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## An Empirical Analysis of the 1990 Bundestag Election

**Paul W. Thurner**

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*Paul W. Thurner ist wissenschaftlicher Mitarbeiter am Mannheimer Zentrum für Europäische Sozialforschung (MZES). Das Arbeitspapier entstand im Rahmen seines Dissertationsvorhabens im Mannheimer Graduiertenkolleg für Sozialwissenschaften, das von Prof. Dr. F.U. Pappi betreut wurde.*

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**Abstract**

Spatial models of voting predominate in the formalization of political decisions and they continue to be a growth industry in political science. But strict empirical applications of this theory have been rare. This article intends to fill the gap between formal and empirical models and to predict the individual voting decision in a multiparty system on the basis of the spatial model. For this reason the random utility model of discrete choice, introduced by McFadden twenty years ago, will be applied. This variant of a probabilistic approach enables us to reformulate theoretically the spatial model in terms of multiattributive stochastic decision theory and to estimate empirically so-called policy reaction functions for differentiated political markets with any number of parties/candidates.

**The Theory of Spatial Voting: Background**

Since the seminal work of Harold Hotelling (1929), Duncan Black (1958) and Anthony Downs (1957), spatial models of voting have been the dominant paradigm in mathematical political theory. In such models, policy options are represented by points in a finite-dimensional vector space and each voter has a utility function on this space, which is commonly assumed to be a decreasing function of the Euclidean distance from the voter's ideal point. The spatial conceptualization of politics allows us to visualize easily a substantial number of classes of examples. Theoretically, the main thrust of these models has been to define conditions under which majority rule does yield an equilibrium on the political market. The most important result from this body of work is Black's Median Voter Theorem. The key assumptions of this result are that policies are defined along a single dimension and voters have single-peaked preferences. The model is in general restricted to two-candidate, simple majority elections[1].

The least satisfying aspect of spatial voting theory is that it generally confines itself to theory. As stated by Mueller: "... the sophistication and elegance of the theoretical models of public choice far exceeds the limits placed by the data on the empirical models that can be estimated" (Mueller 1989:193). For a long time it has been neglected that the role of formal models of politics should not be a means in itself but also a prerequisite for systematic and informative empirical research. However, this lack of empirical studies is definitely not due to a paucity of relevant data: For nearly 30 years the U.S. NES surveys have been asking respondents where candidates stand on important issues of the day. These instruments have also been frequently introduced in European surveys. So far, only a few examples of rigid empirical applications of

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[1] During the last years there have been considerable efforts, to relax certains of these specialized assumptions. So for example attempts were made to determine the general implications of multi-candidate competition (cf. Eaton/Lipsey 1975, Cox 1991, Shepsle 1991, Anderson et al. 1994) under diverse electoral systems (Cox 1990). Rather sobering have been the results when exploring equilibria in the more general, and more realistic k-dimensional case, assuming k dimensions of policy competition, cf. Plott (1967), Schofield (1978), an overview of this literature provides Mueller (1989).

spatial models, especially in the case of the analysis of multi party systems. Policy distances have only seldomly been used as predictors of individual voting decisions.

In the following the demand side of the political market will be modelled by the spatial approach reformulated within McFadden's random utility model. First I will discuss previous empirical applications of the spatial model. Then the paper presents a theoretical and econometric approach to predict individual decisions as well as market shares of parties conditional on attributes of these alternatives. Third, based on data of the German national election study 1990 I will show patterns of substitution of parties conditional on changes in voters' policy preferences. Fourth, diagnostic informations on the differentiated sensitivity of voters towards campaign specific attributes of different parties will be given. In order to control for heterogeneity in the population I consider both party loyal segments and highly involved issue publics. This will allow to extract reactions to actual policies of the German election campaign 1990 as used for examplary reasons.

**Previous Empirical Applications of the Spatial Theory of Voting**

One of the rare examples of using distances in multi party systems on the basis of a Downsonian single ideological dimension is Sani (1974) with an analysis of the Italian postelectoral survey 1972. Sani determines the percentage of correctly predicted votes of the eight considered parties by comparing the perceived minimum distance party with the actual voting intention.

