Postelection Bargaining and Voter Behavior: Towards a General Spatial Theory of Voting

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Abstract

This paper derives a general spatial theory of voting based on Down's concept of a pure policy-oriented rational voter. Applying a modified Baron-Ferejohn model we include voter's perception of postelection bargaining in voter's evaluation of a party to derive a unified model of voting. Main results are: (i) our theory includes the original proximity model of Downs, the directional model of Rabinowitz as well as Kedar's compensational and Grofman's discounting model as special cases. However, especially Kedar's compensational model corresponds to rather unrealistic assumptions regarding voters' perception of postelection bargaining. (ii) The relative weight of the proximity component varies significantly across majoritarian and power sharing systems, and (iii) is additionally determined by party characteristics, i.e. party size, discipline and extremism, as well as voter characteristics, i.e. the organization of voters in social groups or networks. (iv) according to our theory party leaders have less incentives to take extreme party platforms due to the negative impact of extreme platforms on voters' perception of party's performance in postelection bargaining contradicting partly conclusions drawn by Kedar. (vi) existing empirical analyzes support our theory.

1 Introduction

An important body of political science research is dedicated to the question of how voters choose between parties or candidates in an election. The most prominent theory of voter behavior is the spatial theory of voting, which was first developed by Downs (1957) and more fully formalized by Davis et al. (1970) and Enelow and Hinich (1984).[1] The basic idea of spatial theory is that the choice of a party is driven by the location of the party and the voter in a multidimensional policy issue space. From a rational choice perspective choices are derived from maximization of voters' individual utility functions representing the evaluation of various parties. However, formally spatial models can analogously be derived in the framework of cognitive models used in psychology theory, i.e. voters' choices of parties are determined by voters' emotional responses to symbols like positions taken on specific policy issues. However, within the spatial theory of voting there are two different approaches, namely the proximity and the directional model. Following Downs (1957) or Coombs (1964) the proximity model assumes that voters vote for candidates who have platforms that are close to their own ideal points. In contrast, the directional model suggested by Matthews (1979) or alternatively by Rabinowitz and Macdonald (1989) implies that voter vote for candidates who are most likely to change policy outcomes in a direction they prefer.

Beyond, predicting different voter behavior proximity and directional models also imply different party behavior. Following the proximity model parties will choose platforms close to the center of their electorate. In particular, corresponding to the well-known Median Voter Theorem parties competing for the same elec-

[1]Beside spatial voter models focusing on policy factors there exist an important literature on behavioral voter models focusing on non-policy factors, such as sociodemographic characteristics or partisan loyalties determining voter behavior. In particular, the well-known Michigan model of voting (Campbell et al., 1960). The linkages between behavioral and spatial models of voting have been recognized at least since the 1960s (Stokes, 1963). Nowadays it is standard to incorporate non-policy factors of voting into spatial model of voting (Enelow and Hinich, 1981; Hinich and Pollard, 1981; Enelow and Hinich, 1984; Schofield, 2003). However, this paper is focused on spatial models of voting, therefore we will neglect non-policy factors in the following theoretical expositions, although it is well understood that non-policy factors are important for voters choice.

torate converge to the median voter position. In contrast, assuming a directional model of voter choice parties take different and extreme positions contradicting the Median Voter Theorem. In detail, assuming a two-party competition and a one-dimensional policy space it follows from the directional model that competing parties tend to take opposite positions of minus and plus infinity. This rather unrealistic implication induced by Rabinowitz and Macdonald (1989) to revise their directional approach and introduce exogenously a region of acceptability (Rabinowitz and Macdonald, 1989).

However, empirically neither model could be fully supported nor rejected (see literature review in Merrill and Grofman (1999)). In contrast, empirical findings underline that both conceptions play significant roles in voter behavior and hence in party behavior (Merrill and Grofman, 1999). Therefore, some authors suggest a unified model of voting combining both conceptions, the proximity and directional model of voting.[2] Although all existing unified models of voting formally correspond to a linear combination of a proximity and a directional component, two different lines of argumentation to justify this approach can be identified.

The first follows the work of Iversen (1994) arguing that voters have two different motivations to vote: instrumental and expressive voting. While instrumental voting is policy-oriented, expressive voting corresponds to voters desire to express their political opinion. Formally, Iversen (1994) introduced a unified model adding a proximity constraint to Rabinowitz and Macdonald's directional model to represent voter's preferences for expressive voting.

The second idea of a unified model of voting goes back to the work of Merrill and Grofman (1999). Merrill and Grofman (1999) use the discounting model of Grofman (1985) to integrate the two different concepts of spatial voting.[3] For-

[2] Merrill and Grofman (1999) use the term 'unified model of voting' to describe spatial models comprising a proximity and a directional component. While Adams et al. (2005) use the term unified model to describe models integrating spatial and behavioral models of voting. In this paper we use the term unified models of voting referring only to the former.

[3] As Merrill and Grofman (1999) mention Rabinowitz et al. (1993) made a similar argument, but did not provide a formal mathematical derivation.

mally, Merrill and Grofman (1999) could show, that a unified model of voting could be derived as a linear transformation of Grofman's discounting model.

However, Merrill and Grofman (1999) did only formally prove the correspondence of the Grofman discounting model and the unified model of voting, while they did not provide a theoretical interpretation of the derived formal correspondence: "...[Also, we] have seen that it may be difficult to distinguish voting behavior under the mixed proximity-RM model from voting behavior under the Grofman discounting model. Teasing out this distinction we have left as an unanswered puzzle...".

Recently, the discussion on spatial voting models has been enriched by Kedar (2005) emphasizing the impact of postelection bargaining on voter behavior.[4] In her compensational voting model Kedar entertains the idea that voters vote policy-oriented, but expect that their vote is water down in postelection legislative bargaining in multiparty parliaments. Kedar relates her compensational model of voting to the original work of Downs (1957) who conceptualize his rational voter as purely policy-oriented. Furthermore, Kedar argues convincingly, that Downs (1957) derived his proximity model under specific assumptions regarding the institutional settings of postelection bargaining.[5] In particular, even when Downs (1957) extended his theory to a multiparty system he assumes a winner takes it all setup. However, many political systems do not match a winner takes it all setup, i.e. policy outcomes are jointly determined by all elected parties, although the relative impact of individual parties may significantly vary. Following this intuitive idea Kedar derives interesting hypotheses regarding the impact of the institutional environment of legislative bargaining on voter's choice. Especially, Kedar claims that the higher the institutional power sharing among parties within a legislative

[4]Before Kedar (2005) also other studies hint at the idea that voter behavior is determined by voters' expectations regarding policy outcomes in postelection legislative bargaining. For example, Lacy and Paolino (1998) put forward a discounting hypothesis in the American case, claiming that in separation of power systems the authors differentiate between candidate platforms and policy outcomes.

[5]Note that in the two-party set-up of Downs (1957) postelectorate bargaining is rather simple, i.e. the winning party forms the government and implements its platform.

system the higher voter expect that their votes are watered down in postelection bargaining and thus the more they vote compensational, i.e. prefer parties whose positions are more extreme than their own.

However, although Kedar introduces an explicit, even if rather naive, model of postelection bargaining she does not derive her hypotheses from this model. Instead following Iversen (1994) Kedar assumes that policy-oriented voting is only one motivations to choose a party. Voters might also use their vote to express their political opinion. Thus, Kedar suggested a unified model comprising of her compensational model corresponding voters motivation to vote policy-oriented and a proximity model corresponding to expressive voting. In this setup she intuitively relates different legislative systems with a different weight of her compensational voting component (Kedar, 2005). Therefore, her approach still appears flawed in as much as she diverges from her own theoretical premises to follow the original work of Downs (1957) and focus on policy-oriented voting alone (Kedar, 2005). Moreover, we will demonstrate that her compensational model of voting in fact correspond to a linear combination of a standard proximity and directional component. Therefore, the estimated weight of the proximity model in Kedar's unified model of voting is biased when compared to a standard unified model of voting as suggested by Iversen (1994) or Merrill and Grofman (1999).

Analogously to Kedar also Adams et al. (2005) intuitively assume that political power sharing implies that voter perceive that their vote is watered down in postelection legislative bargaining. In their framework of Grofman's discounting model this perception translates into higher discounting. Hence, according to the formal analyses of Merrill and Grofman (1999) Adams et al. (2005) could directly conclude that higher political power sharing implies a lower relative weight of the proximity component in their corresponding unified voting model. However, since Adams et al. (2005) focus their work on the empirical explanation of observed party strategies, they are less concern with teasing out the theoretical foundation of their applied unified voting model. In particular, Adams et al. (2005) do not explicitly analyze how estimated parameter of their unified model systematically correlate with formal institutional setups of legislative bargaining. For example, they neither provide an explicit model of how voter perceive post-election bargaining nor do they explain how their specific assumptions, e.g. the same constant discounting factor for all parties or the status quo policy as neutral point of the RM-component, can be derived from political systems with power sharing.[6] We will demonstrate that assuming constant discounting factors for all parties as well as the actual status-quo policy as neutral point of the RM-model can only be derived in a policy-oriented voter setup under very special assumptions.

Therefore, although the new approaches of Keda and Adams et al. (2005) definitely contribute to our understanding of the impact of postelection bargaining on voter and party behavior, it is fair to conclude that still no comprehensive theory of an unified model of voting exists. Moreover, no common spatial voting theory has been provided, yet, that is sufficiently general to include the various existing spatial models and allows a systematic comparison of these approaches. Such theory should also be able to explain systematically the impact of different institutional setups on voters' perception of postelection bargaining and hence, voters' evaluation of parties.

This paper aims to close this gap via deriving a general spatial theory of voting based on Down's original conception of a pure policy-oriented rational voter. In particular, we will show that our theory includes the original proximity model of Downs, the directional model of Rabinowitz, the discounting model of Grofman as well as Kedar's compensational vote model and all existing unified models as special cases corresponding to specific perceptions of postelection bargaining by voters. While in general voters' perception do not necessarily have to meet reality

[6]Note that Grofman explicitly relates his discounting argument to Downs (1957) original work. Referring to a rational voter Downs (1957, p. 39) writes: "...[the voter] knows that no party will be able to do everything that it says it will do. Hence, he cannot merely compare platforms; instead he most estimate in his own mind what the parties would actually do were they in power." In particular, Grofman assumes like Downs (1957) a winner takes it all setup. However, in contrast to Downs (1957), Grofman explicitly assumes that government has only a limited capacity to change the status quo policy into the direction of its platform and therefore voters anticipating this limited capacity discount party platforms accordingly.

of legislative bargaining, it still seems reasonable to assume that at least in the long run voters perception correspond to real legislative bargaining. Therefore, we theoretically derive voters' perception applying an extended version of the legislative bargaining model of Baron-Ferejohn. In the framework of our formal model both pure directional and proximity model, but also Kedar's computational and Grofman's discounting model appear to correspond to extreme cases of voters perception of legislative bargaining.

