Proximity and directional theory compared: Taking discriminant positions seriously in multi-party systems

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Abstract

This paper tackles the problem of comparison between proximity and directional voting in 27 European multi-party systems. This is a previously unaddressed aspect of European spatial issue voting. We focus on the spatial voting theories as predictors of vote intention, evaluating the extent of proximity and directional voting. We describe the influence of identical predictions on the comparison of these theories. Our multilevel analysis of the 2009 European Election Study data shows more empirical support for proximity voting than directional voting in the countries analyzed. It does this by clearly differentiating between those cases where it is possible to compare proximity and directional voting and where this is impossible. Nevertheless, the prevalence of proximity theory decreases in more polarized party-systems.

Key words: proximity voting, directional voting, discriminant predictions, cross-country comparison.

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1 Introduction

Spatial issue voting occupies an important place among theories of vote choice and candidate preferences (Downs, 1957; Enelow and Hinich, 1984; Rabinowitz and Macdonald, 1989; Westholm, 1997). Previous research frequently discusses and compares the proximity and directional theories of voting. This comparison perplexes researchers because these theories have very different implications for evaluating voter preferences and party competition (MacDonald et al., 1998; MacDonald and Rabinowitz, 2001; Lewis and King, 1999; Westholm, 1997, 2001).[3] Proximity voting suggests that the voter will prefer the most similar party to herself in terms of issue position/ideology (Downs, 1957; Enelow and Hinich, 1984). In contrast, directional rule posits that individuals first choose a side – such as pro or against an issue, or left vs. right ideology – and select the party that is most "intense" about that particular side of the issue. This difference also impacts different strategies for parties and candidates: knowing whether votes can be maximized by moderate or extreme positions shapes their policy stances and campaign messages (Adams and Merrill, 1999; Bernstein, 1995; Downs, 1957; Rabinowitz and Macdonald, 1989).

Comparing proximity and directional theory is a complicated task (Lewis and King, 1999). Methodological problems notwithstanding, one major substantive problem is that these theories frequently predict the same first party choice (Tomz and Houweling, 2008). In these cases, we cannot evaluate which theory fares better. The problem has arisen with particular force recently, since researchers have attempted cross-country comparisons between these two spatial voting theories (Lachat, 2008; Pardos-Prado and Dinas, 2010). However, we do not know whether the change in contextual factors changes also the conditions of the comparison between proximity and directional theory. We contribute to the better understanding of these two spatial issue voting theories by discussing comparability given the voter's position and the party-system constellation, and we generalize the conditions presented by Tomz and Houweling (2008) for multi-party systems. We argue that cross-country research should take into consideration the problem of distinct predictions, and our understanding of the competition between proximity and directional rule should be refined.

First, we flesh out what are the conditions of comparison in multi-party systems and then quantify to what extent the comparisons depend on the whether we allow a dense scale for party and voter positions. Next, we turn our attention to the data provided by the 2009 European Election Studies. We show that if we focus on the first preference, in around 75% of the cases proximity and directional theory offer identical predictions. We then evaluate the role of party positions in the 27 European countries in the comparison. Strikingly, any empirical comparison in these multi-party systems is only a partial one: the 2009 party constellation does not offer the empirical possibility to test whether voters will prefer a proximate party that is on a different side of the ideological spectrum as there will always be a closer party on the same side of the issue continuum.

Taking all these aspects into consideration, in our empirical analysis we test the hypothesis that party-system polarization systematically influences the performance of these two theories. Lachat (2008) focuses on the variation of proximity voting across countries and reports that proximity voting gets stronger in countries where there is higher party-system polarization. Furthermore, he notes that this pattern is also found for directional voting.

[3] Cf. papers in the 1997 Special Issue of Journal of Theoretical Politics.

However, Pardos-Prado and Dinas (2010) report that countries with more polarized party-systems enhance the explanatory power of directional theory, but this is not the case for proximity voting. We evaluate these seemingly contradictory findings. We find that the tenets of adversarial party competition in more polarized party-systems gives a slight systemic edge to directional voting, however proximity theory still presents itself as a better captor of first party choice. The level of party-polarization has to be extremely high in order for directional theory to overtake proximity theory in terms of accurate predictions. But in these regions of the data statistical uncertainty makes it impossible to declare a clear winner. Substantively, our results suggest the prevalence of proximity voting even across different contextual factors.

2 Spatial voting in a comparative setting

2.1 Overview and operationalization

Previous research argues that the increased importance of issues in the electoral decision-making process stems from the decline of the importance of social structure and cleavages (Thomassen, 2005; Lachat, 2008). Classical class identity does not sort the electorate accurately any more, and this leads to enhanced emphasis on issue considerations throughout time.While electoral competition is not necessarily unidimensional, the left-right ideological continuum accurately summarizes and describes the issue positions of the majority of the electorate, making it suitable for spatial voting analysis in a relatively parsimonious fashion (Cox, 1990; Inglehart, 1990). Consequently, comparative analysis of spatial issue voting focuses on the left-right ideological positioning as a "super-issue" (Lachat, 2008; Pardos-Prado and Dinas, 2010), an avenue that we will also adopt in the present paper.

Proximity and directional theory, as two major spatial voting theories [4], both adopt a rational choice perspective, in the sense that preferences over parties are assumed to be representable by a utility function. This function represents voters as possessing a preferred position on an issue space or on a policy option space, and they see the possible programs that parties offer them through those lenses. Parties have expressed positions on the same issue space, and it is assumed that voters have some information about these positions. In their general form, issue voting theories can be expressed for each political issue, and the final expected utility is given by a weighted summation, according to the salience of each issue for the voter. [5] In our case, the two competing theories will be expressed for only one dimension, the general left-right ideological scale.

[4] We acknowledge variations and other spatial issue voting theories – such as the Grofman (1985) discounting model or the compensatory model by Kedar (2009) – we focus in this paper only on proximity and directional theory. We do this not because they are necessarily superior to other spatial models, but because the debates and comparisons between these two theories shaped mostly the spatial voting literature. From now on, when we refer to spatial voting in general, we mean proximity and directional voting.

[5] We ignore the possibility of "expressive returns" of voting suggested by Brennan and Lomasky (1993).

The utility of voting for a party defined by **proximity theory** is the following:

$$u_i(v_i, p_j) = -(v_i - p_j)^2 \quad (1)$$

where v_i is the position of voter i on the left-right ideological scale, u_i is his utility and p_i is the position of party j in question on the same scale. It is easy to see that the utility of each voter reaches its maximum when the positions of the voter i and party j overlap. Furthermore, the neutral position or the middle of the scale has no specific meaning or importance in the proximity logic. If a voter is on the left of the scale, but the most proximate party is on the right, the voter will still prefer that party, disregarding that they are on different sides. In contrast, **directional theory builds** on this differentiation, and utility of the voter is defined as:

$$u_i(v_i, p_j) = (v_i - n)(p_j - n), \quad (2)$$

with n representing the ideological middle, or the point of neutrality between left and right. As stated above, directional theory uses a two-step rationale (Westholm, 1997, 866). The voter looks at first whether there are parties on the side that she took on the left-right scale (side rule). If there are, she will prefer that party that holds that side with the most intensity (party intensity rule); otherwise, he picks the party on the other side that is the least extreme for that side. The choice of the most extreme party on the same side will generate the highest utility for the voter.

We analyze these two theories as theories of vote choice, benchmarking only based on the prediction of the first choice.[6] For each theory, we store the prediction of the first party preference (if a unique choice can be derived) and match this prediction to the declared vote intention of the individual. Thus, we will have situations where (1) one of the theories does not provide a unique prediction for first party choice (2) both theories predict the same party as first preference, but this is not reflected by the vote intention of the individual, (3) both theories (still) predict the same, and this prediction is in accordance with the expressed vote intention of the individual, and (4) the predictions stemming from the two theories are different and one or none of them is correct. If only those cases are taken when spatial voting is detected to be activated, the two theories become mutually exclusive. This highly constrained scenario will give us accurate insight on how these theories perform compared to each other.

Through this approach we can better model, represent and understand how the prevalence of these spatial voting models depends on individual and contextual factors. This was not an impossible task even using the utility function approach[7], but this meant specifying interaction terms between individual – and/or contextual – variables and the utility functions in a stacked cross-sectional dataset. The number and complexity of interactions was always kept to a minimum for reasons of specification and sample size. When employing the present approach, the question of what determines spatial voting is directly translated into the chosen model, spatial voting being the quantity of interest reflected on the left side of the regression equation.

[6] The highest value of the vote propensity essentially overlaps with vote choice or intention (van der Eijk et al., 2006).
[7] Along party-system polarization, Lachat (2008) also accounts for individual interaction effects.

