibria with a broad variety of nondisclosure outcomes being ex-post inefficient. More than that, also the resultant government policy may be different from the one under full disclosure. For example, the strategy profile described above, is an equilibrium for *any* compact set Φ. Such equilibrium induces nondisclosure in the symmetric set $\Phi \times \Phi$, which can be empty or coincide with the whole type space when $\Phi = [0,1]$. All these nondisclosure outcomes are such that parties 1 and 2 of the types in $\Phi \times \Phi$ are perceived by

[33]In this example, all or some voters may end up voting for the party that they actually like less. However, the overall share of votes for each party is the same as under full information, so that in line with Proposition 2, the implemented government policy is identical to the one under full disclosure.

[34]And recall that as in the previous section, we are now focusing on the elections where the grain of truth condition holds.

voters as absolutely identical and hence, gain equal shares in political power. However, for most of the *actual* types in $\Phi \times \Phi$ (those where $x_1 \neq x_2$) this should not be the case as some voters should strictly prefer one party over the other, leading to different success rates of the two parties.

This last observation suggests that when no comparative political campaigning is used, many equilibria are not pay-off equivalent. In fact, nondisclosure can be an equilibrium outcome even if the pay-off to one of the parties of a pooling type is actually lower than its pay-off from full disclosure. The reason why this is different from the case of comparative political campaigning is that here a party can never guarantee itself the full revelation pay-off by unilaterally revealing its own position if the other party does not reveal its position. For example, voters may interpret a deviation to full disclosure as not only revealing the position of the deviating party itself but also as signalling the relative position of the adversary. A non-favorable signal can "punish" the deviation and sustain a large set of equilibrium outcomes, with pay-offs below the full disclosure level.[35]

We now formally characterize equilibrium strategies of the two parties that induce nondisclosure in any (compact) set of types $\Phi \times \Phi$. As noted earlier, whenever Φ is not empty, these equilibrium strategies may misguide voters and lead to both inefficiency of voters' choices and implementation of a policy that is different from the one under full disclosure.[36]

Proposition 3. *Under non-comparative political campaigning, for any compact subset* $\Phi \subseteq [0, 1]$ *there exists an equilibrium where*

- *parties 1 and 2 of any type* (x_1, x_2) *with* $x_1, x_2 \in \Phi$ *make the same statement* $S^* = \Phi$*;*
- *parties 1 and 2 of any other type* (x_1, x_2) *(such that* $x_i \notin \Phi$ *for at least one of the positions) fully disclose their position by making a precise statement, i.e.,* $S_i^* = \{x_i\}$*,* $i = 1, 2$*.*

Clearly, the described symmetric equilibria are only a subset of all possible equilibria. But this subset encompasses a rich variety of nondisclosure equilibria where inefficient voting is common. The proof of Proposition 3 uses a system of voter out-of-equilibrium beliefs such

[35]In particular, this means that in contrast to the case of comparative political campaigning, where all nondisclosure equilibria are weak, in case without comparative campaigning, many unilateral deviations from nondisclosure are diverted since the deviation pay-off is *strictly lower* than the equilibrium pay-off.

[36]The same strategies constitute an equilibrium in case of presidential elections (majority rule), with 0-1 pay-offs. Hence, also in this case, many nondisclosure equilibria are ex-post inefficient and result in the implemented policy being different from the one under full disclosure.

that unilateral deviations of any type of a party are viewed as signalling an even less popular intended policy of this party than under the equilibrium strategies. For example, consider a deviation to a non-equilibrium statement by a party whose type has both positions in Φ. Since the statement of each party is one dimensional and has the grain of truth, the statements of the two parties intersect. Then voters can simply believe that the parties' positions in the intersection are such that the deviating party is at least as far from the middle of the unit interval as its adversary. Given such beliefs, the deviation pay-off of the party is bound to be less than or equal to 0.5, that is, less than or equal to its equilibrium pay-off.

One may argue that the out-of-equilibrium beliefs we use to sustain these nondisclosure equilibria are special. We note however, that standard refinements such as the Intuitive Criterion (Cho and Kreps, 1987) or D1 (Cho and Sobel, 1990) do not rule these out-of-equilibrium beliefs. These refinements are based on the idea that different types have different incentives to deviate and thus rely on pay-off differences across different types. As in our model pay-offs of the political parties only depend on voter beliefs about their positions (types) rather than on their actual positions, these refinements do not rule out any of the equilibria we have described.