Moreover, we show that the relative weight of the proximity component does not only depend on formal institutions, e.g. the election system and the organization of legislature, but also on specific informal institutions, i.e. party characteristics like party discipline, party size or extremism as well as voter characteristics, e.g. the social organization of voters in social groups and networks. The latter might direct to an alternative avenue to introduce sociological and sociodemographic characteristics into spatial voting models.

Finally, we demonstrate that based on our theoretical model conclusions regarding party behavior derived by Adams et al. (2005) and Kedar have at least partly to be revised.

The remainder of the paper is organized as follows: in section 2 we derive our theoretical model. In section 3 we undertake comparative static analyzes regarding the impact of political institutions on voter behavior. Section 4 provide some empirical evidence for our theory derived from empirical estimations provided in the literature, while section 5 summarizes our main conclusions and discusses future research opportunities.

2 Theoretical Model

Following Downs (1957) we assume that voters are interested in policy outcomes and hence vote policy-oriented. Let z denote the multidimensional policy outcome a voter observes, then voters' utility U(z) is defined by the following separable weighted Euclidian utility function (see Enelow and Hinich (1984)):

$$(1) \quad U_i(z) = -\sum_j \mu_{ij} \left(Y_{ij} - Z_j\right)^2$$

In eq. (1) the index $i = 1, \ldots, n$ denotes the individual voter, while the index $j = 1, \ldots, m$ denotes a specific issue dimension.

In general we follow Fiorina (1981); Alensina and Rosenthal (1995) and assume that voters form expectations on future policy outcomes when casting their votes. Thus, voters have to form expectations on postelectoral legislative bargaining. An extreme simple case of postelectoral bargaining arises if one assumes that the majority party forms the government and the government solely determines the policy outcome. This is exactly what Downs assumes in his simple two-party set-up. However, for most legislative systems postelectorate bargaining is more complex, i.e. is not a winner takes it all setup, but involves more than one party. This, holds obviously true for multiparty governments, but also for single party governments it is conceivable that non-governmental parties participate in legislative bargaining (Kedar, 2005). While we will provide an explicit formal model of legislative bargaining below, we first derive our main idea of how voter perceive postelectorate legislative bargaining intuitively in the following.

In contrast to the original assumption of Downs, we assume that policies are generally determined by all elected parties or members of parliament according to the following mean voter decision rule: [7]

$$(2) \quad z = \sum_p C_k x^k \quad \text{with} \quad \sum_{\mathrm{k}} C_k = 1$$

In eq. (2) x^k denotes the political position and C_k the weight of a party k. According to the mean voter decision rule different parties can have different weights, where the relative weight corresponds to the political power of a

[7] A mean voter rule has been developed for example by Caplin and Nelbuff (1991); Pappi and Henning (1998). However, following Henning (2004) below we will explicitly derive the mean voter rule from a Baron-Ferejohn-type model of non-cooperative legislative bargaining. Of course, as a special case the mean voter decision rule includes a winner take it all setup, i.e. policy outcomes are solely determined by the governmental party.

party. Intuitively, the mean voter rule assumes that in a democracy the final policy outcome is a compromise between parliamentary parties engaged in legislative decision-making.

Given the mean voter decision rule voters' perception of their individual impact on the policy outcome determined after elections, can be subdivided into two aspects. The first aspect corresponds to voter's expectations regarding the outcome of election, i.e. the number of votes each party received. The second aspect corresponds to voter's perception of how election outcome translates into political power of parties. Since power of parties in legislative bargaining depends on the distribution of parliamentary seats [8] the latter can be further subdivided in the transformation of votes into parliamentary seats and the transformation of parliamentary seats into party power. Thus, it follows already quite plainly that voters' perception of how election results are transformed into political power crucially depends on formal institutions of the election and legislative system.

However, to formalize this argument we introduce the following definitions and notations. Assume a political system comprises of n voters and r political parties running for elections, where $i = 1, ..., n$ and $k = 1, ..., r$ denotes the index of voters and parties, respectively. We assume that voters have spatial preferences, $U_i(z)$, over policy outcomes, z, as defined in eq.1. Let $y^i = (Y_{i1}, ..., Y_{ij}, ..Y_{im})$ denote the vector of ideal points held by the individual voters i and let $x^k = (X_{k1}, ..., X_{kj}, ..X_{km})$ denote the platform of party k. Further, let $v = (V_1, ..., V_k, ..., V_r)$ denote the election outcome, where V_k is the number of votes received by the party k. Moreover, we assume that for any given election outcome v voter's perception of the corresponding political power of parties is encapsulated in the vector-valued function $c(v) = (C_1(v), ..., C_k(v), ..., C_r(v))$,

[8] Note that all existing models of legislative bargaining, e.g. the Shapley-Shubik or Banzhaf-power indices derived from cooperative game theory as well as power indices derived from non-cooperative legislative bargaining models like Henning (2002) or Snyder et al. (2005) formalize political power as a function of parties' shares in total parliamentary seats. However, non-cooperative legislative bargaining models take also other institutional characteristics of legislative decision making, e.g. agenda setting procedures, as relevant determinants of political power into account.

where $C_k(v)$ denotes the perceived political power of party k given the election outcome v. Of course, the properties of $c(v)$ are crucial for the assessment of the influence of an individual vote on political power and hence on policy outcomes. However, we postpone a more detailed discussion of these properties at this stage and only assume for the moment that the power of any party k, $C_k(v)$, is a non-decreasing function in it's vote share. [9]

Thus, given these assumptions and definitions we are able to model how a voter evaluates the impact of her vote on policy outcome given an election outcome v.

To see this, assume, for the moment, a voter i knows that the election outcome without her participation will be v. Then, this voter expects the following political power distribution [10] $c^0(v) = (C_1^0(v),...,C_k^0(v),...,C_r^0(v))$ and according to the mean voter decision rule the following policy outcome: $z^0(v) = \sum\limits_k C_k^0(v)x^k$.

Assessing her impact on the expected policy outcome a voter evaluates the impact of her vote on political power. Note, that this perceived impact is solely determined by the function c(v). In particular, voting for party k a voter perceives the following impact on political power:

$$(3) \qquad \Delta c_k^0(v) = c^0(v+\Delta v_k) - c^0(v) = \left(\Delta C_{1k}^0(v)...,\Delta C_{kk}^0(v),...,\Delta C_{rk}^0(v)\right)$$

Δv_k is a vector of length r, which k's component equals one, while all other components equal zero. Obviously, Δv_k corresponds to the change in the election outcome induced by the individual vote of voter i for party k.

For simplicity, we further introduce the following separability constraint on c(v):

$$(4) \qquad \frac{\Delta C_{pk}^0(v)}{C_p^0(v)} = \frac{\Delta C_{p'k}^0(v)}{C_{p'}^0(v)} = \frac{-\Delta C_{kk}^0(v)}{1-C_k^0(v)} = -\lambda_k(v) \quad for \quad C_k^0(v) < 1 \quad p,p' \neq k$$

$$\lambda_k(v) = 0, \quad for \quad C_k^0 = 1$$

[9] This assumption appears rather innocent, since at least as far as we know, it holds for all existing models of legislative bargaining.

[10] For convenience we drop the index "i" in the following, whenever it is clear from the context that the defined functions or variables correspond to individual perceptions of a voter i.

As regards contents the separability constraint implies that an additional vote for a party k will shift the political power of this party by a non-negative intensity $\Delta C^0_{ik} \geq 0$, while it leaves the relative political power of all other parties (p,p') constant. Of course, this assumption implies a further constraint on voters perception of legislative bargaining which in general will not hold true for all legislative systems.[11] We introduce this constraint to make the derivation of our main results more tractable and will demonstrate later on that our basic results will not change when we drop it.

Moreover, voting for a party k, which has already total political power, i.e. $C^0_k = 1$, has no impact. Therefore, $\lambda(v)$ equals zero in this case as defined in eq.4 above.

Under these assumptions a voter perceives the following shift of her utility (for a detailed derivation of eq. (5) see appendix A1):

$$\text{(5)} \quad \begin{aligned} &\Delta U_i(v) = U_i(z^0(v) + \lambda_k(v)\Delta x^k) - U_i(z^0(v)) \\ &with: \\ &\Delta x^k = x^k - z^0(v) \end{aligned}$$

Since for any Δx^k the expected utility shift is a continuous function of λ_k, the the ordinary mean value theorem can be applied to derive:

$$\text{(6)} \quad \Delta U_i(v) = \sum_j \frac{\partial U_i}{\partial Z_j}(z^0(v) + \phi\lambda_k(v)\Delta x^k)\lambda_k(v)\Delta X_k \quad 0 \leq \phi \leq 1$$

Assuming a separable Euclidian utility function as defined in eq. 1 it follows:

$$\text{(7)} \quad \begin{aligned} &\Delta U_i(v) = \sum_j \mu_{ij}(Y_{ij} - Z^0_{ij}(v)) - \phi\lambda(v)\Delta X_{kj})\lambda_k(v)\Delta X_{kj}, \\ &\Delta X_{kj} = (X_{kj} - Z^o_{ij}(v)) \end{aligned}$$

Applying some algebra eq. 7 can be rearranged (see appendix A1 for detailed derivation of eq. (8):

$$\text{(8)} \quad \lambda_k(v)\left[\lambda_k(v)U^P(x^k) + (1-\lambda_k(v))\,U^{RM}(x^k, z^0(v))\right] + K(v)$$

[11] Note that assuming political power equals the relative vote share implies that the separability constraint holds.

with:

$$U^{P}\left(x^{k}\right)=-\sum_{j}\mu_{ij}\left(Y_{ijk}-X_{ijk}\right)^{2}$$
$$U^{RM}\left(x^{k},z^{0}(v)\right)=2\sum_{j}\mu_{ij}\left(Y_{ijk}-Z_{ijk}^{0}\right)\left(X_{ijk}-Z_{ijk}^{0}\right)$$

According to eq.(8) the utility shift perceived by a voter expecting a vote distribution v formally corresponds to a linear transformation of a unified voting model.