2.2 Comparing directional and proximity voting

One major reason for the difficulty of comparison stems from non-discernible prediction, i.e. those voter-party configurations where directional and proximity theory do not differ in predictions (Claassen, 2009; Lacy and Paolino, 2010; Lewis and King, 1999; Tomz and Houweling, 2008) and this is the core part of our paper. As a first step, we generalize the results of Tomz and Houweling (2008) on discriminating between proximity and directional theory for more than two parties. We define a discriminating scenario as one in which (1) both theories provide a unique first-party preference for the voter, and (2) these first-party preferences differ. [8]

Take $n > 1$ parties, with $p_i \in [0, s]$, s even. The ideological middle is then $m = \frac{s}{2}$. The party indices can be chosen such that $0 \leq p_1 \leq p_2, \ldots, p_{n-1} \leq p_n \leq s$, white the voter is at $v \in [0, \ldots, s]$. Our results are captured in the following theorem: [9]

Theorem 1 For a particular party-voter configuration, proximity and directional theories provide a unique, discriminating first-party choice if and only if this configuration satisfies the following conditions:

- $v \neq m$.
- If $p_i \leq v \leq p_{i+1}$ for some i, then:
  $p_{i-1} < p_i, \quad \text{if } i \geq 2 \text{ and } v - p_i < p_{i+1} - v;$
  $p_{i+1} < p_{i+2}, \text{ if } i \leq n-2 \text{ and } v - p_i > p_{i+1} - v;$
  $v - p_i \neq p_{i+1} - v.$
- $\dfrac{p_1 + p_2}{2} < v, \quad \text{if } v < m;$
  $\dfrac{p_{i-1} + p_i}{2} > v$, if $v > m$.

The first two conditions are only relevant when being placed in the exact ideological middle, or being equidistant to two parties is not a 0-probability event. This means that the share of discriminating scenarios depends also on the properties of the data used. Although choosing the type of individual and party placements is rarely up to the researcher, these aspects contribute to understanding the context of comparison between the two theories.

[8] Differentiation can be interpreted in a different way: suppose that two parties are equidistant from a voter, but the voter chooses the party that is most extreme on his side. In this case, directional theory is right, while proximity theory – while providing no unique prediction – is clearly wrong. It could be argued that such scenarios are, in fact, discriminating. However, we decided be stringent on what count as a discriminating scenario, and to exclude these cases for two reasons. First, the general criteria for discriminating scenarios would need to include the voter's *actual* choice, rendering the general set of criteria for discrimination too abstruse. Second – and more importantly –, with our data, the only voters excluded by the requirement of unique prediction are the ones positioned in the exact ideological middle. For these, directional theory predicts that they would choose either the most extreme left-, or right-wing party, a clearly mistaken prediction. Relaxing our criterion would thus penalize directional theory. We think that the foundational idea for directional theory – voters seek out the party that is most vocal on their right- or left-wingness – is inapplicable for this centrist voters, so instead of giving a handicap to proximity theory, we say that the first party choice under directional theory is undefined for these voters, and thus no comparison can be made.

[9] The details of the derivation are available in Appendix A.

In principle, models of spatial voting can be set up in either a discrete or a dense scale. [10] The two types of agents that spatial theories deal with – parties and voters – can both be placed on a discrete or a dense scale. Note that the choice of scale topology is independent for these: it is very well possible for voters to inhabit a *different* scale type then parties. Overall, this generates a total of four topological options for spatial voting models and correspondingly for data collection.

$T1$ — discrete scale for both parties and voters.
$T2$ — discrete scale for parties, dense scale for voters.
$T3$ — dense scale for parties, discrete scale for voters.
$T4$ — dense scale for parties and voters alike.

To quantify the effect of scale topology, we calculated the share of voter-party configurations where both theories give a prediction concerning voter behavior, and the predicted behavior is *different*. [11] The share of discriminating scenarios, alongside with our results for $T1$, are shown in Table 1. [12]

[Table 1 around here]

As expected, the share of discriminating scenarios increases from $T1$ to $T4$. Discretization of party positions hurts chances of discrimination more than discretization of the voter's position. For $T1$, even with 7 parties and a scale size of 11 options, the share of discriminating configurations is below 25%. This has very severe implications on any empirical analysis that aims to discriminate between the two theories of spatial voting using a $T1$-type topology. [13] Switching from $T1$ to $T2$ brings significant improvements, especially if the scale size is big enough. However, even using $T2$, the maximum share of discriminating scenarios lingers around 33%. Only introducing non-integer party placements raises the chances of discrimination to over 50%.

[Table 2 around here]

Table 2 shows the average share of intensity rule for each scale topology type. Party numbers or scale size have only minor effects on these ratios, although larger scales do increase the role of the side rule. Unfortunately, the discriminative power of $T3$ and $T4$ rely mostly on the intensity rule, and the side rule plays very little role. This is especially true of $T3$, the scale topology type that our data relies on.

[10] In this setting, "density" means merely the possibility of non-integer party or voter placements, e.g. that a party can occupy position 4.801 on the left-right ideological scale. In all real life scenarios, what we call a dense scale will not be dense in the exact mathematical sense.
[11] The full algorithm and method of simulation is described in Appendix B
[12] Note that for $T4$, the scale size is irrelevant.
[13] In $T1$, the share of discriminating configurations does not converge to one as either the number of parties or scale size goes to infinity, just when they both do. Moreover, the number of parties cannot converge much faster than the size of the scale, otherwise, parties would fall on the same spots on the scale, rendering proximity theory impotent for predicting anything for most voters.

2.3 *Differentiation and the extent of possible comparisons*

The 2009 European Election Studies provides a discrete scale for identifying voter positions. For party positions, unrounded perceived party positions are available [14] , leaving us with an average share of voters in discriminating positions across countries at just 27.6%. The exact implications for our multivariate analysis are two-fold. Figure 1 displays that most of the discriminant predictions stem from the moderate individual cases, whereas the predictions on the more extreme individual positions tend to converge towards the most extreme party on a given side of the left-right continuum. This is simply due to the fact that as the individual moves towards the extremes of the scale, the most proximate party will become the most extreme one, generating overlapping predictions with directional theory. Whenever trying to decide whether the most proximate (and more moderate) party will be preferred against the most extreme on one of the sides, we essentially want to see how more moderate individuals decide. The relevant comparison of these two theories is, by definition, focused on more moderate individuals.

[Figure 1 around here]

Moreover, the range of discriminant prediction varies across countries, depending exclusively on the *supply side*. The most common constellation is that directional and proximity theory offer different predictions for those situated on 3, 4, 6, and 7. This range shrinks to a minimum in Ireland and Estonia; this is due to a small range of party positions and intense crowding of parties around one pivotal position, whereas in Italy and Hungary, even for the more extreme individuals (positions 2 and 8) we find different predictions.

As we have already seen, formulating conclusions on which theory fairs better is based almost exclusively on the behavior of more moderate individuals. However, for the directional theory middle of the policy continuum a meaningful neutral position that separates those who are for or against a policy or ideology. On the other hand, in the case of proximity theory, the voter will prefer the candidate or the party that is located closest to her, disregarding whether they are on the same side. Unfortunately, this fundamental dissemblance cannot fully be tested on the cross-country data at hand: [15] individuals are asked to place themselves on a discrete, 11-point scale. Thus 4 and 6 are the most moderate positions that already take a side. [16] Except the case of Italy and Malta [17] , in each European multi-party system we **always** find a party that cumulatively satisfies the following two conditions: *a)* it is the most proximate party, and *b)* it is on the same side of the ideological continuum as the individual. Thus, the empirical test of directional theory is based on whether the individual is more responsive to an extreme party position than to a more moderate party position.

[14] The data will be introduced in more detail in Section 4.1.

[15] Reviewing previous works and the time points covered by the analyses, it is highly unlikely that this was different in those cases.

[16] For the exposition in this section we refer to the left-right position measured on an 11-point scale, ranging from 0 to 10, with 5 as being the middle point.

[17] Both in Malta and in Italy, individuals positioned one point to the right from the neutral point (6) are faced with a more proximate choice that is already on the "left" side of the spectrum. According to proximity theory, these should be the preferred options for an individual positioned at 6 on the left-right ideological scale. We observe in both cases that these are relatively small parties: 6.5% of the vote share for UDC in Italy, and 0.6% for the AN in Malta. In both cases, these individuals overwhelmingly prefer a party on their side and this is mostly a large party.