Aldrich (1975) tests several theorems proposed by McKelvey (1975) in order to evaluate the applicability of equilibrium conditions on the aggregate level. While analyzing the three-candidate contest in 1968 in the U.S. presidential election, Aldrich pairs the three candidates and considers the situation as „three hypothetical elections" (1975:6). Comparing an ideal-points-only model with a second model with Euclidean distances, thereby assuming equal weights of two policy dimensions represented by seven-point issue scales, he estimates so-

called support functions via ordinary least square regression and dicotomous probit analysis. Since, in the case of the distance model, he is including only the distance toward one candidate[2] as independent variable, his model misses the genuine aspect of the spatial model: the comparative evaluation of the distances of each of the candidates which is indispensable for representing the ordering of the candidates by a utility function and for finding an optimal solution and. It is, therefore, not surprising that this model, contrary to the ideal-points-only model, „fares only poorly" (Aldrich 1975: 15).

Not intended as genuine empirical applications of the spatial models are the studies of Markus/Converse (1979) and Page/Jones (1979)[3], who uses policy-distances as well. They also limit their analyses to binary contests. The authors calculate the differences between respective candidate distances (Markus/Converse 1979: 1059: equation 5) which they call 'comparative policy distances'[4] They interprete the spatial decisions rationale in a way that the larger the perceived distance between two candidates in relation to the voters' ideal point the higher becomes the probability to vote the best located candidate. The same modelling technique is applied in the empirical evaluation of the spatial model by Enelow/Hinich (1985), Enelow/Hinich/Mendell (1986) and Enelow/Endersby/Munger (1995), where the authors use dichotomous probit and logit analysis respectively to estimate the weights of the issues. Contrary to Aldrich (1975) who takes the mean location of the candidate in order to calculate policy distances, they operate the individually perceived candidate positions.

In a further model of neodowsonian spatial voting, Enelow/Hinich (1984) conceptualize voter behavior under uncertainty as imperfect information of voters on the locations of candidate platforms. As a consequence voters are using predictive measures, such as ideological labels.

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2 In order to illustrate Aldrich's procedure, his equation shall be explicitly noted: $P_{ij} = \alpha+\beta(distance_{ij}) + \varepsilon$: the probability $P_{ij}$ that, candidate j is chosen depends exclusively on the distance perceived by voter i to this candidate alone.

3 With these studies a „shift (of) the analytical task away from an explanation of the vote to an explanation of attitudes towards candidates", suggested originally by Brody/Page (1973: 16) can be observed.

4 „...absolute distance measures were computed between the voters' preferred position and the perceived positions of the Republican and Democratic candidates on each scale. For each voter, distance from the Republican was then subtracted from his or her distance from the Democrat, and the resulting signed, algebraic scores were weighted and summed over all policy scales" (Page/Jones 1979: 1073). The authors do not describe how they derived this weighting factor.

With these heuristics in mind voters try to summarize more complicated information about candidate platforms. In order to construct the predictive space empirically by factor analysis, Enelow/Hinich (1984) take as input data the well-known thermometer scores[5]. They determine two-dimensional policy-spaces for the 1976 and the 1980 presidential elections and predict individual decisions for candidates with the least-distance rule as Sani (1974). But it is doubtful whether it is convenient to generate a multidimensional ideological space on the basis of a single input dimension. This, more likely, indicates that the construction of the ideological space by means of factor analysis constitutes no jointly perceived space with collectively consistent candidate orderings, but is rather the result of group-specific perceptions of the ideological space.

Ironically it is the 'directional theory of voting' proposed by George Rabinowitz (1989) which led to an increase of empirical applications of the spatial model. The decision rule of the directional model is no more the minimal distance but the maximum of the scalar product of voter and candidate issue stands relative to the assumed neutral point, the middle category of the seven-point issue scale. It has to be noted that candidate locations in these models are estimated as the mean candidate placement across all respondents. The comparison of proximity und directional models in these studies (Rabinowitz/Macdonald 1989, McDonald/Rabinowitz 1993) seem to indicate that the Rabinowitz approach more closely fits the data than the spatial model. In more recent papers, however, there is a tendency to combine proximity and directional models for theoretical and empirical reasons (Iversen 1994). The problem with the applications of the Rabinowitz school of spatial models is similar to Aldrich's use of distances: the aspect of a comparative evaluation of distances, being the condition to represent the decision by a utility function is not respected. This problem has been solved in one recent article of Iversen (1994) who for the first time models

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[5] A more sophisticated technical approach is proposed by Pappi (1992), where the author constructs the predictive space on the basis of k Issues.

Euclidean distances as attributes of the alternatives and actually specifies a spatial utility function by applying the conditional logit model of McFadden. The article of Iversen is a promising and empirically stimulating starting point for future applications of the spatial model. Since, however, he is focusing on the comparison of directional and spatial models he does not fully take advantage of the conditional logit model. Thus, for example, he assumes equal weights for each policy dimension when calculating Euclidean distances, therefore missing the possibility to determine empirically the weights of the k dimensions and their trade offs. The author also did not develop the theoretical background of the conditional logit model. Finallly he neglects the inherent market perspective of the conditional logit model and is therefore not interested in the substitutional relations between alternatives.