Sofar we have derived voter's perception regarding her impact on policy outcome given the election outcome without her participation is v. However, an individual voter does not know *ex ante* the outcome of election, i.e. the final vote distribution is uncertain. We assume that voter's beliefs regarding the expected outcome of the election are encapsulated in a discrete joint probability density function f(v). Thus, f(v) corresponds to the probability that the election outcome v occurs assuming that voter i does not participate in the election. [12]

Under these assumptions we can summarize our main result in the following proposition (a proof is given in the appendix A1):

Proposition 1: Assuming voter's belief regarding the outcome of elections is encapsulated in a discrete joint probability density function f(v) and voters perception of postelectorate bargaining corresponds to the mean voter decision rule, where voters perception of how electorate outcome, v, transform into political power of the parties correspond to the vector-valued function c(v), which fulfills

[12] Regarding voters beliefs of expected election outcome the general question of rational expectation arises (Cox, 1997). Although this question is beyond the scope of this paper, assuming a probabilistic utility model, which nowadays is standard in empirical election analysis, implies that voters' beliefs regarding election outcome depend on the probabilities, F_{ik}, that a voter i votes for a party k. As long as these probabilities correspond to a quantal response equilibrium, i.e. these are *stochastic* best responses to each other, voters' beliefs correspond to rational expectations (Goeree and Holt, 2005). However, note that even under rational expectations, i.e. the probabilities, F_{ik}, are common knowledge, it does in general still holds that expected election outcomes differ if voter i or t will not participate in election, i.e. $f_i(v) \neq f_t(v)$. This follows quite plainly since expected election outcomes are different assuming that voter i is not participating or a different voter t is not participating in election as long as the probabilities F_{ik} and F_{tk} are not all the same.

the separability constraint. Then the expected utility shift, $E(\Delta U_i(v))$ *can be represented by the following unified utility function*:

$$E(\Delta U_i(v)) = \sum_v f(v)\Delta U_i(v) = \beta_{k1} U^D(x^k) + \beta_{k2} U^{RM}\left(x^k, \tilde{z}^0\right) + K^* \tag{9}$$

with:

$$\beta_{k1} = E\left[\lambda_k^2(v)\right] \quad \beta_{k2} = E\left[\lambda_k(v)\right] - E\left[\lambda_k^2(v)\right] \quad \tilde{z}^0 = \frac{E\left[z^0(v)(\lambda_k(v) - \lambda_k^2(v)\right]}{\beta_{k2}}$$

In eq.(9) E[ ] denotes the expectation operator according to the probability function f(v), while U^D and U^{RM} denote again the proximity and directional component, respectively.

Further, as long as we assume that a voter expected a positive, even if extremely small, impact on political power, i.e. $E[\lambda_k(v)] > 0$, it follows directly from *Proposition 1*:

$$E(\Delta U_i(v)) = \alpha_k\left[\beta_k U^D(x^k) + (1-\beta_k) U^{RM}\left(x^k, \tilde{z}^0\right)\right] + K^* \tag{10}$$

with:

$$\alpha_k = \beta_{k1} + \beta_{k2} = E\left[\lambda_k(v)\right]; \quad \beta_k = \frac{\beta_{k1}}{\alpha_k} = \frac{E\left[\lambda_k^2(v)\right]}{E\left[\lambda_k(v)\right]}$$

Thus, eq. (10) corresponds again to a (linear transformation of an) unified model analogously to eq. (8). However, to enable a more intuitive interpretation of the mixing parameter, β_k, consider the following transformation:

$$\frac{E\left[\lambda(v)^2\right]}{E\left[\lambda(v)\right]} = \sum_v \lambda(v) \frac{f(v)\lambda(v)}{\sum_v f(v)\lambda(v)} = \sum_v \lambda(v) f^*(v) = E^*\left[\lambda(v)\right] \tag{11}$$

From eq. (11) it follows that the weight of the proximity model,β_k, corresponds to voters expected impact on political power given the distribution of votes is derived from the probability function f*(v) instead of f(v). Intuitively, f*(v) can be understood as the conditional probability function derived for the condition that a individual voter is decisive, i.e. $\Delta C_{kk}(v) > 0$. However, in general f*(v) correspond not exactly to this conditional probability function, since the probability of an election outcome is additionally weighted by $\lambda_k(v)$. Thus, only if $\lambda_k(v)$ takes the same value, whenever a voter is decisive, this interpretation is fully correct. In general, $E^*[\lambda_k(v)]$ can be interpreted as a weighted expected policy impact, where the weights are zero for all election outcomes, in which a voter is not decisive, and if a voter is decisive the weights are the higher the higher the policy impact given a specific election outcome, v. Note in particular, that especially when voters observe a low probability to be decisive, β_k is much higher than α_k, which often approximates zero in large electorates (Ledyard, 1984; Palfrey and Rosenthal, 1985). For example, under the Downsian two-party and the winner takes it all set-up β_k equals 1 as long as there exists at least one election outcome with a non-zero probability, for which the voter is decisive, since if a voter is decisive in this setup, she turns the political power of a party from zero to 1, while α_k can become infinitely small for large electorates.

Analogously, as can be seen from the appendix A1, the expected policy outcome, $\tilde{z}^0$, can also be interpreted as a weighted expected policy outcome, where again only policy outcomes corresponding to electorate outcomes in which the voter is decisive have a positive weight, although the weight correspond to $\lambda_k(1-\lambda_k)$ instead of λ_k

Next, in *proposition 2* we generalized our results stated in *proposition 1* via dropping the restrictive separability constraint (a proof is given in the appendix A2):

Proposition 2: Assuming voter's belief regarding the outcome of elections is encapsulated in a discrete joint probability density function f(v) and voters perception of postelectorate bargaining corresponds to the mean voter decision rule, where voters perception of how electorate outcome, v, transform into political power of the parties correspond to the vector-valued function c(v). Then the expected utility shift, $E(\Delta U_i(v))$ can be represented by the following unified utility function:

$$(12) \quad E\left(\Delta U_i(v)\right) = \sum_v f(v)\Delta U_i(v) = \beta_{k1}U^D(x^k) + \beta_{k2}U^{RM}\left(x^k, \tilde{z}^0\right) + \rho_k + K^*$$

ρ_k is a party specific constant utility term a voter attaches to each party corresponding to the perceived (expected) policy change due to the redistribution of political power among other parties induced by her vote for party k. A formal derivation of ρ_k is given in the appendix A2. Note that ρ_k is zero, whenever c(v) fulfills the separability constraint.

Finally, as long as we assume that a voter expected a positive, even if extremely small, impact on political power, it follows directly from *Proposition 2*:

(13) $$E\left(\Delta U_i(v)\right) = \alpha_k \left[\beta_k U^D(x^k) + (1-\beta_k) U^{RM}\left(x^k, \tilde{z}^0\right)\right] + \rho_k + K^*$$

Overall, our theoretical analyses so far imply the following points:

(1) Assuming that policy formulation corresponds to the mean voter decision rule pure instrumental voting implies that voters' individual preferences can be represented by a affine transformation of unified model, where α_k is the linear factor and ρ_k is the additive constant. The unified model corresponds to a linear combination of a directional and proximity model with the mixing parameter β_k.

(2) The relative weight of the proximity component within the unified model, β_k corresponds to voters' weighted expected impact on the final policy outcome, where a voter only takes those election outcomes into account for which she is decisive.

(3) In general, since the probability, that an individual voter is decisive when voting for a party k, varies over different parties, it follows already that β_k generally varies across parties contradicting the assumption made by Merrill and Grofman (1999) or Adams et al. (2005).

(4) Moreover, even if we assume that voters have rational expectation regarding the election outcome, the relative weight of the proximity component for a specific party k generally differs for different individual voters.

(5) As long as an individual vote for a party k also shifts the relative political power of other parties, voter's evaluation of different parties includes a party specific constant,ρ_k, which varies with both voters ideal points as well as parties ideal points and hence at least formally might play a similar role as party identity in spatial voting models.

(6) For sufficiently large electorates α_k approximates zero and therefore, also the total utility derived from voting approaches zero. Thus, the paradox of not voting still persist in our theory (Ledyard, 1984; Palfrey and Rosenthal, 1985).

Before we will analyze how formal and informal political institutions determine voter behavior in more detail, it might be conductive to identify shortly conditions, i.e. properties of f(v) and c(v), under which our approach replicates existing spatial models of voting. The empirical relevance of these identified conditions will then be discussed in the framework of an explicit legislative bargaining model, we derive in the following section.

Our approach replicates the original proximity model of Downs, when β_k equals 1. [13] Technically, this implies that for all election outcomes in which a voter is decisive, i.e. $\lambda_k(v) > 0$, it must hold that $\lambda_k(v) = 1$. In other words, we have to assume that, whenever a voter is decisive, she shifts the power of a party from zero to one. Non surprisingly, that is exactly the case under a winner takes it all setup as assumed by Downs (1957).

In contrast, the directional model implies that $\beta_k = 0$. Thus, there exists no election outcomes for which the voter perceives a non-zero probability and for which she is decisive. Obviously, this also implies that when voter behavior correspond to a pure directional model, voter also perceive zero utility from voting, since they perceive that their vote has absolutely no impact on the policy outcome. Therefore, a pure directional model is only conceivable as a approximation of voter behavior. However, at a system level, voter behavior is the better approximated by a pure directional model the more c(v) approximates a function that relates political power to party's received vote share. In this case it is easily shown that for all election outcomes v and all parties voter perceived a constant impact $\lambda_k = \frac{1}{n}$, where n is the total number of voters.[14] Obviously, for large electorates λ_k approaches zero for all parties.

[13] Moreover, we generally have to assume that the affine transformation, i.e. the parameters α and ρ are the same for all parties.

[14] Interestingly Adams et al. (2005) (Appendix 6.1) suggested exactly this modeling of political power to derive an alternative interpretation of Kedar's compensational model.

To derive the Grofman discounting model or more concrete the version applied by Merrill and Grofman (1999) from our approach, we have to assume that for all parties β_k equals a constant number between zero and 1. Neglecting the extreme cases for which the discounting model reduce to the pure proximity or directional model, we assume that a parliament, for which parties run for election, shares control over policy outcomes with other institutions, e.g. a second chamber or a president. Thus, it follows that the maximal political power a parliament can collectively exert is lower than 1. Now, if we assume again a the winner takes it all setup implies for all party the same β_k, which lies between zero and a finite number below one depending on the power of the parliament vis-a-vis the other political institutions. However, to receive exactly the discounting model as suggested by Merrill and Grofman, the expected policy outcome,$E(z^0)$, has to correspond to the status quo. This is generally not the case, since we assume forward looking voters. However, at least if we neglect any dynamics in party platforms, a voter who expect that without his vote the old government stays in power, while her vote brings the old opposition party into power, would indeed perceive that the status quo is the expected policy outcome.