3 Contextual variation and hypotheses

Under what contextual configuration do we find more spatial issue voting? The theoretical conditions for better explanatory power of spatial utility functions can be summarized in two points: when ideology or an issue is salient (1) and/or there is policy differentiation of the competing parties (2), issue voting will be stronger. The usually employed proxy for these characteristics is party-system polarization, understood as a measure of spread of parties along the ideological left-right continuum (Dalton, 2008). Increased party-system polarization describes a system in which parties emphasize their unique ideological positions and try to differentiate themselves from other competing parties (Downs, 1957). Thus, party-system polarization is a measure of ideological differentiation (Sartori, 1976). Party-system polarization is expected to intensify the debates between parties and public debate on the dimension (Sartori, 1976), and make the dimension more salient for the electoral decision (Downs, 1957; Alvarez and Nagler, 2004). Indeed, previous research shows that in countries with more polarized party-systems – or country sub-units (Lachat, 2011) – spatial voting theories describe better the voter's preferences (Lachat, 2008; Pardos-Prado and Dinas, 2010). This comes as no surprise in light of the results reported by van der Eijk et al. (2005). Also, in a follow up, Dalton (2008, 14) reports: as party-system polarization increases, the correlation between the left-right position and the vote increases heavily ($r = 0.633$). For our research question, this translates into the hypothesis that:

Hypothesis 1 *As party-system polarization increases, the probability of spatial issue voting increases.*

We will also define party-system polarization identical to previous comparative work on spatial issue voting – following Taylor and Herman (1971), where the polarization measure for a party system with K number of parties is:

$$Polarization = \sum_{i=1}^{K} w_i |LR_i - \overline{LR}| \quad (3)$$

where:

w_i = the weight attached to party i, given by its relative vote share at the time of the election observed.

$\overline{LR}$ = the weighted mean of the parties' placement on the left-right scale;

LR_i = the position of the party i on the left-right scale;

We use the polarization values as in Vegetti (2011). The party placement scores were calculated based on the mean perceived left-right position of each party in the European Election Study 2009. Although this survey concerns the EP elections, both the party positions of the left-right scale and the vote intention refer to the national political arena.[18] Furthermore, the party weights reflect the vote share of each party based on the previous elections. One last aspect to mention is that this score includes only relevant parties: parties running in all the country and parties represented in the national Parliament at the

[18] The questionnaire refers to the individuals vote intention if **national elections** would be held. Also, the perceived party position and the left-right self-placement refer to general concepts, not to EU or EP election specific quantities.

time of the 2009 European Election (for exceptions see Vegetti (2011)).

Two additional points should be discussed for Hypothesis 1. On one hand, Lachat (2008) found that both proximity and directional utility functions gain in exploratory power in more polarized party-systems. On the other hand, Pardos-Prado and Dinas (2010) report that party-system polarization only benefits directional theory, with no or negative effect on the proximity utility function. At this stage of our analysis, these differences should not have any sizeable influence on our Hypothesis 1. If we accept the conclusions of Lachat (2008), spatial voting frequency should definitely increase with party-system polarization. If we follow the results of Pardos-Prado and Dinas (2010), the accuracy of directional theory should increase more – even on the detriment of proximity theory, but this overall would not change the increase of spatial voting frequency. It would simply change the ratio of spatial voting determined by directional *vs* proximity voting. This is due to our operationalization in which we refer to spatial issue voting being activated if either proximity or directional theory (or both) offer a correct prediction of the vote intention.

How does the composition of spatial voting change as party-system polarization increases? Can too much differentiation create an adversarial context? As stated above, in the case of an unconstrained approach that does not differentiate between cases where the two theories offer different predictions, the accuracy of directional and proximity theory should be influenced in the same way by party-system polarization. Clearer divisions or differentiation between the competing parties creates a more fertile terrain for spatial issue voting in general (Vegetti, 2011). We regard that the percentage of non-discriminant predictions (around 75% on average) is so high that no other expectation can be formulated, but that these two theories are influenced in the same way by party-system polarization. Hence, our second hypothesis:

Hypothesis 2 *In the unconstrained scenario, both the vote intention prediction of proximity and directional prediction will be more accurate as party-system polarization increases.*

However, party-system polarization also reflects a degree of conflictual politics (Pardos-Prado and Dinas, 2010). This is even more emphasized if we think about the formula we use for polarization. If a given party is more relevant (bigger parties) it will have a higher impact on the overall polarization score as it distances itself from the middle of the scale. Thus, in those countries where we have higher levels of party-system polarization, it is also expected that the more important parties deviate more from the middle of the scale. These parties will be relevant players in the political competition, and they will also be considered as valid choices by voters. We need to note here the problem of causal direction. As seen, in more polarized systems, bigger parties tend to be more distant from the middle point. In quite some cases, they end up being the most extreme party on one (or both) side of the ideological continuum. In this case, this will automatically lend more credence to directional theory.[19] However, could it be that the party-system constellation or the move of relevant parties to the extremes is a result of more responsiveness to extreme positions on the individual level? If this is a plausible mechanism, we cannot necessarily argue that directional voting is increased *by* polarized party-systems. Given the data at hand, we cannot disentangle the net of complicated causal relationships possible, and thus we have to emphasize the correlational nature of our analysis. This aspect

[19] Considerations related to strategic voting will be discussed in the results section.

of our analysis is not different from the limitations reported by previous research in this field (Lachat, 2008; Pardos-Prado and Dinas, 2010).

Furthermore, if the policy space is divided – by the voter's cognitive process – into many categories, it is more probable that the voter will be a proximilist. However, if a voter uses only two categories that closely resemble the two sides of the policy space (as measured in surveys for example), the voter will be a directionalist (Collins, 2011). Based on how the party-system polarization index is operationalized and its divisive nature, we argue that in more polarized systems we can expect people to consider the political arena in fewer categories, these reflecting the divisions between left and right. In sum:

Hypothesis 3 *For cases with discriminant predictions and spatial voting at play, the vote intention prediction of proximity theory will be less accurate in highly polarized party-systems, whereas the vote intention prediction of directional theory will be more accurate as party-system polarization increases.*

This last hypothesis has a direct implication on the comparison of the two theories. Ultimately, in those cases where we have discriminant prediction **and** there is some sort of spatial voting going on, we expect that directional theory will be positively influenced by party-system polarization, on the expense of proximity theory. Essentially, this is the accurate decomposition of the spatial voting into proximity and directional voting. Will this mean that directional voting outperforms proximity voting in more polarized party-systems? We do not have an explicit answer to this question. We can only speculate based on previously reported results. According to Pardos-Prado and Dinas (2010, 776), a change from the minimum to the maximum level of reported party-system polarization induces an increase of 0.02 in the directional function's impact, pushing it slightly over (0.013), but suggesting that the proximity function (0.04) still prevails even in this context. This effect is in the expected direction, but given the choice of modeling we do not know anything about the changes in the proximity function's slope across countries (in interaction with party-system polarization), and thus it is highly problematic to correctly contextualize the magnitude (and significance) of the effect on directional theory.

Nevertheless, we consider this as a guiding empirical result, and we expect that although directional voting will gain on the expense of proximity voting in the direct comparison, this might not be sufficient for it to prevail as the most frequent spatial issue voting type. [20] We proceed with our empirical analysis in the next section.

[20] Although Pardos-Prado and Dinas (2010) make a differentiation between electoral and party-system polarization, we cannot fully test this differentiation on our data. This is due to the simple fact that for the 27 countries included in our analysis, the correlation between party-system polarization and electoral polarization was extremely high ($r = 0.73$; $p < 0.001$) for 2009. In light of this empirical constellation, even if we would be able to derive specific hypotheses, we cannot expect significantly diverging results.

4 Empirical analysis

4.1 Data

In order to comparatively evaluate the accuracy of proximity and directional theory, we use the 2009 European Election Studies. As noted previously, the vote intention question refers to the national elections, not to the European Parliamentary Elections, making it suitable to draw inferences about general party competition and electoral behavior. Including 27 European countries, these data present several advantages that facilitate both gaging cross-country differences and deciding in heads-up predictions of the two spatial voting theories. The survey was carried out simultaneously in the 27 countries so there are no additional time related factors that would bias the cross-country comparisons. [21]

As in previous research, we assume that the left-right political dimension captures the most essential parts of ideology both on the individual and on the party level. Our data contains the classic 11-point left-right political ideology scale. Also, respondents were asked to place the parties from their country on the same 11-point left-right scale. We follow previous work in order to avoid the problem of projection (Macdonald and Rabinowitz, 1997; MacDonald et al., 1997), and hence compute for each party in each system an average perceived left-right position. This party specific variable also ranges from 0 to 10, but it can take up non-integer values. With the assumption that voter positions (as asked in the survey) are discrete, but party positions are continuous, and given the voter distribution on the left-right scale we compute for each individual position two quantities: (1) what party preference would directional theory predict, if any *(Directional.P)*, and (2) what party preference would proximity theory predict, if any *(Proximity.P)*. Based on the country of observation and the individual's left-right self-placement, we augment the individual level data with these two variables. As operationalized in previous sections, if any (or both) of these two theories offered a correct prediction, we tag it as spatial voting. Overall, for each individual, we compute three dichotomous variables:

$$Directional = \begin{cases} 1 & \text{if } Directional.P = VoteIntention \\ 0 & \text{otherwise} \end{cases}$$

$$Proximity = \begin{cases} 1 & \text{if } Proximity.P = VoteIntention \\ 0 & \text{otherwise} \end{cases}$$

$$Spatial = \begin{cases} 1 & \text{if } Proximity = 1 \parallel Directional = 1 \\ 0 & \text{otherwise} \end{cases}$$

Furthermore, for each individual we store whether the two theories predicted different

[21] For a more general setup, we will employ the following notation: J reflects the total number of systems, in our case 28, whereas n is the total number of individual observations in our data. We have 28 instead of 27 second level units because Belgium is split up into Flanders and the Walloon region.

first party choice as follows:

$$Discriminate = \begin{cases} 1 & \text{if } Proximity.P \neq Directional.P \\ 0 & \text{otherwise} \end{cases}$$

As implemented here, this is the most conservative test of the predictive power associated with each of these two theories. We only assess whether the spatial theory predicted first party preference, and we are not benchmarking the theory based on the whole set of ranked preferences predicted. Moreover, we penalize directional theory for not offering party preference predictions for individuals on the middle point of the left-right political scale. As there are no predictions associated with directional theory for a voter in the middle position, the *Directional* binary variable will always be 0 if $Left - Right_{voter_{ij}} = 5$.