The results of our equilibrium analysis in this and previous section demonstrate a possibility of a very broad range of nondisclosure outcomes with inefficient voters' choices in case when no comparative campaigning is used, and generic efficiency of all equilibria when campaigning is comparative. This emphasizes the role of parties' ability to disclose the position of the adversary and implies that while ambiguity of non-comparative political statements can often distort voter choices, comparative statements, even if they are vague, are almost never misleading. Thus, we obtain that in addition to the grain of truth condition, the comparative nature of political campaigns is key for "correct" voting. In this sense, both conditions together – the grain of truth and comparative campaigning – are (generically) necessary and sufficient for all equilibria to be ex-post efficient.

6 Strategic choice of political positions

So far we have considered political positions of parties to be exogenously given and drawn from some probability density function $f(x)$. This is the approach taken in the literature on political disclosure (Schipper and Woo, 2015; Polborn and Yi, 2006; Demange and Van der Straeten, 2013). On the other hand, under full information regarding political positions, there is a large literature, with the median voter theorem at its core, studying the positional strategies of political parties (Black, 1948; Downs, 1957). In this section, we combine these literatures and consider a strategic game where parties first choose political positions and then statements regarding these positions. As before, we focus on the case where all statements satisfy the grain of truth condition, and study whether given this minimal requirement for equilibrium ex-post efficiency, the role of comparative campaigning remains as crucial as it was in case with exogenous positions.

More formally, we consider a game where at stage 0, preceding information disclosure, parties simultaneously choose their political positions x_1 and x_2. After that the game continues as before: at stage 1 parties learn both positions and make statements consistent with the grain of truth condition, and at stage 2 voters observe the statements and either abstain or vote for the party that is perceived as closest to their own position.

We show that the conclusions we arrived at before continue to hold in the setting where positions are chosen strategically. When parties make comparative statements, full disclosure is the unique equilibrium outcome, and therefore, voter choices are the same as under full information. By contrast, when comparative statements are not used, a continuum of equilibrium nondisclosure outcomes exists and both, voter choices and the resultant government policy may be different from those under full information. Formally, the result for the case of comparative political campaigning can be stated as follows:[37]

Proposition 4. *Under comparative political campaigning all equilibria are such that both political parties choose the median voter position* 0.5 *and for any pair of parties' political statements, voters infer parties' true positions and hence, make the same choices as under full disclosure.*

The logic behind this proposition is very similar to the logic behind the well-known median voter theorem. The proof relies on the observation that any party can deviate not only by changing its disclosure statement but also by changing its actual position, and that each party can disclose not only its own true position but also the position of the adversary. Indeed, consider a strategy profile where at least one of the parties chooses a position different from 0.5 and parties make statements that either fully disclose both positions or don't. Then irrespective of the pay-offs associated with this strategy, at least one of the parties can deviate and earn a strictly larger share of votes. To do that, a party can simply move its

[37]The same proposition holds true in case of presidential elections (majority rule), where the pay-offs are 0-1.

position ε-close (and in the direction of the median voter) to the position of the adversary for arbitrary small ε and then reveal both parties' positions precisely. We then obtain the median voter result: the only pair of positions for which the described deviation does not guarantee a higher pay-off for either party is $(0.5, 0.5)$. Knowing this, voters can deduce (and believe) that, even if the equilibrium statements are fuzzy, both parties are located at 0.5, so that indeed, neither party can benefit from deviation.

This is no longer true in case when comparative campaigning is not used. If each party can reveal only its own position but not the position of the other party, the argument above does not go through. In fact, a large range of nondisclosure equilibria emerges. For example, by analogy with the case of non-comparative campaigning in section 5, it is easy to show that for any set $\Phi \subseteq [0, 1]$ such that $0.5 \in \Phi$, there exists an equilibrium where both parties choose a position in Φ and make a nondisclosing statement including all positions in Φ. Such equilibrium induces nondisclosure in the symmetric set $\Phi \times \Phi$, which in particular, can be the whole unit square of possible positions. Clearly, such nondisclosure can lead voters to make choices that are different from those that they would have made under full information. Also the resultant government policy can be different from the one under full disclosure. And as before this produces a stark difference with the case of comparative campaigning.

Formally, the large class of equilibria inducing nondisclosure in any set $\Phi \times \Phi$ such that $0.5 \in \Phi$ is characterized below:[38]

Proposition 5. *Under non-comparative political campaigning, for any subset* $\Phi \subseteq [0, 1]$ *such that* $0.5 \in \Phi$ *there exists an equilibrium where both political parties choose a position in* Φ *and make the same statement* $S^* = \Phi$.