Finally, to derive the Kedar's compensational model note that in fact Kedar's compensational model corresponds to a unified model of voting, where according to Kedar's notation the power of a political party, s_k, corresponds to the mixing parameter.[15]

Obviously, adapting for the moment Kedar's notation implies that a voter perceives that whenever she is decisive, when voting for a party k, she shifts political power of party k from zero to s_k, while the relative power of all other parties re-

[15]To see this formally note that it holds:

$$
\begin{aligned}
&z = z^0 + \Delta z^o = z^o + s_k(x^k - z^o)\\
&z^0 = \frac{1}{\sum\limits_{p' \neq `k} s_{p'}} \sum_{p \neq k} s_p^0 x^p\\
&z = \sum_p s_p x^p = \frac{(1-s_k)}{\sum\limits_{p' \neq `k} s_{p'}} \sum_{p \neq k} s_p^0 x^p + s_k^0 x^k = (1-s_k) z^0 + s_k^0 x^k
\end{aligned}
$$

mains constant. To derive this result in the framework of our model we have to assume that there exists party specific thresholds, T_k, and it holds:

$$(14)\quad C_k(v) = \begin{cases} C_k(v) & \text{if} \frac{V_k}{\sum_p V_p} \geq T_k \\ 0 & \text{otherwise} \end{cases}$$

For example, in Germany exists a threshold of 5 p.a.. Thus, a small party like the Greens will only be represented in the parliament, if it receives at least 5 p.a. of total votes. If a voter now expects only election outcomes with a positive probability, for which she is decisive and her additional vote implies that the Greens just pass the threshold, the Kedar model would result. However, applying the same logic to a large party, e.g. the SPD in Germany, a higher threshold over 30 p.a. would be needed to imply Kedar's model. Such a high threshold is hardly conceivable for real electorate systems. Moreover, there hardly exists any real electorate systems designating different thresholds to different parties. Note further that due to the defacto correspondence between Kedar's compensational model and a unified model, it follows that her estimated mixing parameter β_{kedar} systematically underestimate the true weight of the proximity component, i.e. it holds:

$$(15)\quad \beta_{kedar} + (1 - \beta_{kedar}) s_k^{kedar} = \beta_k$$

In particular, it follows directly that estimation procedure suggested by Keda, in fact imposed a lower bound on the true weight of the proximity component, i.e. following her estimation procedure, β_k can never be smaller than s_k^{kedar}, which is the power of party k according to Kedar's notation.

3 Formal and informal institutions as determinants of voting behavior

Given our analyses above voter's perception of her individual impact on policy outcomes rests on three components: the expectation of electorate outcomes v, the transformation of electorate outcomes into political power and the translation of political power into policy outcomes.

Sofar we rather ad hoc assumed that voter's perception of legislative bargaining can be modeled via the mean voter decision rule and we only assumed some rather general properties of the function c(v). However, in this section we will first explicitly derive our ad hoc assumed mean voter decision rule from a non-cooperative legislative bargaining model corresponding to the model suggested by Baron and Ferejohn (1989). Moreover, based on this model we are able to undertake a more comprehensive analysis of the impact of political institutions on the function c(v) and thus on voter behavior. Since in this paper we focus on the impact of postelection bargaining on voter behavior, we basically analyze the impact of institutions on the function c(v), while we leave the analyzes of the impact of institutions on voters' perception of the electorate outcome,i.e. the function f(v), for future work.

3.1 Modeling legislative bargaining

As modeling of legislative bargaining is not the main focus of the paper, we only briefly describe our model of legislative bargaining in this section. For a more detailed description of the model we refer to the original model suggested by Baron and Ferejohn (1989); Baron (1994); Banks and Duggan (1998) as well as especially to the work of Henning (2004, 2000); Pappi and Henning (1998) modifying the original Baron-Ferejohn model.

Following Baron and Ferejohn (1989) we consider a legislature comprising of a set N_L of n_L legislators, where $l = 1, ..., n_L$ denotes the index of legislator l, and a constitutionally fixed majority voting rule φ. Legislature has collectively to choose an policy z out of a compact and convex subset R^m of the m-dimensional cube $(0,1)^m$. Each legislator $l \in N_L$ has a complete, transitive binary preference relation defined for all $z, z' \in R^m$, that is represented by a separable euclidian utility function $U_l(z)$. Formally, the rule φ corresponds to a binary choice procedure, which determines legislature choice among two alternatives z and z', and a random recognition rule that determines which legislator can make a proposal.

In general, the random recognition rule can be represented by a vector of individual probabilities $q = q_1, .., q_{n_L}$, where q_l denotes the probability that legislator l is chosen to make a proposal. For simplicity we assume in the following that $q_l = 1/n_L$ for all $l \in N_L$.

The choice procedure can be represented by a set of winning coalitions, G. A winning coalition $g \in G$ is defined as an element of the superset 2^{N_L}, for which the following holds: if all members of g vote for an alternative z in comparison to an alternative z', then legislature chooses the alternative z.

In this context Baron (1994) as well as Banks and Duggan (1998) model legislature's choice of a policy $z \in R^m$ as a infinite horizon non-cooperative bargaining game among legislators determined by the following rules. At a first stage an individual legislator $l \in N_L$ is selected according to the randomized recognition rule to propose a policy and at a second stage all legislators vote on the made proposal. If the proposed policy received sufficient votes, i.e. a winning coalition forms for the proposal, this proposal is the new policy, otherwise a new legislator is selected and the procedure starts from the beginning. Baron as well as Banks and Duggan (1998) studied stationary subgame perfect Nash equilibria of the non-cooperative legislative bargaining game.

In this context, Henning (2000, 2002, 2004) modified the original game via relaxing the assumption of noise free perfect rational behavior of legislators. In particular, Henning assumed that voting on a policy proposal at the second stage of the game is probabilistic rather than deterministic, i.e. legislators do not always "best respond" according to their expected utilities, since there is some noise in their choices. This noise can be due to errors in terms of perception biases, distractions or miscalculations that lead to non-optimal decisions or it can be due to unobserved utility shocks that make rational behavior look noisy to an outside observer[16]. Regardless of the source of the noise choice becomes stochastic, and

[16]Both reasons are conceivable in the context of legislators behavior. On the one hand, regardless if legislators are policy or office seeking or both, they consider legislative decisions usually

the distribution of of the random variables determine the form of the choice probabilities. Technically, assuming best responses contain some noise, following the interesting work of McKelvey and Palfrey (1998, 1995) a quantal response equilibrium can be defined , as a vector of individual response probabilities that is a stochastic best response to itself (Goeree and Holt, 2005). [17]

Based on the work of Henning we further assume the following modification to derive a simple model of legislative bargaining that corresponds with our voting model developed above. First we define a party structure as a partition of the set of legislators,$\{N_1, ..., N_k, ..., N_r\}$. Accordingly, $N_k \subset N_L$ denotes the subset of legislators being a member of party k. Further, we define x_l^k as the ideal position of a legislator l being a member of party k. Moreover, for any party being represented in the legislature, i.e. $N_k \neq \{\}$, there exists a party leader, l_k, with $x_{l_k}^k = x^k$, where x^k is the party platform supplied in election. Furthermore, we assume that party members have ideal points that in average are close to the ideal point of the party leader, but differ for individual party members. Thus, we assume each ideal point of a party member,l_k, is randomly drawn from a probability distribution, with mean x^k. Finally, we assume that at the proposal stage legislators are perfectly committed to their party, that is whenever, a legislator is selected according to the random recognition rule he will suggest the party platform of his party. In contrast, the voting stage is not fully controlled by the party leader. Here, we

as instruments to achieve a specific final goal, e.g. a political career or a better state of the world. Thus, preferences over policy outcomes are always induced preferences, i.e. are derived from maximizing a specific final goal subject to a technical constraint describing the technical relation between policies and final goal achievement. These technical relations are often rather complex and only known by legislators with uncertainty. This implies noisy choices due to errors as well as random information shocks changing the expected (believed) technical relations and thus translate into random utility shocks. On the other hand, within legislative bargaining side payments in terms of package deals including other political decisions or other resources like career promotion might play a role. These side payments often occur randomly. Some side payments might be unobservable to an outside observer.

[17] As a matter of fact making the above mentioned modifications Henning analyzed quantal response equilibrium of the non-cooperative legislative bargaining game, although not being aware of the work of McKelvey and Palfrey (1998) he considered these equilibrium still as Nash equilibrium. In particular, he derived the mean voter decision rule on the basis of this equilibrium.

follow Henning (2004) and assume that voting is probabilistic. To formalize the probabilistic behavior we follow Goeree and Holt (2005). In detail, assume EU_{lk}^{+} is the expected spatial utility of legislator l, if he will vote for the party platform k, when it is proposed, while EU_{lk}^{-} is the expected spatial utility of legislator l, if he will not vote for the party platform k. Now, the total utility of legislator l received from a vote in favor or not in favor of party platform x^k, is received by adding a stochastic utility term $\gamma\omega_i$ to the spatial utility, where $\gamma > 0$ is an error parameter and ω_i represent identically and independently distributed realizations of a random variable for the decision to vote for the party platform, $i = 1$, or against it, $i = 2$. Total utility to vote for the platform is greater than total utility from voting against it, if it holds: $EU_{lk}^{+} + \gamma\omega_1 > EU_{lk}^{-} + \gamma\omega_2$.

Assuming a double exponential distribution for ω results in the following choice probability (Goeree and Holt, 2005):

$$(16) \quad \pi_{lk} = \frac{e^{\gamma EU_{lk}^{+}}}{e^{\gamma EU_{lk}^{+}} + e^{\gamma EU_{lk}^{-}}}$$

Further, denoting by W_l the continuation value of a legislator l playing the infinite horizon non-cooperative legislative bargaining game, and let Π_{lk}^{+} denote the probability that a winning coalition will vote for the proposal, x^k, given legislator l votes in favor of it, while Π_{lk}^{-} denotes the probability that a winning coalition will vote for the proposal, x^k, given legislator l votes not in favor of it. Then it holds:

$$(17) \quad \begin{aligned} EU_{lk}^{+} &= \Pi_{lk}^{+} U_l(x^k) + \left(1 - \Pi_{lk}^{+}\right) W_l \\ EU_{lk}^{-} &= \Pi_{lk}^{-} U_l(x^k) + \left(1 - \Pi_{lk}^{-}\right) W_l \end{aligned}$$

Moreover, let Π_{gk} denote the probability that the winning coalition g is formed to support the proposal x^k, and define the set $G^l \subset G$ as the subset of winning coalitions, of which legislator l is a member, while accordingly $G - G^l$ is the subset of winning coalitions of which l is not a member. Then it follows:

$$
\begin{aligned}
&\Pi_{lk}^{+} = \frac{1}{\pi_{lk}} \sum_{g \in G^l} \Pi_{gk} \\
&\Pi_{lk}^{-} = \frac{1}{(1-\pi_{lk})} \sum_{g \in G-G^l} \Pi_{gk} \\
&\Pi_{gk} = \prod_{l \in g} \pi_{lk} \prod_{l' \notin g} (1-\pi_{l'k})
\end{aligned} \tag{18}
$$

Given the definition above and let δ denote the common discount factor of legislators , the continuation value of the infinite legislative bargaining game is defined as follows:

$$
\begin{aligned}
&W_l = \sum_p q_p \Pi_p U_l(x^p) + \delta W_l \sum_p q_p (1-\Pi_p) \\
&\Leftrightarrow \\
&W_l = \frac{\sum_{p'} q_{p'} \Pi_{p'}}{1-\delta+\delta \sum_{p'} q_{p'} \Pi_{p'}} \sum_p \frac{q_p \Pi_p}{\sum_{p'} q_{p'} \Pi_{p'}} U_l(x^p)
\end{aligned} \tag{19}
$$

, where Π_p is defined as:

$$
\Pi_p = \sum_{g \in G} \Pi_{gp}
$$

Finally, if we denote the vector of probabilities that legislators vote for a party proposal k by $\pi_k = \{\pi_{1k}, ..., \pi_{n_L k}\}$ and define the vector $\pi = \{\pi_1, ..., \pi_r\}$, then, given the exposition above, π can be defined as a function of itself, $\pi = h(\pi)$.