We use expressed vote intention instead of vote recall because it reflects a first preference stipulated under the influence of current party-system constellation and individual status. By choosing vote intention we avoid the possible effect of changes in party-system polarization, disappearance of parties, and any other factors that are a function of the time gap between collecting the survey and the previous national election.

4.2 Descriptive results

A first step in the empirical analysis is a careful look at the descriptive results presented in Figure 2. [22] We observe substantial cross-country variation, spatial theories being least correct on first party choice in Slovenia (16.86%) and overwhelmingly accurate in Malta (71.19%). These results offer a less daunting picture about the performance of issue voting theories in Europe, suggesting that this approach towards voter preferences still has a relatively large explanatory power. From a normative perspective, an acknowledged and represented role of ideology (or issues) in the electoral outcomes is desired, and again, it is preferred if a proximity logic underlies the choice (Powell, 2004; Thomassen and Schmitt, 1997). We see that, on average, in close to 40% of the electoral preferences some sort of spatial-ideological logic is represented. When focusing on the extent of spatial voting, we can already establish a positive relationship between party-system polarization and spatial voting, though not necessarily a linear one.

[Figure 2 around here]

When we decompose the sources of spatial voting into directional and proximity – and take into account only discriminant scenarios – we see 3 major groups of countries. We have countries – such as Austria, Bulgaria, Belgium (both systems), Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Poland, Portugal, Slovakia – where proximity theory has a clear edge. We also have a set of countries – Czech-Republic, Finland, Luxembourg, Netherlands, Romania, Slovenia, Sweden, UK – where the two theories perform very similar to each other. Finally, we have a relatively small

[22] We also report these proportions in table format in Appendix C.

group of countries where the directional model is clearly a better predictor of vote intention: Cyprus, Malta, Lithuania, Spain.

Overall, we see substantial cross-country variation in spatial voting, with a relative win for proximity theory. Also, we identify that more polarized party-systems (over the median) exhibit systematically higher rates of spatial voting, and this contextual setting gives a slight edge to directional theory. Nevertheless, a multivariate account is needed to identify and to evaluate the systemic differences that affect the performance of these theories.

4.3 Statistical model

In the general description we follow Gelman and Hill (2006) and use the following general hierarchical model specification:

$$\begin{aligned} y_i &\sim \mathcal{N}(X_i^0\beta^0 + X_i B_{j[i]}, \sigma_y^2), \text{ for } i = 1, \ldots, n \\ B_j &\sim \mathcal{N}(U_j G, \Sigma_B), \text{ for } j = 1, \ldots, J \end{aligned} \tag{4}$$

where X^0 is the $n \times R$ matrix of individual predictors and β^0 is the vector of their unmodeled regression coefficients. X is the $n \times K$ matrix of individual predictors that have coefficients varying by groups (intercept included). B is the $J \times K$ matrix of regression coefficients. U is the $J \times L$ matrix of group level predictors (in our case it is only a vector, $L = 1$) and G is the $L \times K$ matrix of coefficients for the group level regression (again, in our case this is a vector, $L = 1$). Σ_B is the covariance of the varying intercepts and slopes. Given the nature of our dichotomous dependent variables, we use a $logit$ link function. We only diverge from this specification in one respect: we do not employ a linear restriction on the effect of party-system polarization, and thus estimate smoothing splines (Keele, 2008). [23]

We specify a total of six separate models to test our hypotheses. In our first model, the dependent variable is spatial voting, and our analysis does not differentiate between cases in which both theories were correct or only one of them. Overall, with this model we can test Hypothesis 1. We then analyze how proximity and directional voting are directly influenced by party-system polarization, without restraining our sample to discriminant scenarios, testing Hypothesis 2.

For our fourth and fifth model, we restrict our sample to the cases in which directional and proximity theory offered different predictions. In the fourth model, we estimate the probability of proximity voting (1) vs. no spatial voting **or** directional voting (0). Similarly, in the fifth model we estimate the probability of directional voting (1) vs. no spatial voting **or** proximity voting (0). With these two models we can evaluate Hypothesis 3 without being influenced by overlapping predictions and compare the results to the previous two models. Finally, we estimate a model in which we analyze to what extent more polarized party-systems help directional voting against proximity voting. In this case, our sample includes only cases in which we know that there is spatial voting, and the two theories offer different predictions. In this case we only need to specify one model, as directional

[23] We specified models with penalized regression splines (basis being cubic regression spline) and automatic knot selection.

and proximity theory are mutually exclusive.[24] Overall, this last model reflects the direct and accurate comparison between the two spatial voting theories, contributing to previous debates on which theory is "better", a corollary of Hypothesis 3 in our case.

All these models include five individual level predictors: left-right self placement, political knowledge, interest in politics, age, and gender. Although not of particular interest for our general research question, we employ these variables to explain individual variation and correctly link party-system polarization cross-country variation in a correctly specified model.[25] Detailed description and descriptive statistics of these variables are presented in Appendix D. Finally, before turning our attention to the results, we report that around 9% of the variation in spatial, 7% variation in proximity, and 15% of the variation in directional voting is across-countries. Furthermore, when the sample for direct comparisons is considered, close to 23% of the variation in directional (identical for proximity voting) is between country variation, suggesting a fertile variance structure for a hierarchical model.

4.4 Multivariate results

According to our theory based on increased salience of the ideology (and issues) and higher policy differentiation in polarized party-systems, we expect a positive relationship between polarization and spatial voting.[26] As reported in Figure 3 (panel A), our empirical analysis confirms this expectation.

[Figure 3 around here]

Analyzing 28 European multi-party systems, we find a substantive and statistically significant positive effect of party-system polarization on spatial voting: the probability spatial voting is employed increases from around 0.2 in depolarized political systems to above 0.6 in highly polarized party-systems – everything else held constant.[27] However, a more realistic interpretation takes into account that only very few countries score that high on

[24] Given this subsample, whenever directional theory was wrong, proximity theory was accurate with its different prediction.

[25] We let the coefficient of the left-right self placement to vary across groups randomly. We do this, because the discriminant predictions are contingent on where the individual places herself. However, this is relevant only for the cases where we analyze the unrestrained sample. Accordingly, in our last three models, we estimate the the left-right self placement as a fixed effect.

[26] As mentioned previously, we are not focusing here on the individual level covariates. We have to point out that the left-right self placement employed as a control should not be interpreted, because it was not specified as a categorical variable. Politically more interested individuals tend to use spatial voting (both proximity and directional) more often, but this does not influence the outcome of the direct comparison. Similarly, we find that politically more informed individuals employ spatial voting more often, and this holds true for directional and proximity voting as well, if we do not restrain our sample for discriminant predictions. The controls for gender and age display mixed results depending on which sample we use for analysis. Overall, we see that women tend to be less "directional" than men, and as people get older they more often follow a proximity logic than a directional one.

[27] Similar to Lachat (2008), we find that more interested and politically more informed individuals are also more prone to follow a spatial logic in choosing their representatives. Full model results are reported in Appendix E.

polarization that our model would predict above 0.5 probability for spatial voting.[28] For example, in a system with moderate party-system polarization (such as the Finland, Romania, or UK) the predicted probability of spatial voting of around 0.25, whereas for the same individual in countries with above average polarization (such Bulgaria, Hungary, or the Czech-Republic) this value will be closer to 0.4. Consequently, we see what those hard-to-interpret cross-level interactions meant in previous analysis in terms of probabilities of spatial voting across countries. No matter how conservative is our interpretation, we find strong empirical evidence that when parties offer better differentiated policy stances on the left-right political dimension, this policy considerations aggregated by the left-right ideological continuum matter more in the electoral decisions of individuals. Yet again a note of caution is needed in the interpretation. We see that varying levels of party-system polarization are associated with different predicted probabilities for spatial voting. This covariation is suitable to explain only cross-country variation in spatial voting. It is not possible to think of these results in terms of how much spatial voting will drop after a depolarizing trend in a given country. We have to note that changes of 0.5 or 1 in the party-system polarization for a given country would mean quite a reshuffling of the existing party-system with either emergence and consolidation of new parties, or disappearance or merging of existing parties.[29] In highly institutionalized Western European party-systems it is unlikely to find these major changes in a realistically short period of time.