The proof of Proposition 5 is very simple. Given the symmetry of parties' statements, the pay-off of every party in the described candidate equilibrium is 0.5. If one of the parties deviates by choosing either a different statement or a different position *and* a different statement, then voters may form beliefs that the deviating party has some position consistent with its deviating statement, while the other party's position is that of the median voter. Given such beliefs, the deviating party is regarded as being at least as far from the median voter as its adversary. Therefore, a deviation is not gainful.

This equilibrium proof employs the fact that once a party has deviated, beliefs about the position of its adversary are undetermined and can be chosen such that it is not optimal

[38] The same equilibria exist in case of presidential elections.

to deviate. If voters believe, however, that a deviating statement does not convey any information regarding the position of the adversary, despite the fact that the deviating party knows the adversary's position, then the only equilibrium that satisfies this restriction on the out-of-equilibrium beliefs is the one that confirms the median voter theorem. Note that this restriction on beliefs is similar to the notion of passive beliefs (see, e.g., McAfee and Schwartz, 1994), requiring that receivers of statements justify a player's deviation by considering theories that are as close as possible to the equilibrium theory of play. From this perspective, the difference between comparative and non-comparative campaigning is still remarkable, as with comparative campaigning, nondisclosure is not an equilibrium *irrespective* of voters' beliefs, while without comparative campaigning nondisclosure stops being an equilibrium only given certain restrictions on voters' beliefs.

Thus, results for the case when parties' positions are strategic rather than exogenously given, are conceptually very similar. Comparative campaigning leads to the unique full disclosure outcome, so that in equilibrium voters' choices are not distorted by uncertainty regarding parties' positions. In contrast, no comparative campaigning results in a continuum of nondisclosure equilibria, where voters' choices and implemented government policy can be different from those under full information, unless voters have specific out-of-equilibrium beliefs.

7 Discussion and conclusions

This paper has examined the incentives of political parties to reveal their true, intended policy to uninformed voters during parliamentary elections. These incentives are studied both in a setting where the positions of political parties are exogenously given and in a setting where they are strategically chosen. Our primary interest lies in understanding whether the ambiguity of political statements, commonly observed during political campaigns, confuses voters and leads to "wrong" choices or whether under some conditions voters can still deduce which of the parties represents their interests best.

We find that two conditions, or aspects of political culture, are generically necessary and sufficient for "undistorted" voting: the grain of truth condition and comparative campaigning. If politicians make comparative statements that, even if vague, contain the true positions, then the generic equilibrium outcome is such that all voters are able to detect their most preferred party and make correct decisions. In this sense comparative campaigning allows voters to maximize their ex-post utility from voting, given the revealed intended policies, and thus, leads to efficient outcomes. By contrast, when statements are pure cheap talk and/or the politicians are not able to discuss the intended policies of their adversaries, a large variety of equilibria exist, where voters' choices may be misguided. Moreover, with comparative campaigning, any equilibrium is such that voters' support for each party and hence, the resultant government policy are the same as under full disclosure. Without comparative campaigning, the resultant policy is often different from the one under full information. Thus, the paper demonstrates the importance of being able to reveal not only own but also the adversary's position in democratic elections and shows that ambiguity of at least "minimally truthful" political statements is not a problem as long as comparative campaigning is in place.

While we have not formally analyzed the game where the parties have a choice whether or not to engage in comparative campaigning, it is not difficult to see that the arguments leading to "correct" voters' choices under comparative campaigning also lead to this outcome in any equilibrium, where parties can choose the type of campaigning.[39] That is, all equilibria, with full or partial disclosure, are ex-post efficient in this case.

Under presidential elections, where the candidate gaining the largest vote share wins and the other looses, the results are the same as under parliamentary elections in case political positions are chosen strategically. If positions are exogenous, then the same conclusions as before apply to the resultant policy, i.e., the winning candidate, but not to choices made by individual voters. Namely, the winning candidate is determined correctly in any equilibrium with comparative political campaigning but not without comparative campaigning, while individual voter choices can be distorted irrespective of whether political campaigning is comparative or not. To see why this is the case, note that under comparative campaigning, the candidate whose true position is closer to the median voter and who, therefore, wins the election under full disclosure, will only pool with other types if he also wins under nondisclosure. However, the indifferent voter given the equilibrium nondisclosure statements