Hence, we can summarize the characteristics of a quantal response equilibrium of the infinite session legislative bargaining game:

Proposition 3: A vector π^* of legislators' choice probabilities corresponds to a quantal response equilibrium (QRE) of the modified infinite legislative session game as defined above if it is a fix point of the function h, i.e. $\pi^* = h(\pi^*)$. Moreover, in equilibrium the expected policy outcome corresponds to a weighted mean of party platforms, $E(z) = \sum_p C_p x^p$, where the weight of a party k corresponds *to the ex ante probability that it's platform will be the final policy outcome. In particular, it holds:*

$$(20) \quad C_k = \frac{q_k \Pi_k(\pi^*)}{\sum\limits_p q_p \Pi_p(\pi^*)}$$

The proof of proposition 3 follows directly from Goeree and Holt (2005) and therefore is omitted here.

So far we have assumed that voting behavior of party members is not controlled by party leaders. However, analyzing the QRE of our legislative bargaining game for large legislatures, results that voting of individual legislators is rather probabilistic even if reasonable high levels of rationality are assumed. This follows from the fact that for large legislatures the probability that an individual legislator is decisive is rather low. Accordingly, the difference between the expected utility,$EU_{lk}^{+} - EU_{lk}^{-}$, derived from voting in favor or against a proposal approximates zero, even if a legislator has high preferences for or against a given proposal. Therefore, coordination of voting behavior among party members improves legislative outcomes from the view point of party members as long as party members have more homogenous policy preferences when compared to the average legislator. A standard procedure to coordinate voting behavior is party discipline, i.e. the ability of party leaders to control voting behavior of their party. Of course party discipline can take many forms (Cox and McCubbins, 1993; Huber, 1996; Calvert and Fox, 2000). We will not focus, in this paper, on different mechanism of party discipline, instead we focus on the impact different levels of party discipline have on legislative outcomes. One possibility to introduce party discipline into our model would be to allow for side payments the party leader can make to party members, if they vote according to the party line. Since these side payments do not depend on legislators decisiveness they have direct impact the probability which with legislators vote for or against a given proposal. However, introducing party discipline into our modified Baron-Ferejohn model via allowing for side payments made by party leaders implies a rather complicated model. Therefore, we suggest the following simpler modeling strategy. Obviously, the higher the party discipline, the more voting behavior corresponds to the optimal voting strategy chosen by a perfectly rational party leader, while the lower party discipline the more the voting behavior corresponds to the uncoordinated strategy of individual party members, i.e. the more voting becomes probabilistic. If we assume that voting behavior of party members is fully controlled by party leaders, then legislative bargaining corresponds to a Baron/Ferejohn model defined over the set of party leaders instead of individual legislators. Thus, a straightforward way to introduce imperfect party discipline into this model is to reduce the rationality of party leaders. Therefore, to take into account for different levels of party discipline we analyze the QRE of the non-cooperative bargaining game defined over the set of party leaders assuming different levels of rationality corresponding to different values of γ_k. Accordingly, for this simplified version of the game the set of winning coalitions is defined as a subset of the power set of set of party leaders, where according to the number of party seats each leader has a specific voting weight. Hence, we can summarize the characteristics of a quantal response equilibrium of our simplified infinite session legislative bargaining game including party discipline in proposition 4:

Proposition 4: A vector π^* of party leaders' choice probabilities corresponds to a quantal response equilibrium of the modified infinite legislative session game defined over the set of party leaders if it is a fix point of the function h, i.e. $\pi^* = h(\pi^*)$. Moreover, in equilibrium the expected policy outcome corresponds to a weighted mean of party platforms, $E(z) = \sum_k C_k x^k$, where the weight of a party k corresponds to the ex ante probability that it's platform will be the final policy outcome. In particular, it holds:

$$(21) \quad C_k = \frac{n_k \Pi_k(\pi^*)}{\sum_p n_p \Pi_p(\pi^*)}$$

In eq. (21) n_p and n_k denote the number of parliamentary seats of party p and k respectively.

Note that given the noise of legislators' choices at the voting stages as well as due to the random recognition rule, policy outcome is uncertain. Therefore, as long as it is assumed that legislators are risk averse, policy outcome is still inefficient, i.e. there always exists certain policy outcomes which are commonly preferred by all legislators. Thus, legislators have incentives to agree on informal decision making procedures, if these informal procedures lead *ex ante* to more efficient outcomes. Weingast (1979) where one of the the first scholars who emphasized the role of self-enforcing informal procedures in legislative decision-making. Based on Weingast Henning suggested a mean voter decision rule, as a self-enforcing informal procedure of legislative decision-making derived in the shadow of the uncertain outcome of non-cooperative legislative bargaining. According to the mean voter decision rule, legislature directly adopts a common proposal, which corresponds to the weighted mean of party platforms, where the weights of individual party platforms equal parties ex ante probabilities that their platform will be the final outcome of the formal decision making procedure. Thus, formally the mean voter decision rule is defined as:

$$z^m = \sum_k C_k x^k,$$

Given the concavity of legislators' spatial utility functions it follows directly that the mean voter decision rule implies for every legislators a higher *ex ante* expected utility when compared to the outcome of the non-cooperative legislative bargaining game. Hence, the mean voter decision rule is self-enforcing (Henning, 2002).[18]

Overall, we have demonstrated that our ad hoc assumed mean voter decision rule can be derived from a formal model of legislative decision making. Moreover, our theoretical model allows an explicit analyzes of the determinants of political power of parties. In particular, it allows a quantitative analyzes how political systems, e.g. majoritarian compared to systems of power sharing (Lijphart 1984), influence the transformation of votes (seats) into political power of parties.

[18] In a more general version it can also be considered that the process of legislative decision making includes always finite sessions ex post, i.e. it is possible that no proposal will be accepted and thus, the status quo remains as the final policy outcome (Henning, 2004).

Given the fact that our simple legislative bargaining model assumed a one-chamber parliamentary system, analysis is constrained to this system type. However, it is straightforward to extent the model to include more complex legislative systems, i.e. presidential or multi-chamber parliamentary systems and hence extent our analyzes to these systems(Henning, 2004). Nevertheless,in this paper we focus on simple one-chamber parliamentary systems and leave the analysis of more complex political systems for future work. Our model allows a detailed analysis of the single impact of specific institutions on policy outcome, e.g. number of parliamentary parties,r, constitutional rules of legislative decision making corresponding to the set of winning coalitions G, party size,n_k, party discipline and extremism of party platforms.

3.2 The impact of political institutions on voter behavior

To analyze the impact of political institutions in the framework of our model, we analyze the QRE of the legislative bargaining game defined above under different institutional contexts. In particular, we will analyze the impact of different institutional environments of majoritarian and power sharing systems on the parameters α and β.

To model voters expectation of the election outcomes,f(v), we assume for simplicity that voters expectations can be approximated via a probability distribution over party seats, while for any expected number of party seats voter perceive the same conditional probability to be decisive, i.e. her individual vote will increase the number of seats by one, while randomly another party will loose one seat. Technically, we randomly draw parties' seats from an assumed probability distribution assuming an expected distribution of seats as given in table 1. Given the randomly drawn seat distribution we calculate the corresponding QRE. Moreover, we calculate for the same random draw of party seats a second QRE assuming that party k has one additional seat, while another randomly drawn party has one seat less. Based on these two QRE equilibria we calculate expected political power,

c^0, as well as the parameters α and β. Overall, we made 100 random draws per simulation run to calculate the parameter values.

To analyze the impact of institutions we undertook various simulation runs assuming different institutional scenarios. In particular, we focus our simulation analysis of legislative bargaining in parliamentary systems assuming a majority party and a multi-party coalition government, while we only briefly discuss power sharing under bicameralism or presidential systems. Finally, we analyze the impact of informal institutions. This includes on the one hand specific party characteristics, e.g. party discipline, size and extremism. On the other hand this also includes specific voter characteristics, i.e. the organization of voters in social networks or groups.

3.2.1 Majority party versus multiparty government

To compare postelection bargaining under a majority and multi-party government we construct the following two political systems. In the majoritarian system we have two parties L and R, which run for election for a parliament comprising of 99 seats. Election outcome is uncertain. However, the expected outcome corresponds to 50 seats for party R and 49 seats for party L. Party platforms comprise 3 ideological issues. Issue 1, may be economic policy, issue 2 may be social policy and issue 3 may be environmental policy. Party platforms correspond to the preferences of the party leaders and are given in table 1.

Party members have heterogenous preferences, where the left party L comprises of a social democratic, socialistic and an environmental group. The conservative party is subdivided into a conservative and a liberal group. For the multiparty government system we assume that 5 parties exists, where each party just corresponds to the 5 subgroups defined for the two parties L and R in the majority party system. Thus, we have a conservative party, R_1, a liberal party, R_2, a social democratic party, L_1, a Green, L_2, and a socialistic party, L_3. Accordingly, the expected seat distribution over the five parties corresponds to 41 for the conservative, 9 for the liberal,6 for the Greens, 39 for the social democratic party and 4 for

Table 1: Assumed party preferences and seat distribution in simulation runs

	L	L_1	L_2	L_3	R	R_1	R_2
Position							
Y_1	-1.01	-1	-1	-2	0.68	1	0
Y_2	-0.56	-0.5	-1	-1	0.66	0.5	1
Y_3	0.16	0	1	0.5	0	0	0
Interest							
μ_1	0.50	0.50	0.25	0.60	0.50	0.50	0.25
μ_2	0.25	0.25	0.25	0.15	0.25	0.25	0.50
μ_3	0.25	0.25	0.50	0.25	0.25	0.25	0.25
Seats	49	39	6	4	50	41	9

the socialistic party. This five party multiparty system roughly corresponds to the German party system after the unification. In table 2 the outcome of the QRE is reported assuming almost perfect party discipline.[19]

Table 2: Voting behavior under majority party and multi-party government

	Majority party government	**Multi-party government**
β	0.946	0.726
α^*	0.660	0.307

*the unit of α corresponds to the conditional probability that an individual vote shifts the number of seats of the conservative party by one. Thus, in contrast to β α is extremely small for large electorates.
Source: own calculation with GAMS setting $\gamma = 10$

[19]The QRE was calculated in GAMS using an iterative approximation procedure. Convergence was generally achieved quickly and stable after less than 50 iterations. Note, that approximating perfect rationality implies that γ becomes infinitely large. Technically, it was infeasible to calculate QRE for values of $\gamma > 10$. However, a value of 10 corresponds already to a very high control of the individual voting behavior of party members by the party leader.