With empirical support for our Hypothesis 1, we evaluate now whether proximity and directional theory is affected systematically differently by party-system polarization. As discussed before, we specify two hierarchical models with proximity and directional as dependent variables, first without restraining our sample. When proximity (directional) takes the value 1 we don't know whether directional (proximity) theory made a bad prediction. We see in Figure 3, panel B and panel C that both theories gain in more polarized party-systems. Generally, directional voting is far less probable in depolarized systems compared to proximity voting, but increasing party-system polarization has a stronger beneficial effect on it. Towards very high levels of party-system polarization, both vote choice strategies will be similar in extent. Overall, this only means that for directional voting to be comparable in magnitude to proximity voting, higher levels of party-system polarization are necessary. Our results regarding proximity voting suggest that the policy differentiations salience effect is still present, and does not necessarily disappear with increasing centrifugal party competition (and implicitly more adversarial competition). In this sense, we find confirmation of the hypothesis that as party-system polarization increases both the spatial voting theories benefit from this aspect. However, as in over 75% of the cases these two theories offer the same prediction, we contend that this result is driven by this impossibility to discern between the two theories. This is even more plausible if we think back to Figure 1, where we see that there are no discriminant predictions on the two relative ends of the ideological continuum. Consequently, the positive results displayed based on our second and third models are expected to be generated by increasing accuracy of the two theories exactly on these side segments of the continuum.

[Figure 4 around here]

[28] Based on our analysis we suspected that Cyprus (with a score of over 3 for party-system polarization) is an outlier. Thus, we re-specified our model without including Cyprus. Both the magnitude and the statistical significance of party-polarization's effect remained basically unchanged.

[29] As our results hold for polarization on the left-right ideological dimension, it is not sufficient to find a new "single" issue party performing well.

For this reason, we restrained our sample to discriminant cases only for the next two models. Accordingly, when proximity (directional) takes the value 1 we know that directional (proximity) theory made a bad prediction. However, when proximity (directional) is 0, we cannot be sure (yet) whether the directional (proximity) model was right in predicting the first party preference. Thus, this is not yet a direct, heads-up comparison between the two theories. It is a step in which we can evaluate the effect of party-system characteristics without being influenced by the overlapping predictions. When controlling for discriminant predictions, we see in Figure 4, panels A and B that only directional theory gains in more polarized party-systems. The magnitude of this gain is, however, is limited: from a close to 0 probability of directional voting in depolarized systems to a roughly 0.2 probability in the most polarized party-systems. More telling is the approximately 0.1 probability of directional voting at the median level of party-system polarization. The slight negative effect of party-system polarization on proximity voting does not reach statistical significance, and predicted probability of proximity voting is somewhere around 0.2 - 0.25, independent of the level of party-system polarization. One possible interpretation of this result is that proximity voting is resistant to more adversarial political contexts. Even if there is more accentuated competition with relevant political options diverging even to the extremes of the ideological continuum, a fair amount a proximity voting will be present. Again, this result is encouraging from a normative perspective that stipulates the desirability of choosing representatives that are "congruent" on policy stances with the voter (Adams and Merill, 2005; Powell, 2004; Thomassen and Schmitt, 1997). Furthermore, this normative approach does not require the differentiation between non-discriminant and discriminant scenarios. No matter whether directional theory predicts the same first preference, when there is proximity voting, the benefits of representatives that are congruent with the voter are present.

Our contribution till this point clarifies and extends the conclusions elaborated by Pardos-Prado and Dinas (2010). As stated before, Pardos-Prado and Dinas (2010) did not assess in their analysis the interaction between the proximity functional form and party-system polarization, thus we had no indication whether this theory "suffers" under a context characterized by a more polarized party-system.[30] Furthermore, Lachat (2008) reported that the proximity function gains in explanatory power as party-system polarization increases. These diverging results lead to a quandary: our empirical analysis clearly suggests that proximity voting benefits from party-system polarization, but not as much as directional theory. However, even if the slope of party-system polarization is steeper for directional voting, this is only sufficient to compensate for its relatively low probability in depolarized systems (as displayed in Figure 3). But these are only "illusory" gains for proximity theory. As discussed above and displayed in panels A and B of Figure 4, proximity theory only gains because of the overlapping predictions with directional theory. The final remaining question is how would these two theories compare against each other directly. Our last model aims at bringing empirical evidence to settle this dilemma.

For the direct comparison, we restrained our sample to those cases in which only one of the two theories offered a correct prediction. Consequently, in this sample we have cases where there is spatial voting **and** discriminant predictions are offered by the two theories. Party-system polarization has a statistically significant and substantive effect in this case as well. Panel C in Figure 4 displays this effect. Indeed, in the direct comparison,

[30] As discussed previously, we are unable to meaningfully test the effect of electoral polarization on these two theories, because in our data party-system polarization and electoral polarization is highly correlated ($r = 0.73, p < 0.001$).

directional theory gains substantially from increasing party-system polarization: from 0.1 probability in the lowest party-system polarization range to 0.7 in the highest.[31] Correspondingly, proximity voting decreases from around a probability of 0.9 to 0.3.

Yet again, although these results are in conformity with those reported by Pardos-Prado and Dinas (2010), the interpretation must take into account carefully the values of party-system polarization. In this sense, the conclusions for directional theory are not that bright. In order for directional voting to reach the same prevalence as proximity voting (0.5 probability value), there has to be a relatively high party-system polarization. The only countries that are sufficiently polarized are Cyprus, Malta, and the Czech-Republic.[32] Moreover, given the model based uncertainty of these estimates, we cannot really distinguish between the two theories in segments where party-system polarization is higher than 2. This implies that when comparing these two theories, we must offer only very restrained conclusions or verdict. We can say with certainty that proximity theory is a better descriptor of electoral intentions than directional theory, but the gap between them decreases (linearly) as party-system polarization increases.[33] The turning point from where directional voting is more frequent than proximity voting is in a very high domain of the party-system polarization score, and estimation uncertainty makes it impossible to determine a clear winner in this segment.

One limitation of the empirical assessment of spatial issue voting theories stems from strategic voting. Many forms of strategic voting may affect results in multi-party systems with different electoral rules (for an overview see Gschwend, 2007) might influence the discrepancy between policy match and actual vote. First and foremost, we consider that strategic voting is a relevant constraint for all spatial issue voting theories, so our aim here is simply to assess whether it might have a differentiated effect on the two theories and their comparison, being responsible for systematic bias in comparisons. Secondly, we do not have explicit individual measures on how people perceive various parties chances of winning or ticket-splitting data, and hence our clarifications here are based on rough proxies.

Notwithstanding the noted limitations, we use the information provided by each individual on which is the party that they feel close to, essentially a party identification measure. The differences between the party of vote intention and party identification can have mul-

[31] For this last model, the probabilities (or frequencies) are values that reflect solely on cases where there is spatial voting going on. For example, in Greece the predicted probability of directional voting in our last model is around 0.25. This would mean that, with the necessary statistical uncertainty, around 25% of the **spatial voting in discriminant scenarios** is directional. This does not mean that there 25% of the vote intentions is described accurately by directional theory. This quantity is below 10% in discriminant positions (see panel B in Figure 4), or just slightly above 10% in non-discriminant scenarios (see panel C in Figure 3).

[32] Ireland, Spain, Hungary also have party-systems that are very polarized, and would push the predicted probability of directional voting to around 0.45. However, in these cases proximity voting still outperforms directional voting.

[33] Two additional aspects were considered in the empirical analysis. We ran the same models but included to a control variable for closeness to a party. This is a rough control for possible valence effects. Our results were identical. Secondly, following the work of Schmitt and Scheuer (2012), we included a second level control variable to differentiate between established Western-European countries Post-Communist countries. As expected, spatial voting based on the left-right is more frequent in established democracies, but this effect did not reach statistical significance. Even with this additional country level control our results remained unchanged.

tiple sources from measurement error, different candidate evaluations, but also considerations of strategic voting. Accordingly, we first check whether the differences in accuracy of proximity and directional voting between those who have overlapping vote intention and party identification parties and those who do not are similar in extent.[34] For each country, subtracting the percentage of correct proximity (directional) in the sample with not overlapping parties from the percentage of correct proximity (directional) in the sample with overlapping parties gives us a measure of differences. The average differences are roughly 12% for proximity and 11% for directional accuracy. The correlation between the difference for proximity and directional correctly predicted is 0.85, suggesting that the possible effects of strategic voting influence the accuracy of both theories in a very similar manner. Unsurprisingly, given the party constellation, slight differences are found mostly for Malta and Cyprus, where the directional voting suffers more when party identification and vote intention differences are taken into consideration.