[39] Indeed, the fact that the sum of parties' pay-offs is always equal to one implies that given a choice between the two types of campaigning, parties will only be "satisfied" with the equilibrium where their pay-offs are equal to the full revelation pay-offs. As a result, any equilibrium, with or without comparative political campaigning, will fulfill this property. Second, the monotonic functional dependence of parties' pay-offs on the position of the indifferent voter suggests that in any nondisclosure equilibrium, the position of the indifferent voter for any nondisclosing type must be the same as under full disclosure. Then due to the same argument as before this will imply that when parties' positions are exogenous, generically any equilibrium outcome is such that voters make the same choices as under full information, and when positions are strategic, any equilibrium outcome has this property.

might be different from the indifferent voter for any actual pooling type, so that some of the voter choices might be distorted. If the political campaigning is not comparative, then (as in parliamentary elections) many nondisclosure equilibria are not only ex-post inefficient but also lead to distorted election outcomes, where the winning candidate is not the same as under full disclosure.

Appendix

Demonstration that π_L is increasing in $\widehat{\lambda}$. Using the definition of π_L in (9) and applying the Leibniz rule of integral differentiation, we obtain:

$$
\begin{aligned}
\pi_L' &= \frac{\int_0^{\widehat{\lambda}} g(\lambda)d\lambda \cdot \left(\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda\right) - \int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda \cdot \left(\int_0^{\widehat{\lambda}} g(\lambda)d\lambda - \int_{\widehat{\lambda}}^1 g(\lambda)d\lambda\right)}{\left(\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda\right)^2} \\
&= \frac{G(\widehat{\lambda})\left(\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda\right) - \int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda \cdot \left(2G(\widehat{\lambda})-1\right)}{\left(\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda\right)^2} = \\
&= \frac{\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda \cdot \left(1-G(\widehat{\lambda})\right) + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda \cdot G(\widehat{\lambda})}{\left(\int_0^{\widehat{\lambda}}(\widehat{\lambda}-\lambda)g(\lambda)d\lambda + \int_{\widehat{\lambda}}^1(\lambda-\widehat{\lambda})g(\lambda)d\lambda\right)^2}.
\end{aligned}
$$

This expression is strictly positive for any $\widehat{\lambda} \in (0,1)$. □

An example of equilibrium under comparative campaigning where pooling in a non-generic set of types may misguide voters. Consider the following strategy profile. An asymmetric selection of types on the downward sloping diagonal of the $[0,1] \times [0,1]$ square pool and all the other types fully reveal both positions.[40] Note that types above the 45-degree line have party 1 located to the left of party 2 and types below the 45-degree line have party 2 located to the left of party 1. Suppose that the asymmetric selection of pooling types is such that it consists of all types on the diagonal above the 45-degree line and only one type below the 45-degree line. Figure 2 provides an illustration.

Note that all the pooling types have positions of the two parties symmetric around 0.5, i.e., $x_1 = 1 - x_2$. Therefore, the associated pay-off to both parties of any pooling type is 0.5 as the indifferent voter is located exactly in the middle of the unit interval.

[40]Full disclosure of all the other types is considered for simplicity. Instead, we could, for example, consider that all types which are not on the downward sloping diagonal pool with each other in the same manner as in the example of section 4. As we have shown in that example, such kind of pooling does not distort voters' choices, and in this sense, it is equivalent to full disclosure.

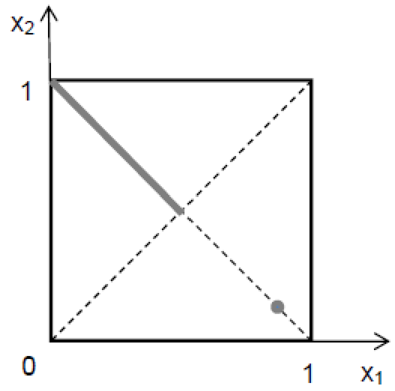

Figure 2: An equilibrium where types on the downward sloping diagonal above the 45-degree line and one type below the 45-degree line pool. The induced voters' choices can be different than under full disclosure.

It is easy to see that the proposed strategy profile is an equilibrium. First, just as in the example of section 4, no type can imitate the strategy of another type due to the grain of truth condition. Second, by fully revealing both positions, a party of any pooling type obtains the same pay-off as in the proposed equilibrium, equal to 0.5. Finally, one can easily construct voter out-of-equilibrium beliefs such that after any deviating statement, voters believe that the true type is one of the types in the statement where the associated full revelation pay-offs to both parties are equal to their equilibrium pay-offs. Hence, a deviation is not gainful.