Overall, a number of questions remain to be answered. An appropriate statistical solution for the modelling of distances to all candidates/parties has only been given by Iversen (1994). In general, however, the complete neglection of the empirical determination of competitive aspects has to be stated. The substitution of n parties/candidates conditional on the evaluation of separate policy dimensions has never been considered. As such the market analogy was lost in the empirical modelling. With the exception of the contributions of Enelow et al. (1986, 1995), in most studies the weights of policy dimensions and trade offs between dimensions have not been determined empirically, but set by assumption.

**The Model**

Starting with the standard spatial model I assume that all voters participate. Let Z be a subset of an n-dimensional Euclidean space, with $\{Z \subset R^N\}$ representing the policy space. There is a finite set of voters, indexed by the elements in the set B. Each individual voter, denoted by $i \in B$, is assumed to has a well-defined utility function over this space. Her policy preferences are characterized by a finite point of maximum utility $x_i \in Z$, called her ideal point or bliss

point. Let the party system consist of n ≥ 2 parties and the choice set therefore be A = $\{a_1,a_2,...,a_j,...,a_J\}$. Each party j, conceived here as a unitary actor, takes policy positions $z_{jk} \in Z$ in the k-dimensional policy space with the dimensions to be separable. Voters are assumed to have identical choice sets[6]. They base their evaluation of the parties on the platforms of these parties. Utility i deriving from a perceived party's policy position $z_{ij}$ is denoted $U_i(z_{ij})$. All voters vote for the platform closest to their most-preferred position[7] and the utility of a platform $z \in Z$ decreases with the distance from z to $x_i$. Hence, the utility associated with a party is the negative of the minimum distance. It is now a common-place in theoretical literature to assume weighted Euclidean distances for their mathematical properties and for the intuitively appealing visualisation of Euclidean spaces, but as Ordeshook (1986: 22 ff) and Laver/Hunt (1992: 15 ff) have pointed out, this is far from being the only possible assumption. As the „...assumptions about the relationships between dimensions are assumptions about the preferences of individuals" (Laver/Hunt 1992: 18) it should be an empirical question how to select the most appropriate metric. Therefore, I suppose for the utility function $U_i(z_{ij})$ the general Minkowski-Metric[8], containing the negative of any utility function that is radially symmetric about an ideal point x:

$$U_i(z_{ij}) = \left(\sum_{k=1}^{K} -\beta_k \left| x_{ik} - z_{ijk} \right|^r\right)^{1/r} \qquad (1)$$

where $\beta_k$ represents a constant that weights the impact of each of the k policy dimensions and is assumed to be common to all voters or segments of voters, and r represents the order of the metric, so for example if r = 2 the Euclidean metric is specified, while if r = 1 the City Block-

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6 The more general model would allow the voters to have individually specific choice sets $A_i$. Within the context of random utility models it is quite possible to handle the problem of individually varying choice sets (cf. McFadden 1984: 1416, Greene 1995: 490 ff). At present I am developing new survey instruments in order to take into account the possibility of restricted choice sets in multi party systems.

7 For a critical discussion of this assumption of 'sincere voting' in multiparty systems with coalition governments, see Shepsle 1991: 63 ff.

8 See the corresponding proposal by Laver/Hunt 1992: 15 ff.

metric is specified. These weights should be determined empirically and not per fiat. They indicate how the voters trade of closeness in one dimension against distance on another when evaluating the different polices on offer. I will call this a decompositional multiattributive utility function. Another possible variant, chosen by Iversen (1994), is to determine a single, unweighted measure of the distance between ideal points and parties' policy positions in multidimensional policy space which implies the following general specification:

$$U_i(z_j) = (-\beta \sum_{k=1}^{K} \left| x_{ik} - z_{ijk} \right|^r)^{1/r} \qquad (2)$$

where $\beta$ represents a constant that weights the impact of the platform as a whole, assuming equal weights of each dimension. I refer to this as a compositional, unweighted multiattributive utility function. It will be an empirical question which type of utility function will adequately reproduce the voters' preferences.