Next, we check whether these differences are systematically related to the share of discriminating cases. Here, we find negative correlations between the differences and the share of discriminating cases: -0.31 for proximity and -0.51 for directional theory. Hence, we can see that the direct comparisons suffer the least from discrepancies that might be related to strategic voting, but also that there is a difference between how the two theories are affected. More importantly though, after a 28% discriminant prediction share on the country level, neither the proximity nor the directional differences between accuracy for the sample with not overlapping parties and the sample with overlapping parties are statistically significantly different from 0. Finally we looked at whether party system polarization correlates differentially with the differences discussed above. Here, we find a positive relationship between the accuracy of both theories (full sample, non-discriminant positions included) that is mostly driven by Malta and Cyprus again, but these influences are technically identical for the two theories – $r = 0.39$ for both theories. As noted previously, we have specified the models in our core analysis by dropping these two cases, and the substantive findings were unchanged. These checks suggest that, indeed, strategic considerations play a role in evaluating spatial issue voting, but not in a manner that would systematically bias our comparisons or change the substantive findings of our paper. We discuss these implications in the final section below.

5 Discussion and conclusions

In the present paper we investigated the frequency of two major spatial voting theories in 27 European countries. We departed from the classical method of analysis that employs spatial utility functions as preference descriptors, and we focused only on the first party preference. Taking this avenue, we argued that it paints an easily understandable and important picture on the actual **role** of spatial voting theories in electoral decisions. Secondly, we wanted to offer an approach that can incorporate the problem of overlapping predictions offered by proximity and directional theory. If both theories predict the same first party preference, it is very hard to discern which one is at play when individuals decide about their electoral choices. Intuitively, overlapping predictions appear on the relative sides of the ideological continuum: those for who are farther away from the middle of the left-right scale, the most extreme party on that side will also become the most

[34] As it is not central to our argument in the paper we do not include here the detailed analysis. All this analysis is available upon request from the authors.

proximate one. As seen, this is contingent on the party-system constellation in each country. Furthermore, as our analysis reveals, the success or failure of these two spatial voting theories also depends on party-system characteristics. In line with previous research by Lachat (2008, 2011) and Pardos-Prado and Dinas (2010), we concentrated on the role of party-system polarization on the left-right ideological spectrum.

As a first step, our main interest was in spatial voting in general, described by situations in which proximity and/or directional theory predict a first preference that is identical to the individual's vote intention. We have found that, on average, in close to 40% of the cases there is spatial voting going on. Of course, this percentage is much higher for politically more informed and interested individuals, a finding that is in accordance that for spatial voting information and at least some cognitive effort is needed. More importantly, we saw that when the party-system is more polarized and there **is** actual differentiation between party proposals and positions, spatial voting becomes more frequent. These findings are in line with those reported by Lachat (2008), but are easily quantifiable: there is an increase from 20% spatial voting in depolarized systems to around 60% in highly polarized party-systems. These findings lend further credence to the hypothesis that ideology (and issues, respectively) are more important in the electoral decision making when the political discussion is salient about them and the supply-side alternatives are indeed real alternatives. But should the two very different spatial theories be influenced in the same way by increasing party-system polarization? We offered a classical "it depends on the assumptions" sort of an answer. We believe that this does not take away from the merits of either of these theories, and does not reduce the implications of the present research.

If our main concern is a normative one determined by the desirability of ideological congruence between individual and preferred party, we should not be concerned with the discriminant predictions. Even if the two theories offer overlapping predictions, if proximity theory is right then the individual will prefer the closest party, satisfying the normative imperative of ideological congruence. However, and we stressed this aspect throughout the paper, this does not help in understanding which spatial voting type is generating that first preference. Our results suggest that if our goal is to compare the accuracy of these two theories and we focus on discriminant scenarios, proximity voting is not influenced by party-system polarization. Conversely, directional theory registers statistically significant but rather small gains as party-system polarization increases. In this sense, even if the political debate is tense, it produces more extreme large parties, or there are tenets of adversarial politics, the segment of people choosing the parties closest to them remain relatively stable. Thus, even in more divisive political contexts, proximity voting remains frequent. The final stage of our analysis focused on the direct comparison between the two spatial voting theories. If we consider the necessity of discriminant predictions and statistical uncertainty, our general conclusion must be very low-key. This depicts that ubiquitous situation in which previous research was neither fully wrong, nor entirely right. Based on our results, conclusions such as the people are more responsive to extreme policy positions than to proximate ones in polarized party-systems are unwarranted. However, this does not mean that directional voting is not fostered by increasing levels of party-system polarization, just that this help is not enough to clearly outperform proximity voting. A realistic consideration of party-system polarization scores suggests that directional theory matches up to proximity voting only in very few countries (Cyprus, Malta, and the Czech-Republic) and in these cases model based uncertainty makes it impossible to distinguish between the fitness of the two spatial voting theories. Clearly, directional voting moves from a being an improbable type of spatial voting (0.1) in depolarized party-systems to around 0.3 in above average ranges of party-system polarization, and it does this on the cost of proximity voting. Finally, we shall reiterate that even considering only discriminant scenarios, our comparisons are limited. They are limited, because we can only test the *intensity* rule of directional theory, simply because in the current party-system constellations there are no real cases for which the most proximate political party would be on the other side of the neutral point.

In sum, our analysis brings more empirical support for proximity voting than directional voting in the 27 European countries presented. It does this by clearly differentiating between those cases where it is possible to compare proximity and directional voting and where this is impossible. Although both are spatial voting theories, the individual level decision-making mechanisms are very different and they would suggest different emerging party positions for vote maximization. This was our main reason to offer an analysis in which clear differentiation between the two theories is incorporated in the empirical study. All these constraints in our analysis further enhance our understanding of both the amount of spatial voting in Europe, and their composition across countries, and how this depends on contextual factors.

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Figures

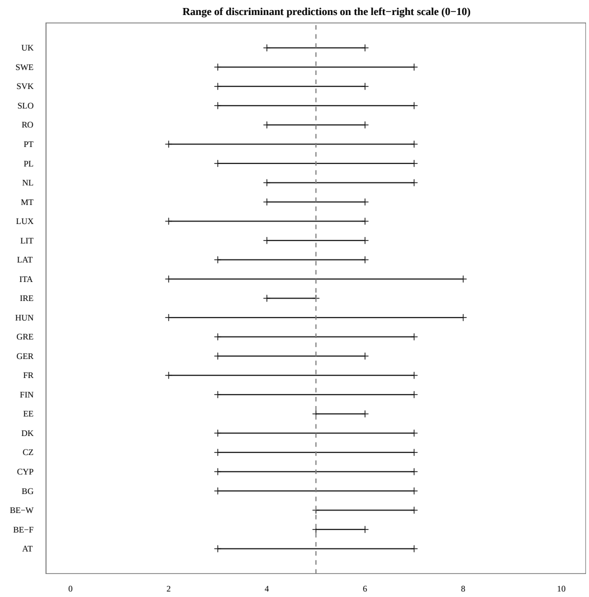

Fig. 1. EU 28: Different predictions of the two theories depending on the party positions and the individual left-right self-placement, and based on the 2009 EES.

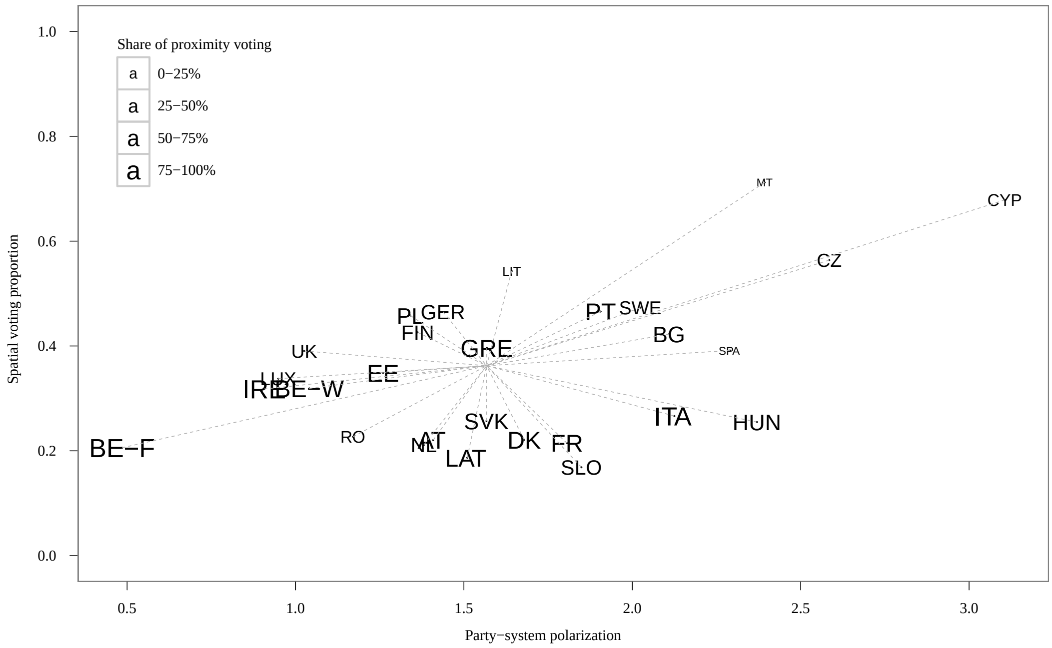

Fig. 2. Proportion of spatial voting ($y-axis$) plotted against party-system polarization ($x-axis$), based on EES 2009. The size of the labels represents the percentage of proximity voting for cases where there is spatial voting **and** the two theories offer different predictions. The center gravity point is given by the average proportion of spatial voting across countries and the median party-system polarization value (1.568, for Greece).