Clearly, the described strategies may lead to inefficient choices at least for some voters. Indeed, given the equilibrium strategies, and after observing the pooling statement, voters assume that it is infinitely more likely that party 1 is located to the left of party 2. Therefore, all voters with a position to the left of the median voter vote for party 1, provided that their cost of voting is not too high. However, there is one type making the same statement that is located on the other side of the 45-degree line, and if that type materializes, all voters vote for the "wrong" party. That is, an inefficient outcome occurs. □

Proof of Proposition 2. Consider a set of types $\Phi \subseteq [0,1] \times [0,1]$ such that Φ is *not* a subset of types on the upward and downward sloping diagonals.[41] In the following we show that for *any* such set, as soon as there exists an equilibrium in which all types in Φ pool with each other, their nondisclosure does not mislead voters and equilibrium voting choices are the same as under full disclosure. This will then suggest that the only types in the $[0,1] \times [0,1]$ square that (a) may have incentives to pool with other types and (b) by pooling induce inefficient

[41] Recall that $x_1 = x_2$ for all types along the upward sloping diagonal, and $x_1 = 1 - x_2$ for all types along the downward sloping diagonal.

voters' choices are all located on either of the two diagonals. Therefore, there does not exist an equilibrium where the set of types that (a) do not fully disclose and (b) make a statement inducing inefficient voters' choices has a positive measure.

So, suppose that there exists an equilibrium in which all types in set Φ pool. Pooling requires the existence of at least two different types in Φ. Let us denote them by (x_1, x_2) and (y_1, y_2). Moreover, since Φ is not a subset of the upward and downward sloping diagonals, there exists at least one type in Φ – let it be (y_1, y_2) – that does not belong to either of the diagonals, so that $y_1 \neq y_2$ and $y_1 \neq 1 - y_2$.

Notice that the pay-off of each party of any type in Φ is equal to the pay-off of this party in the full disclosure equilibrium. This follows from two observations. First, since parties know positions of each other, each of them can guarantee itself a full disclosure pay-off by revealing both positions precisely. Therefore, in any not fully revealing equilibrium, the pay-off to any type of a party must be at least as high as the pay-off to that type in the full disclosure equilibrium. Second, the pay-off to any type of a party cannot be strictly larger than the full disclosure pay-off since the sum of the parties' pay-offs is always equal to one. Indeed, if one party would get a pay-off in a nondisclosure equilibrium that is larger than her full disclosure pay-off, then the other party would have an incentive to deviate to full disclosure. Thus, the pay-off to a party of any type in Φ is equal to its full revelation pay-off.

The equality of equilibrium pay-offs and full disclosure pay-offs is equivalent to the following two conditions. First, as the pay-off to each type is uniquely determined by $\widehat{\lambda}$ (whenever it is well-defined), we should have that for any type in Φ, the position of the indifferent voter is the same for a given equilibrium pooling statement and under full disclosure. Second, as the pay-offs to parties 1 and 2 of a type in Φ are not the same (we will show this below), parties' relative positions with respect to each other should be the same as their relative *perceived* positions due to the pooling equilibrium statement. The two conditions imply that nondisclosure by types in Φ does not mislead voters and the equilibrium is ex-post efficient.

The fact employed for the second condition – that the pay-offs to parties 1 and 2 of a type in Φ are not the same, – is an immediate implication of the first condition and the assumption that at least one type in Φ, for example, (y_1, y_2), has its two positions asymmetric around 0.5. Indeed, the first condition means that the value of $\widehat{\lambda}$ due to the equilibrium pooling statement is equal to the position of the indifferent voter when type (x_1, x_2) or (y_1, y_2) fully discloses:

$$\widehat{\lambda} = \frac{1}{2}(x_1 + x_2) = \frac{1}{2}(y_1 + y_2). \tag{12}$$

In this expression $y_1 + y_2 \neq 1$, so that $\widehat{\lambda} \neq 0.5$. Therefore, the pay-offs of the two parties, as defined by (9) – (10), are not the same.[42]

It remains to consider the case where the indifferent voter is not well-defined, as this is the only case in which the above argument does not go through. Below we show that since our set of pooling types Φ includes (y_1, y_2), where parties' positions are neither equal nor symmetric around 0.5, this situation is not an equilibrium. This would then contradict the definition of set Φ, and thereby, conclude the proof.