As can be seen from table 2 our model replicates the intuitive expectation of Kedar, i.e. majority systems lead to a higher weight of the proximity component vis-a-vis the directional component. Moreover, assuming almost perfect party discipline β is close to one for the majority system, while it is significantly lower than one for multiparty government. Assuming perfect control of the party leader in a classical majoritarian system with two parties competing in a single vote constituency the majority party forms the government and totally controls legislative and executive power. Under this conception it follows quite plainly that the transformation of seats into political power is a rather simple two-step function. As long as a party holds less than the majority of seats in parliament it has no power and, accordingly, as long as it controls the majority of seats it has total political power. Thus, the impact of an individual vote on political power of a party can only take the value zero or one. Accordingly, β, the expected weighted policy impact of an individual vote, equals 1, i.e. individual voting behavior corresponds solely to the proximity model. In contrast, α, the (not weighted) expected policy impact of an individual vote still becomes extremely low for large electorates establishing the paradox of voting. Note that in table 2 the unit of α is the conditional probability of an individual voter to be decisive, which is extremely low assuming large electorates. Beyond the absolute unit, it follows from table 2 that α is more than two times larger for majority when compared to multiparty government systems.

The latter results from the fact, that under multiparty government, calculation of political power is no longer a simple task of winning the majority of votes. As can be seen from table 6 in the appendix in a multiparty legislature, where no party commands a absolute majority, even totally rational party leaders vote for other party platform, once they are proposed, with a non-zero probability. Of course, depending on party preferences specific legislative coalitions arise. For example, in the QRE of our simple model the conservative party forms a legislative coalition with the liberal, while the socialistic party forms such a coalition with the Greens (see table 6 in the appendix). In contrast, in majority party systems the party leader of the majority party never votes for the proposals of the opposition party given that discount factor is sufficiently large. Therefore, in a multiparty systems generally all political parties command some political power in equilibrium. Accordingly, political power of a specific party takes generally values strict below 1, where concrete power values depend on the concrete distributions of parliamentary seats and party platforms. Hence, for a multiparty government the weight of the proximity model, β, will c.p. be lower when compared to a majoritarian system. Thus, our model provides a consistent theoretical explanation for Kedar's intuitively derived hypothesis.

However, as we will demonstrate below, beyond Kedar's intuitive analysis it follows directly from our model that voter's perception of postelection bargaining, i.e. the α- and β-parameters, are also determined by other institutional factors, i.e. party characteristics such as party size, discipline and extremism, as well as voter characteristics such as voters organization in social groups. Before we will analyze how these institutional factors influence voting behavior in more detail, we will briefly discuss other systems of power sharing in the next subsection.

3.2.2 Other forms of power sharing: bicameralism and presidential systems

Although sofar we developed our legislative bargaining model for a simple unicameral legislature, it can be easily extended to more complex legislative systems including presidential or bicameral systems. Essentially, the set of legislators will include other legislators affiliated to other institutions and the set of wining coalitions G as well as the random recognition rule will be extended according to the more complex decision-making procedure. A major impact of these extensions is that the total political power held by the set of legislatures affiliated with one chamber will be less than 1. Thus, applying the same logic of power-sharing in a multi-party government to presidential elections in the US-system, or to election of the *Bundestag* in a bicameral system in Germany, it follows that the weight of the proximity model is lower when compared to a pure majoritarian system. In particular, this follows from the fact that both the presidential and bicameral systems are characterized by a separation of power between government and legislature and between the two chambers, respectively, i.e. in contrast to the government in a majority system neither the president nor the chambers of parliament have total legislative power. [20] However, a comparison of the weight of the proximity model between presidential elections and parliamentary elections for a multi-party government is generally indeterminate and depends on the specific separation of power, e.g. how many parties exist in the representative system or which specific legislative rights of the president are determined by the constitution.

3.3 Informal institutions and socially embedded voting behavior

3.3.1 Party size, discipline and extremism

Giving our legislative decision-making model one can already intuitively expect that party characteristics like party size, discipline as well as the extremism of party platform have an impact on parties political power and thus on the parameters β and α.

In particular, given our expositions above it is intuitively conceivable that the lower the party size, i.e. the expected number of seats, the lower is ceteris paribus political power of a party and therefore also the expected value of λ, since the latter is by definition increasing in the political power of a party. This intuition is underlined by the simulated comparative static of the QRE. As can be seen from table 3, both parameter, β and α, significantly increase with party size.

Analogously, we intuitively expect that political power of a party, and therefore the parameter β_k and α_k, will increase with a higher level of relative party discipline. However, beyond relative party discipline, the average party discipline might also vary across political systems. In this paper we do not focus on the explantation of party discipline. In general, party discipline can be explained as an

[20] For example, the Shapley-Shubik voting power index of the US president is 0.166 (Pappi et al. 1995).

Table 3: The impact of party size, discipline and extremism on voter's perception of postelection bargaining

	Multi-party government					
Party size[1]	**15**	**20**	**25**	**30**	**36**	**41**
β	0.09	0.17	0.24	0.32	0.42	0.57
α	0.03	0.04	0.05	0.07	0.12	0.26
Power	0.12	0.18	0.22	0.27	0.33	0.35
Party discipline[2]	**0.1**	**1.0**	**2.0**	**3.0**	**5.0**	**10.0**
β	0.02	0.02	0.10	0.19	0.41	0.73
α	0.02	0.02	0.06	0.09	0.16	0.31
Power	0.41	0.41	0.42	0.41	0.35	0.28
Party extremism[3]	**1.0**	**1.2**	**1.7**	**2.7**	**4.8**	**9.7**
β	0.57	0.48	0.45	0.35	0.27	0.27
α	0.26	0.17	0.17	0.11	0.09	0.10
Power	0.35	0.35	0.29	0.29	0.29	0.22

[1] QRE calculated for $\gamma = 5$, party size in expected parliamentary seats; [2] QRE calculated changing γ_R from 0.1 to 10 for the conservative party keeping party discipline of all other parties constant ($\gamma_p = 5$); [3] QRE calculated for $\gamma = 5$, party extremism modeled by multiplying party platform of the conservative party by factors ranging from 1 to 9.7.

self-enforcing institutions solving collective action problems of individual legislators running for election as well as collective action problems evolving in legislative decision making (Aldrich, 1995). More recent literature on party discipline mainly focus on informational rational of party discipline (Snyder and Ting, 2002; Asworth and de Mesquita, 2005), while our model suggest the interpretation of party discipline as an institution solving collective action problems of legislative decision-making. However, in this paper we take party discipline as exogenously given and analyze how legislative decision-making changes for different levels of party discipline. Given the fact that recent literature on party discipline highlight the role of the formal institutional environment as a determinant of average party discipline (Asworth and de Mesquita, 2005), we analyze both the impact of different relative party discipline as well as the impact of a common shift of average party discipline on legislative bargaining.

In particular, simulating the impact of relative party discipline we only shift the γ_{R_1}-parameter of the the conservative party, while keeping this parameter constant for all other parties. The simulation results are summarized in table 3. As can be seen from table 3 a high level of relative party discipline increases significantly party power and thus the parameters β and α. In particular, these simulation results underline that party discipline is in fact a self-enforcing institution to solve collective action problems among legislators with homogenous preferences.[21] Obviously, in general both the technical possibility of party leaders to control voting behavior of their members as well as heterogeneity of preferences of party members vary across parties. Accordingly, beyond party size, the weight of the proximity model should vary across parties even within the same political system.

Moreover, average party discipline may vary across political systems (Asworth and de Mesquita, 2005). In particular, as long as no perfect party discipline is assumed, even a majority party in a majoritarian system does no more exert total political power. Therefore, observed voting behavior, even in purely majoritarian systems, should not fully correspond to the proximity model. To see this we simulated the QRE of our multiparty and majority party systems shifting the γ-parameter stepwise from 10 to 0.1 simultaneously for all parties. The simulation results are presented in table 4.

As can be seen from table 4 both β as well as α significantly increase with average party discipline. In particular, both the mixing parameter, β, as well as voter's expected policy impact, α, can be lower for majority system when compared to multiparty systems, as long as party discipline is extremely low in the

[21]Note especially, that in contrast to Krehbiel (1993)'s claim that ideologically homogenous parties have no need of discipline, in the QRE of our model collective action problems arises even assuming homogenous preferences due to the fact that individual legislators observe an extremely low probability to be decisive and thus vote probabilistic, i.e. with probability 0.5 for any proposed policy.

Table 4: The impact of average party discipline on voter's perception of postelection bargaining in majority and multiparty systems

	Level of party discipline						
	0.1	1	2	3	5	7	10
β_{major}	0.08	0.59	0.85	0.92	0.94	0.93	0.95
β_{multi}	0.02	0.02	0.10	0.19	0.41	0.60	0.73
α_{major}	0.06	0.33	0.43	0.47	0.54	0.54	0.66
α_{multi}	0.02	0.02	0.06	0.09	0.16	0.18	0.31

* QRE calculated changing simultaneously γ_p from 0.1 to 10 for all parties;
The indices "major" and "multi" stand for the majority and multi-party system, respectively.

former and extremely high in the latter. Of course, analyzing party discipline as an exogenous variable might be problematic, since it might in fact also be endogenously determined by general institutional setting (Asworth and de Mesquita, 2005). Moreover, analogously to party discipline we could further introduce informal coalition agreements coordination voting behavior in legislature. However, we leave these interesting topics for future work.