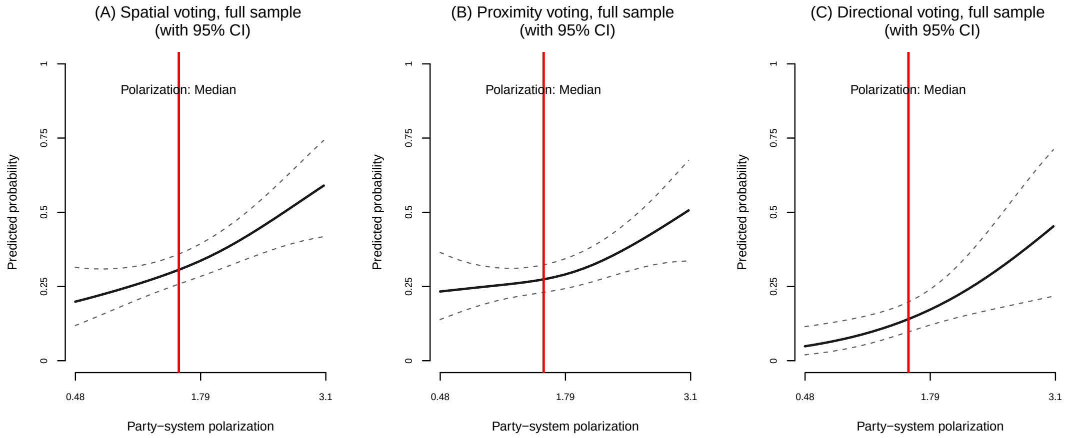

Fig. 3. Effect of party-system polarization on spatial voting theories. Panel A presents the slope of polarization for spatial voting in general; panel B and panel C present the slope of polarization for proximity and directional voting, when all cases are kept in the sample. Dashed lines: 95% confidence intervals. The party-system polarization median value is 1.568 (Greece). All other individual level covariates are set to their mean, respectively gender is male.

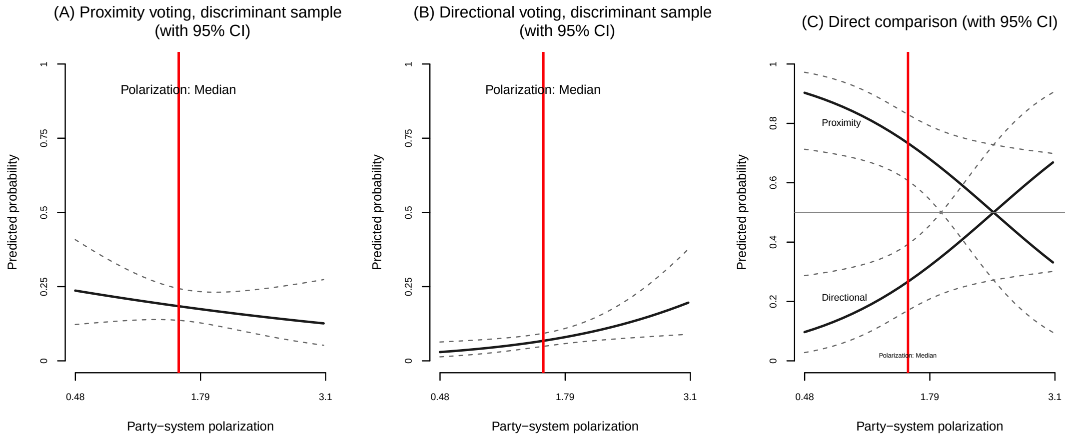

Fig. 4. Effect of party-system polarization on competing spatial voting theories. For panels (A) and (B) the sample is restricted to discriminant scenarios. For panel (C) the effect is modeled on the subsample for which we found that (1) one of the spatial voting theories is correct and (2) the two theories offer different predictions. These latter results reflect the direct, heads-up comparison between proximity and directional theory. The two slopes are identical in magnitude, but with opposite signs. We plot both to display till what point can we differentiate between them. Dashed lines: 95% confidence intervals. The party-system polarization median value is 1.568 (Greece). All other individual level covariates are set to their mean, respectively gender is male.

Tables

Table 1
Share of discriminating scenarios, %

Topology, scale size

Number of parties	T1					T2					T3					T4
	3	5	7	9	11	3	5	7	9	11	3	5	7	9	11	—
2	0	3	6	8	9	11	14	15	15	16	0	5	8	10	11	17
3	0	6	10	13	16	11	19	23	25	26	0	11	17	20	22	31
4	0	7	12	16	19	7	19	25	29	31	0	17	24	28	31	42
5	0	7	13	17	21	4	17	25	30	33	0	22	31	35	38	51
6	0	6	12	17	21	2	14	23	29	34	0	26	36	40	44	58
7	0	5	11	16	21	1	11	21	28	33	0	30	40	45	48	63
8	0	4	10	15	20	0	9	18	26	31	0	32	43	48	52	67
9	0	3	9	14	19	0	6	15	23	29	0	34	45	51	55	70
10	0	2	8	13	18	0	5	13	21	27	0	36	47	53	57	73
11	0	2	7	12	16	0	3	11	19	25	0	37	49	55	59	75
12	0	1	6	11	15	0	2	9	16	23	0	37	51	57	61	77

Table 2
Share of intensity rule within discriminating scenarios, %

Topology

T1	T2	T3	T4
94	57	97	89

Appendices

A Theorem 1 and its constituent conditions

Suppose there are $n > 1$ parties, and their positions on the left-right axis are denoted by $p_i \in [0, s]$ for $i \in \{1, 2, \ldots, n\}$, s even. The middle of the spectrum is represented by the position $m = \frac{s}{2}$. The indices can be chosen such that $0 \leq p_1 \leq \ldots \leq p_n \leq s$. Denote the position of the voter by $v \in [0, \ldots, s]$.

First, we note that if the voter is in the exact ideological middle, i.e. $v = m$, then directional theory does not provide a prediction for any distribution of parties over the spectrum.

Condition 1 $v \neq m$.

Condition 1 already excludes a substantial share of voters: in our data, 29.4% of voters position themselves in the ideological middle on average.

If Condition 1 holds and $v < p_1 < p_2$ or $v > p_n > p_{n-1}$, then both theories provide a unique, but identical prediction for first party choice. To see this, consider that for proximity theory, p_1, respectively p_n is clearly the most proximate party. For directional theory, there are two: possible cases. If v is on the same side of the spectrum as p_1 (p_n), then clearly this party is the most extreme on the voter's side. If, however, v is on the other side of spectrum, then v will still choose this party, albeit reluctantly, since the voter will experience negative utility for this choice. Nevertheless, voting for any other party would cause an even higher utility loss, and not voting is not an option. Therefore, if $v < p_1 < p_2$ or $v > p_n > p_{n-1}$, then both theories predict identical first party choice, and we again cannot discriminate between our two theories.

If, however, $v < p_1 = p_2$ or $v > p_n = p_{n-1}$, then neither theory predicts whether v chooses p_1 or p_2 (p_n or p_{n-1}). Bringing this together with the result of the previous paragraph, we get:

Condition 2 $p_1 \leq v \leq p_n$.

Condition 2 implies that for additional 36% of voters in our data, it is impossible to discriminate between the two theories. Note that Condition 2 also implies that there is at least one party on the voter's side of the ideological spectrum.

Proximity theory does not provide a (unique) prediction where there are two parties that are equally proximate to the voter.

Condition 3 If $p_i \leq v \leq p_{i+1}$ for some i, then

$$p_{i-1} < p_i, \quad \text{if } i \geq 2 \text{ and } v - p_i < p_{i+1} - v;$$
$$p_{i+1} < p_{i+2}, \text{if } i \leq n-2 \text{ and } v - p_i > p_{i+1} - v;$$
$$v - p_i \neq p_{i+1} - v.$$

The first inequality stipulates that the voter is not exactly in the middle between two parties. The second and third inequalities jointly require that there are no two parties that are at the same position, and are thus both closest to the voter.