Suppose first that the indifferent voter is not well-defined for the equilibrium pooling statement. Then the equilibrium pay-off to a party of any type in Φ is either 0.5 (when all voters are indifferent between the two parties) or 0 or 1 (if no voter is indifferent). In either case, it is easy to see that one of the parties of type (y_1, y_2) would strictly benefit from deviating to full disclosure. Now, suppose that the indifferent voter is not well-defined when one of the pooling types in Φ fully discloses. This can only occur when the positions of the two parties of that type are equal, so that all voters are indifferent between parties 1 and 2. Then the full revelation pay-off of both parties of this type is 0.5 and given the equality of the full revelation pay-off and equilibrium nondisclosure pay-off, the equilibrium nondisclosure pay-off of this – and any other type in Φ – is also equal to 0.5.[43] But this implies that the party of type (y_1, y_2) whose location is closer to 0.5 can benefit from deviating to full disclosure. Hence, the situation where the indifferent voter is not well-defined, either for the equilibrium pooling statement or for one of the pooling types in Φ, is not an equilibrium.

Thus, we obtain that for any equilibrium set of pooling types Φ, nondisclosure does not mislead voters and their choices are the same as under full disclosure. □

Proof of Proposition 3. First, notice that no type of a party can or has incentives to imitate the strategy of another type. Indeed, even if the grain of truth condition allows a party to make an equilibrium statement of another type, this imitation will be detected by voters. This is so as voter beliefs about the type are formed based on statements of *both* parties and the other party still makes an equilibrium statement. For example, if $x_1 \in \Phi$, but $x_2 \notin \Phi$, party 1 could imitate a type with both positions in Φ by making a statement $S^* = \Phi$. However, since party 2 of type (x_1, x_2) reveals its own position precisely, and this position lies outside

[42] Recall that from our discussion in the end of section 2 it follows that the pay-offs of the parties with the furthest left and right position are equal, $\pi_L = \pi_R$, if and only if $\widehat{\lambda} = 0.5$.

[43] Here we employed the fact that the equilibrium pay-off of a party is the same at any pooling type and does not depend on the type.

Φ, voters, who know the equilibrium strategies, deduce that party 1 has deviated. Similarly, a party of a type with both positions in Φ can fully disclose its own position, imitating the equilibrium statement of a type where the position of that party (but not the position of the adversary) is in Φ. But given that the statement of the other party is Φ, voters deduce that both parties have positions in Φ and hence, the first party has deviated. Finally, a party of a type with at least one of the positions outside Φ can imitate the strategy of another such type – if this party's position is the same for both types. But given that the other party fully reveals its position, the imitating party cannot succeed in pretending to be of the other type.

Since the deviating party can always be detected, we now need to construct a system of voter out-of-equilibrium beliefs such that given these beliefs, no incentives to deviate exist. Consider the following out-of-equilibrium beliefs. If voters observe $S_i = \Phi$ and $S_j \neq \Phi$, then they assign probability one to such positions of the two parties in $S_i \bigcap S_j$ where party j is at least as far from 0.5 as her adversary, that is, where $|x_j - 0.5| \geq |x_i - 0.5|$.[44] And if voters observe $S_i = \{x_i\}$ and $S_j \neq \{x_j\}$, then they assign probability one to party j being located at $x'_j(S_j) \in S_j$ where the distance from party j to 0.5 is the largest among all locations in S_j, that is, where the full revelation pay-off of party j, given position x_i of the adversary, is minimized.

It is easy to see that given such voter out-of-equilibrium beliefs, no type of a party has incentives to deviate from the proposed equilibrium strategy. Indeed, a party of type (x_1, x_2) such that $x_1 \in \Phi$ and $x_2 \in \Phi$ has no incentives to deviate since its equilibrium pay-off, given the symmetry of the statements, is 0.5, while any deviation pay-off does not exceed 0.5.[45] Next, consider a deviation by a party of type (x_1, x_2) such that either x_1 or x_2 or both positions do not belong to Φ. If party j deviates to some admissible statement $S_j \neq \{x_j\}$, then given the voter beliefs in this case, the subsequent choice of voters will be as if the true position of party j is $x'_j(S_j)$ for sure. Then the deviation pay-off of party j is equal to its full revelation pay-off based on the pair of positions where its own position is $x'_j(M_j)$ and the position of the adversary is x_i. As $x_j \in S_j$, it follows that this pay-off does not exceed the party's full revelation pay-off based on the true positions. Thus, the deviation is not gainful. □

[44] $S_i \bigcap S_j \neq \emptyset$ due to the grain of truth condition.

[45] Recall that according to voters' out-of-equilibrium beliefs, the deviation pay-off is smaller or equal to the pay-off of the competitor.

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