Finally, it follows directly from our model that political power systematically varies with the extremism of the party platform, since legislator's probability of voting for a party platform is c.p. the higher the closer it is to her own ideal point. Therefore, political power of a party decreases the more extreme it's platform is. Simulating the quantitative effect of party extremism we multiplied the party platform of the conservative party by a factor ranging from 1.2 to 10. As can be seen from table 3 the corresponding QRE's imply that party extremism analogously to decreasing party discipline significantly decreases party power and accordingly the parameters β and α.[22] Moreover, note that since extreme party platforms significantly lower political power, party leaders have less incentives to take extreme

[22]Note that in simulation runs we assumed that only the position of the conservative party leader becomes more extreme, while the ideological position of all other legislators including members of the conservative party remain constant. Therefore, a more extreme conservative party leader

positions in electorate competition. This holds especially true for large parties, with a high weight of the proximity component, but also for small parties, since extremism significantly reduces α and therefore the total expected utility received from voting for extreme parties. Thus, the conclusion regarding party behavior of both Kedar (2005) and Adams et al. (2005) have at least partly to be revised. This follows quite plainly from our theory, since both neglect that these parameters are in fact a function of the party platform. In particular, the more extreme platform, that a party leader k chooses, the lower is c.p. the expected political power of her party for any number of parliamentary seats and additionally the lower becomes voters' scaling parameter α_k. While the former reduces expected policy gains derived from parliamentary seats won in election, the latter reduces chances to win seats in elections. Thus, ceteris paribus party leaders have additional incentives to refrain from taking to extreme party positions due to the indirect negative impact of party platforms on party power and voters' perception of the party's effectiveness in postelection bargaining. These aspects are totally neglected in the existing literature (Merrill and Grofman, 1999; Adams et al., 2005; Kedar, 2005).

3.3.2 Social organization of voters

According to eq. 8 the expected utility gain derived from the participation in election is close to zero implying the so-called paradox of not voting (Downs, 1957; Tullock, 1967; Riker and Ordeshook, 1968). Thus, even if very low costs of voting are assumed, individual participation in elections only appears rational if an extremely (unrealistically) low overall voter turnout is assumed. Otherwise, expected gains from participating in election are negative. Various attempts to solve the paradox of not voting have been made (see for example Thurner (1998). However, a promising solution to the paradox of not voting seems to relax the assumption of atomistic individual actions implicitly inherent in standard rational choice models. The work of Opp (1995); Uhlaner (1989); Morton (1991); Chong

observe c.p. a lower probability to get support for it's platform due to increased heterogeneity within his party as well as between parties.

(1991); Ostrom (1990, 1991) demonstrates that political participation can be better understood as the outcome of individual, but socially embedded rational actions structured by complex network arrangements in which norms and expectations functioning as implicit contracts coordinate actions among individual members.

Assuming that voters are embedded in various social networks with other voters implies a different voting behavior. On the one hand, abstention is no more private information, but can be observed by other actors within the social network. Therefore, it is conceivable that some social groups with homogenous policy preferences can solve the free rider problem inherent in the paradox of not voting. In particular, we suggest that abstention is not costless to the voter, but implies some punishment via the loss of social reputation or exclusion from social interaction within this group. Expected punishment of abstention is the higher the more dense social interaction within the group and the higher the utility gain of a social group derived from collectively coordinated voting, e.g. the more homogenous policy preferences within the group. On the other hand, since the expected policy impact of an individual voter is rather low it often appears individually rational to vote for a party with a more extreme platform when compared to the voter's own ideal point. However, at the group level the political impact of total vote of all members is considerably higher, imply-ing that collectively it would be rational to vote for a party with a platform close to one's ideal point, establishing another free rider problem of voting. It is conceivable that cohesive social groups manage to overcome this kind of free rider problem by implementing group identity in the sense that individual voters do not consider their individual vote but the sum of votes from their affiliated social group when assessing the expected impact of voting. Under this assumption the weight of the proximity component will be systematically higher for voters with a strong affiliation to cohesive social groups, such as members of strong trade unions. To assess this effect quantitatively we simulated the QRE of our simple multi-party system assuming that voter perceive to shift a higher number of parliamentary seats ranging from 1 to 10. The simulation results are presented in table 5 below.

As can be seen from the simulation results in table 5 understanding voting as a socially embedded action not only offers a solution to the paradox of voting, but also implies a significant increase of both the mixing and the scaling parameter.

Table 5: Impact of social organization on voter's perception of postelection bargaining

	Expected number of seats shifted by social group voting					
	1	2	3	5	7	10
β	0.568	0.562	0.604	0.644	0.685	0.959
α	0.256	0.351	0.505	0.591	0.648	0.959

4 Empirical Evidence

In this section we will provide some empirical evidence for our theory. Overall, the following empirical hypotheses can be derived from our theory:

1. Voter behavior can be best represented by an unified model of voting when compared to pure proximity or directional models. 2. The mixing parameter, β varies systematically with the formal institutional set-up. In particular, a higher mixing parameter is ceteris paribus expected for majoritarian when compared to power sharing systems. 3. The mixing parameter varies systematically with party characteristics. In particular, the mixing parameter will c.p. be higher for large, not extreme parties characterized by a high level of party discipline. 4. The mixing parameter varies systematically across voters. Especially, it is c.p. higher for well-organized cohesive social groups, such as union members or farmers.

Regarding the first hypothesis Merrill and Grofman (1999) provide convincing empirical evidence, while Kedar (2005) provides empirical evidence for the the second hypothesis. Using election data from Great Britain, Canada, The Netherlands and Norway she finds evidence in support of the hypothesis that voting in majoritarian systems is significantly correlated with a higher weight of the proximity component when compared to power sharing systems. Her results also support our conception of political power based on individual voting of party members in parliament, i.e. even in Britain with its purely majoritarian system the share of the proximity component is significantly below 1.

However, there have hardly been any empirical tests as to the extent to which specific party characteristics, namely size, discipline and extremism, or the organization of voters in social groups and networks impact on voting behavior in a given institutional framework. However, some empirical evidence has been provided by Hinich et al. (2004), who conducted an empirical analyzes using pre-election survey data from 2002 for Germany to test for both party specific mixing parameters as well as group specific policy preferences. Their results basically support our theory, e.g. mixing parameters significantly vary across parties, while for well organized cohesive social groups, like union members, a significantly higher weight of the proximity component was found. Nevertheless, their estimation results partly also raises new questions. For example, Hinich et al. (2004) found high β-parameters for the both opposition parties, CDU and FDP, and moderate β-parameters for both governmental parties, SPD and the Greens. Thus, according to these empirical results party size seem to play no role in voters' evaluation of parties contradicting our theory. One explanation for these unexpected results might be seen in the fact that Hinich et al. (2004) did not explicitly control for other party characteristics, first of all party discipline. Another, possible explanation could be seen in voters' perception of pre-election coalition formation. If voter have perceived pre-election coalition building between the SPD and the Greens on the one hand, and CDU and the FDP on the other hand, voter in fact might have perceived a two-party the winner takes it all set-up when casting their vote. This would explain, why estimated mixing parameter are almost identical for the parties forming a coalition. The strong differences of β-parameters between the two competing coalitions could then potentially follow from different perceived levels of party or coalition discipline. [23]

However, these are only ad hoc explanations, and more serious empirical work has to be undertaken to solve remaining puzzles. In particular, future empirical work should explicitly take party discipline into account. Moreover, comparative analyzes should include a higher institutional variance, i.e. beyond parliamentary systems also presidential systems should be included in the analyzes. Technically, existing estimations could also be improved in at least two ways. First, existing empirical estimations, on the one hand, take arbitrary a zero point as the neutral point of the RM-component (Adams et al., 2005) or, on the other hand, calculate the expected policy outcome, z^0, (Hinich et al., 2004), while according to our theory the weighted expected outcome, z^{0*}, would be the correct neutral point of the RM-component. Simulation analyzes underline that estimation results are rather sensitive to the selected neutral point, thus this certainly is an area for future research. Second, empirical estimation of voters' underlying preferences can be improved using extended discrete choice models like exploded logit or rank ordered logit to analyze voters complete stated party preferences (Allison and Christakis, 1994; Herrmann, 2005).

5 Conclusion

This paper derives a general spatial theory of voting based on Down's concept of a pure policy-oriented rational voter. In particular, including voter's perception of postelection bargaining we derive a unified model of voting comprising of a linear combination of a proximity and a directional model of voting. Technically, we model voters perception of postelection bargaining via a mean voter decision rule which we formally derive from a modified version of of the Baron-Ferejohn non-cooperative legislative bargaining game. In particular, we show that out theory in-

[23] Alternatively, this result might be induced by specific expectations regarding election outcome. For example assuming that voter expected that the SPD/Green coalition will win elections with a high probability could result in observed different mixing parameters for the two coalitions

cludes the original proximity model of Downs as well as the directional model of Rabinowitz, the compensational model suggested by Kedar as well as Grofman's discounting model as special cases. However, in the framework of our model all of these existing approaches correspond to rather extreme cases of voter's perception of postelection bargaining. Compared to the recent work of Merrill and Grofman (1999), Kedar (2005) and Adams et al. (2005) our theory implies three major revisions. First, the mixing parameter in the unified model of voting, β, is party specific. Second, voters evaluation of parties corresponds in fact to a party specific linear transformation of a unified model of voting, where the expected policy impact, α_k, is a party specific scaling factor and ρ_k is the party specific additive constant utility term corresponding to the perceived policy change due to an induced redistribution of political power among other parties a voter is not voting for. Third, beyond political institutions also party characteristics and voter characteristics have an significant impact on voter behavior. Accordingly, we show that the relative weight of the proximity component not only varies systematically with formal institutions, i.e. is high for majoritarian systems when compared to power sharing systems, but is also significantly determined by party and voter characteristics. Simulation analyzes imply that voter's evaluation of parties varies significantly with party size, discipline and extremism, where both the relative weight of the proximity model as well as voter's total evaluation is c.p. high for large parties with a high level of party discipline and a moderate party platform. Thus, in contrast to Kedar, Merrill/Grofman as well as Adams, Merrill and Grofman neglecting the impact of party characteristics on voter's utility parameters, our theory implies that party leaders have less incentives to take extreme party platforms due to the indirect negative impact of extreme party platforms on party power and voters' perception of the party's performance in postelection bargaining. Beyond this, our theory contributes to the body of literature resolving the paradox of not voting via conceptualizing voting as a socially embedded action. Finally, existing empirical analyzes mainly support our theory. However, some puzzles still remain to be solved in future research.

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Appendix

A Proofs

A.1 Proof of proposition 1

To prove proposition 1 we proceed in 4 steps.