From Condition 2, we know that there is at least one party on the side of the voter. According to directional theory, the voter will always choose the most extreme party on his side, thus, the vote will go for p_1 if $v < m$. Proximity theory predicts a different vote if another party is more proximate. But if any other party is most proximate, then p_2 is also more proximate than p_1. To see this, suppose party p_i, with $i \neq 1$, is most proximate. Then

$$(v - p_i)^2 \leq (v - p_2)^2 \Leftrightarrow 2v(p_2 - p_i) \leq (p_2 - p_i)(p_2 + p_i)$$

If $i > 2$, then since $p_2 < p_i$, we get $v \geq \frac{p_2+p_i}{2} \geq p_2$, which implies that $v - p_1 = (v - p_2) + (p_2 - p_1) \geq v - p_2$. If, however, $i = 2$, then p_2 is clearly more proximate than v_1. Therefore, a necessary condition for discrimination is that p_2 is more proximate than p_1, whenever the voter is on the left. A similar condition can be obtained for the right of the spectrum, as well.

Condition 4

$$\frac{p_1 + p_2}{2} < v, \quad \text{if } v < m;$$

$$\frac{p_{i-1} + p_i}{2} > v, \ \text{if } v > m.$$

Obviously, Condition 4 implies Condition 2, so Condition 2 can be ommited. It is easy to see that Conditions $1, 3$ and 4 are also sufficient for discrimination, since whenever v is on the left of the spectrum, p_1 will be chosen by directional theory; but if p_2 is more proximate than p_1, then p_1 is never chosen by proximity theory.

Theorem 2 *For a particular party-voter configuration, proximity and directional theories provide a unique, discriminating first-party choice if and only if this configuration satisfies Conditions* 1*,* 3 *and* 4*.*

Conditions 1 and 3 ensure that both theories provide a unique prediction. Condition 4 ensures that the prediction is *different*. To see whether the side rule or the intensity rule are at work, we only need to check whether the most proximate party p_i is on the same side of the spectrum as the voter. We have to note, however, that if Condition 4 holds, and there are at least two parties on the voter's side (i.e. $p_2 < m$ if $v < m$ or $p_{i-1} > m$ if $v > m$), then *the first party choice would be different even if the most proximate party was on the voter's side*. This indicates that the intensity rule is more forceful, and hints at more possibilities of differentiation between the two theories when not only first-party choice is taken into account.

B Simulating discriminant scenarios

To reiterate, we start with the following four possibilities:

$T1$ — discrete scale for both parties and voters.
$T2$ — discrete scale for parties, dense scale for voters.
$T3$ — dense scale for parties, discrete scale for voters.

$T4$ — dense scale for parties and voters alike.

Considering scale topology $T1$, we conducted an exhaustive search of all possible positions of voters and parties. We investigated odd scales with a size of up to 11, and maximum 12 parties. Our algorithm was as follows:

(1) Fix the size of the scale at k, and the number of parties at n;
(2) generate all possible positions for one voter and all the parties, i.e. a total of $(n+1)^k$ possibilities;
(3) for each of these party-voter position configurations, check whether both directional and proximity theory provide a unique prediction for first-party choice;
(4) if they both do so, check whether the prediction is *different*;
(5) divide the total number of discriminating positions found by the total number of possibilities.

Since calculating the share of discriminating scenarios within all possible ones is tantamount to assuming uniform, independent distributions for party and voter positions. Therefore, for $T2$, $T3$ and $T4$, where an exhaustive search was impossible, we assumed uniform distribution directly, and conducted simple Monte Carlo simulations. Although it would in principle be possible to derive closed formulas for each parameter combination, the precise share of discriminating scenarios are not important, and Monte Carlo simulation gives adequate information on the order of magnitude of the differences. For each combination of topology type, scale size and party numbers, we executed 10^6 runs.

C Descriptive results

Country	% Overall spatial voting		% of proximity if diff. and corr.		Polarization
	%	*c*	%	*c/n*	
AT	22%	140	84%	95/113	1.409
BE-F	21%	78	100%	56/56	0.485
BE-W	32%	82	89%	41/46	1.041
BG	42%	234	69%	55/80	2.109
CYP	68%	469	34%	39/114	3.106
CZ	56%	345	53%	69/129	2.585
DK	22%	186	89%	129/145	1.679
EE	35%	181	88%	46/52	1.260
FIN	43%	299	63%	79/125	1.363
FR	21%	109	89.%	83/93	1.806
GER	47%	315	67%	113/170	1.438
GRE	40%	266	91%	183/202	1.568
HUN	25%	157	79%	93/117	2.370
IRE	32%	213	97%	57/59	0.907
ITA	27%	147	98%	127/129	2.125
LAT	19%	91	84%	56/67	1.510
LIT	54%	171	19%	4/31	1.642
LUX	34%	210	47%	38/80	0.949
MT	71%	257	0%	0/21	2.393
NL	21%	167	57%	59/103	1.381
PL	46%	246	75%	88/118	1.341
PT	47%	285	85%	211/247	1.906
RO	23%	108	40%	6/15	1.171
SLO	16%	114	64%	39/62	1.849
SPA	39%	263	9%	5/57	2.290
SVK	26%	159	79%	50/63	1.567
SWE	47%	370	47%	76/162	2.024
UK	39%	253	46%	38/84	1.026

All percentages based on EES 2009 and calculated as valid percentages excluding missing values. The differences between the overall spatial voting count and the total counts in parentheses in column 3 show in how many of the spatial voting cases both theories offered the same prediction. The percentage of correct directional prediction can be calculated by subtracting the proximity share in column 3 from 100%. These are the source data for Figure 2.

D Independent variables

Variable	Coding	μ	σ
Left-right self placement self placement	0 - Left, 10 - Right	5.33	2.72
Political information	From lowest (0) to highest (1) information Linearly rescaled from 0-7 based on number of correct answers	0.56	0.26
Interest in politics	0-no interest, 1-high interest Linearly rescaled from 0-4	0.52	0.30
Gender	0-Male, 1-Female	0.55	0.49
Age	Age in years	50.29	16.91
Party-system polarization	Calculated using Equation 3	1.65	0.58

All variables were grand mean centered for the multivariate analysis. Age was recoded as $(value - \mu_{age})/2\sigma_{age}$ for more meaningful coefficients, and thus the effect reflects a change in the response variable when age changes from one standard deviation below the mean to one standard deviation above the mean. Both μ and σ are calculated on the unrestrained sample. As we employ the direct comparisons, these two parameters also change, because the sample will be reduced to discriminating scenarios.

E Hierarchical model results — logit coefficients

For all models, grand mean centering was employed. For the Comparison model, the signs of the coefficients reflect the effects on directional voting; effect sizes are identical for the proximity model with opposite signs. *Pure proximity* and *Pure Directional* are the models when we restricted our sample to the discriminant scenarios (but spatial voting is not a necessary condition). These models accompany the reported polarization effects from Figures 3 and 4. All models fit better than the null-models (not reported here), and adding party-system polarization as a second level predictor always increases model fit. As seen in the figures, there is only slight non-linearity (for the directional models especially), but the non-linear models do not bring any significant increase in model fit compared to the linear models.

Multilevel model results

	Spatial	Proximity	Directional	Pure Proximity	Pure Directional	Comparison
Fixed effects						
(Intercept)	-0.70^{***}	-0.96^{***}	-1.70^{***}	-1.59^{***}	-2.51^{***}	-0.77^{**}
	(0.11)	(0.11)	(0.21)	(0.18)	(0.17)	(0.29)
Left-right	0.11^{*}	0.11^{*}	0.18^{*}	0.04^{*}	0.37^{***}	0.23^{***}
	(0.05)	(0.05)	(0.07)	(0.02)	(0.04)	(0.04)
Interest	0.35^{***}	0.37^{***}	0.54^{***}	0.39^{***}	0.38^{*}	0.00
	(0.07)	(0.07)	(0.13)	(0.10)	(0.16)	(0.00)
Information	0.35^{***}	0.27^{***}	0.26^{**}	0.15	0.16	−0.04
	(0.08)	(0.08)	(0.10)	(0.12)	(0.18)	(0.21)
Gender	−0.03	−0.003	-0.10^{*}	0.12^{*}	−0.07	−0.12
	(0.04)	(0.04)	(0.07)	(0.06)	(0.08)	(0.10)
Age	0.02	0.11^{**}	0.05	0.07	-0.24^{**}	-0.26^{**}
	(0.04)	(0.04)	(0.04)	(0.06)	(0.08)	(0.10)
Random effects (StdDev)						
Intercept	0.56	0.53	1.06	0.91	0.84	1.44
Left-right	0.24	0.24	0.37	–	–	–
N	16329	16329	16329	8497	8497	2701
Groups	28	28	28	28	28	28
AIC	74369	76115	86374	40463	48918	13218
$logLik$	−37172	−38045	−43175	−20222	−24449	−6599

Standard errors in parentheses

† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$