1. Derivation of eq. (5):

Obviously, it holds for the expected utility shift$\Delta U(v)$:

$$\Delta U(v) = U(z^0 + \Delta z) - U(z^0)$$

By definition it holds for the shift of policy outcome expected by the voter due to her vote: Δz:

$$\Delta z = \sum_j \Delta C_j x^j = \Delta C_k x^k + \sum_{j \neq k} \Delta C_j x^j = \Delta C_k \left(x^k - \sum_{j \neq k} \frac{\Delta C_j}{\sum\limits_{r \neq k} \Delta C_r} x^j \right)$$

Further, since we assume that the additional vote leaves relative political power of the other parties constant, it holds:

$$\frac{\Delta C_j}{\sum\limits_{r \neq k} \Delta C_r} = \frac{C_j^0}{\sum\limits_{r \neq k} C_r^0} = \frac{C_j^0}{1 - C_k^0}$$

Now, substituting terms results:

$$\Delta z = \frac{\Delta C_k}{1 - C_k} \left(x^k (1 - C_k^0) - \sum_{j \neq k} C_j^0 x^j \right) = \frac{\Delta C_k}{1 - C_k^0} \left(x^k - \sum_j C_j x^j \right) = \lambda \left(x^k - z^0 \right)$$

with:

$$z^0 = \sum_j C_j^0 x^j \quad \text{and} \quad \lambda = \frac{\Delta C_k}{1 - C_k^0}$$

2. Next we show that $\phi = 0.5$

It holds by definition:

$$U_i(z^o) = -\sum_j \mu_{ij}\left(Y_{ij} - Z_j^o\right)^2$$

$$U_i(z^o + \lambda\Delta x^k) = -\sum_j \mu_{ij}\left(Y_{ij} - Z_j^o - \lambda\Delta X_{kj}\right)^2 = -\sum_j \mu_{ij}\left(Y_{ij} - Z_j^o\right)^2$$

$$+2\lambda\sum_j \mu_{ij}\left(Y_{ij} - Z_j^o\right)\Delta X_{kj} - \lambda^2\sum_j \mu_{ij}\Delta X_{kj}^2$$

Further it holds for the first order differential of U, U':

$$\lambda U'(\phi\lambda) = 2\sum_j \mu_{ij}(Y_{ij} - Z_{ij}^0 - \phi\lambda\Delta X_{ikj})\lambda\Delta X_{ikj} = 2\lambda\sum_j \mu_{ij}\left(Y_{ij} - Z_j^o\right)\Delta X_{kj} - 2\lambda^2\phi\sum_j \mu_{ij}\Delta X_{kj}^2$$

Therefore, it follows directly from:

$$\Delta U_i(x^k) = \lambda U'(\phi\lambda)$$

that it must hold: $\phi = 0.5$

3. Derivation of eq. (8)

Obviously, the following rearrangements hold:

$$\Delta U_i = 2\sum_j \mu_{ij}(Y_{ij} - Z_{ij}^0 - \phi\lambda\Delta X_{ikj})\lambda\Delta X_{ikj}$$

$$= 2\lambda\sum_j \mu_{ij}\left((Y_{ij} - Z_{ij}^0)(1-\phi\lambda) + \phi\lambda(Y_{ij} - X_{ikj})\right)\left((Y_{ij} - Z_{ij}^0) - (Y_{ij} - X_{ikj})\right)$$

$$= 2\lambda\sum_j \mu_{ij}\left((Y_{ij} - Z_{ij}^0)^2(1-\phi\lambda) - (1-\phi\lambda)(Y_{ij} - Z_{ij}^0)(Y_{ij} - X_{ikj})\right)$$

$$+\left(\phi\lambda(Y_{ij} - X_{ikj})(Y_{ij} - Z_{ij}^0) - \phi\lambda(Y_{ij} - X_{ikj})^2\right)$$

$$= 2\lambda\sum_j \mu_{ij}\left(-\phi\lambda\left[(Y_{ij} - X_{ikj})^2\right] + (1-2\phi\lambda)\left[Y_{ij} - Z_{ij}^0)(X_{ikj} - Z_{ij}^0)\right] + \phi\lambda\left[(Y_{ij} - Z_{ij}^0)^2\right]\right)$$

$$= \lambda\sum_j \mu_{ij}\left(-\lambda\left[(Y_{ij} - X_{ikj})^2\right] + 2(1-\lambda)\left[Y_{ij} - Z_{ij}^0)(X_{ikj} - Z_{ij}^0)\right] + \lambda\left[(Y_{ij} - Z_{ij}^0)^2\right]\right)$$

Thus, it follows:

$$\lambda_k(v)\left[\lambda_k(v)U^P(x^k) + (1-\lambda_k(v))\,U^{RM}(x^k, z^0(v))\right] + K$$

with:

$$U^P\left(x^k\right) = -\sum_j \mu_{ij}\left(Y_{ijk} - X_{ijk}\right)^2$$

$$U^{RM}\left(x^k, z^0(v)\right) = 2\sum_j \mu_{ij}\left(Y_{ijk} - Z_{ijk}^0\right)\left(X_{ijk} - Z_{ijk}^0\right)$$

$$K = \lambda_k(v)\sum_j \mu_{ij}\left(Y_{ijk} - Z_{ij}^0\right)^2$$

4. Derivation of the expected utility shift $E(\Delta U_i)$

It holds for the expected utility shift, $E(\Delta U_i)$:

$$E(\Delta U_i) = \sum_v f(v) \Delta U_i(v)$$

Substituting eq. (8) results in:

$$\begin{aligned}
&\sum_v f(v) [\lambda(v)]^2 \sum_j \mu_{ij} \left[(Y_{ij} - X_{ikj})^2\right] + \\
&\sum_v f(v) \left(\lambda(v) - [\lambda(v)]^2\right) \sum_j \mu_{ij} \left[\left(Y_{ij} - Z^0_{ij}(v)\right)\left(X_{ikj} - Z^0_{ij}(v)\right)\right] + \\
&\sum_v f(v) K
\end{aligned}$$

Rearrangements yield:

$$\begin{aligned}
&= E(\lambda^2) \sum_j \mu_{ij} \left[(Y_{ij} - X_{ikj})^2\right] + \left(E(\lambda) - E(\lambda^2)\right) \sum_j \mu_{ij} Y_{ij} X_{ikj} \\
&- \sum_j \mu_{ij} Y_{ij} E^*(Z^0_{ij}) - \sum_j \mu_{ij} X_{ikj} E^*(Z^0_{ij}) + \sum_j \mu_{ij} E^* \left((Z^0_{ij})^2\right) + K
\end{aligned}$$

$$\begin{aligned}
&= E(\lambda^2) \sum_j \mu_{ij} \left[(Y_{ij} - X_{ikj})^2\right] + \\
&\left(E(\lambda) - E(\lambda^2)\right) \sum_j \mu_{ij} \left[\left(Y_{ij} - E^{**}\left(Z^0_{ij}\right)\right)\left(X_{ikj} - E^{**}\left(Z^0_{ij}\right)\right)\right] + K^*
\end{aligned}$$

where it holds:

$$\begin{aligned}
&K^* = \sum_j \mu_{ij} E^{**} \left(\left\{Z^0_{ij}\right\}^2\right) + K \\
&E^{**}\left(Z^0_{ij}\right) = \frac{E^*(Z^0_{ij})}{\left(E(\lambda) - E(\lambda^2)\right)} \\
&E^*\left(Z^0_{ij}\right) = \sum_v P(v) Z^0_{ij}(v) \left(\lambda(v) - \lambda(v)^2\right) \\
&E^*\left({Z^0_{ij}}^2\right) = \sum_v P(v) (Z^0_{ij}(v))^2 \left(\lambda(v) - \lambda(v)^2\right)
\end{aligned}$$

Q.E.D.

A.2 Proof of proposition 2

Relaxing the assumption that a additional vote for a party leave relative political power of all other party constant implies the following shift in policy outcome:

$$\Delta z = \frac{\Delta C_k}{1-C_k^0}\left(x^k(1-C_k^0) - (1-C_k^0)\sum_{j\neq k}\frac{\Delta C_j}{-\Delta C_k}x^j\right) = \lambda\left(x^k - z^0 + \varepsilon^k\right)$$
$$\varepsilon^k = (1-C_k^0)\sum_{j\neq k}\left(\frac{C_j^0}{1-C_k^0} + \frac{\Delta C_j}{\Delta C_k}\right)x^j$$

Note that ε^k is zero as long as relative political power of other party is constant.

Now, substituting $x^k + \varepsilon^k$ into the expected utility shift as defined in step 4 above results the following:

$$-\sum_v f(v)\left[\lambda(v)\right]^2 \sum_j \mu_{ij}\left[(Y_{ij} - (X_{ikj} + \varepsilon_{ikj}(v)))^2\right] +$$
$$2\sum_v f(v)\left(\lambda(v) - [\lambda(v)]^2\right)\sum_j \mu_{ij}\left[\left(Y_{ij} - Z_{ij}^0(v)\right)\left(X_{ikj} + \varepsilon_{ikj} - Z_{ij}^0(v)\right)\right] +$$
$$\sum_v f(v)K^*$$

Rearrangements yields:

$$= -E(\lambda^2)\sum_j \mu_{ij}\left[(Y_{ij} - X_{ikj})^2\right] +$$
$$2\left(E(\lambda) - E(\lambda^2)\right)\sum_j \mu_{ij}\left[\left(Y_{ij} - E^{**}\left(Z_{ij}^0\right)\right)\left(X_{ikj} - E^{**}\left(Z_{ij}^0\right)\right)\right] + K^* + \rho_k$$

ρ_k is a party specific constant utility term a voter attaches to each party corresponding to the perceived (expected) policy change due to the induced redistribution of political power among other parties. Formally, it holds:

$$\rho_k = 2\sum_j \mu_{ij}\left[\left(Y_{ij} - X_{ikj}\right)E(\varepsilon_{ijk}) + E(\varepsilon_{ijk}^2) + Y_{ij}E^*(\varepsilon_{ijk}) - E^*(\varepsilon_{ijk}Z_{ij}^0)\right]$$

where:

$$E(\varepsilon_{ijk}) = \sum_v f(v)\lambda(v)^2\varepsilon_{ijk}(v) \quad E(\varepsilon_{ijk}^2) = \sum_v f(v)\lambda(v)^2\left(\varepsilon_{ijk}(v)\right)^2$$
$$E^*(\varepsilon_{ijk}) = \sum_v f(v)\left(\lambda(v) - \lambda(v)^2\right)\varepsilon_{ijk}(v)$$
$$E^*(\varepsilon_{ijk}Z_{ij}^0) = \sum_v f(v)\left(\lambda(v) - \lambda(v)^2\right)\varepsilon_{ijk}(v)Z_{ij}^0(v)$$

Q.E.D.

Table 6: Probabilities to vote for party proposals in QRE of majority and multi-party system

	Multiparty system Proposal				
	R1	R2	L1	L2	L3
R1	0.966	0.400	0.000	0.000	0.000
R2	0.614	0.976	0.120	0.068	0.049
L1	0.505	0.785	0.913	0.587	0.548
L2	0.500	0.500	0.500	0.500	0.500
L3	0.448	0.930	0.788	0.625	0.631
	Majority Party system Proposal				
	R	L			
R	0.950	0.000			
L	0.500	0.500			