To overcome the restrictive assumptions needed for the existence of equilibria in the deterministic voting model, a number of authors have turned to probabilistic models, where individuals vote randomly according to probability functions based on their preferences and where the candidates maximize expected votes or expected pluralities[9]. In these models the probabilistic choice represents uncertainty of the candidates about what decision a given voter will take. They reflect „the fact that the candidates' uncertainty requires a probabilistic description of the voters' choice behavior" (Coughlin 1992: 21). As Ordeshook has pointed out, this assumption is especially appropriate in the context of large scale elections where the parties generally rely on public opinion surveys in order to take into account expected voter reactions: „Information from public opinion surveys is not error-free and is best represented as statistical. Hence, if we want to design models that take into cognizance of the kind of data

[9] See the discussion of equlibrium conditions in probabilistic voting models in: Mueller (1989), Coughlin 1992, Lafay 1993.

that the candidates are likely to possess, probabilistic models seem more reasonable" (Ordeshook 1986: 179).

Following an approach originally proposed by McFadden (1974) for the modelling of so called 'qualitative' or 'discrete' choice behavior I present an empirically operational model for multi-candidate/party elections where voters are assumed to vote probabilistically as a function of their policy preferences and perceived distances. Since I am accentuating the central feature of this so-called conditional logit model, also labeled as 'random utility model' or 'discrete choice' model in the literature, that it considers the effects of choice characteristics as determinants of choice probabilities[10], I will call this model multiattributive[11] random utility model (MRUM) in the following.

MRUM are capturing the candidates' uncertainty about voters. The derivation of qualitative choice models from utility theory is based on a precise distinction between the behavior of the decisionmaker and the analysis of the researcher. Following McFadden (1974) and Manski (1977), the assumption that utility is a random function "..does not reflect a lack of information in the decision-maker but reflects a lack of information regarding the characteristics of alternatives and/or decision-makers on the part of the observer" (Manski 1977: 229).

Let us therefore assume that the parties are not certain about how voters will vote when they select policy positions from Z. However, both candidates have the same subjective expectations about the random behavior of voters. These expectations are represented by probabilistic voting funtions. The probability $p_{ij}$, that voter i chooses alternative j of the set of alternatives A with $A = \{(P_0, P_1, P_2, \ldots P_J) \mid P_0 + P_1 + P_2 + \ldots P_J = 1, \textit{each } P_j \in [0,1]\}$, depends on the observed characteristics $z_{ij}$ of the alternative j compared with the characteristics of each of

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[10] Whereas the Multinomial Logit Model makes the choice probabilities dependent on individual characteristics only.

[11] For a general introduction into multiattributive decision theory see Keeney/Raiffa 1992.

the other alternatives, as well as on the observed characteristics $s_i$ of the voter. The random utility model specifies this probability as a parametric function of the general form[12]:

$$P_{ij} = f(z_{ij}, z_{ih}, \ \forall j \text{ in } A, \text{and } j \neq h, s_i, \beta) \qquad (3)$$

where f is the function that relates the observed data to the choice probabilities. This function is specified up to some vector of parameters, ß, representing the relative importance of the characteristics.

Having specified the criteria of the utility function, each individual is assumed to make selections that maximize their utility. The probability that alternative j is chosen is the probability that the utility of alternative i is higher than that of any other alternative:

$$P_{ij} = \text{Prob}(U_{ij} > U_{ih} \quad \forall j \quad in\ A,\ j \neq h) \qquad (4)$$

To specify the choice probabilities the total utility has to be separated into a deterministic utility component $V_{ij}$, also called the systematic or representative component, and into a random component:

$$U_{ij} = U_{ij}(V_{ij}\ \varepsilon_{ij}) \qquad (5)$$

with $V_{ij} = V_{ij}(z_{ij}, s_i)$

Substituting (5) into (4) yields:

$$P_{ij} = Prob(V_{ij} + \varepsilon_{ij} > V_{ih} + \varepsilon_{ih},\ \forall j\ in\ A,\ j \neq h) \qquad (6)$$

$$P_{ij} = Prob(V_{ij} - V_{ih} > \varepsilon_{ih} - \varepsilon_{ji},\ \forall j\ in\ A,\ j \neq h) \qquad (7)$$

This demonstrates that the voter chooses alternative j only when the deterministic utility component exceeds the one of h by more than the stochastic component of h the one of j. Choice probabilities are well-defined when both $V_{ij} - V_{ih}$ as well as $\varepsilon_{hi} - \varepsilon_{ij}$ are known:

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[12] Cf. Train 1986: 8.

$$\text{Prob}\,(U_{ij} > U_{ih}\ ,\ \forall j \quad \text{in A},\ j \neq h\,)$$

$$= \int_{\varepsilon_{i1}=-\infty}^{\infty} \left[ \int_{\varepsilon_{i2}=-\infty}^{V_{i1}-V_{i2}+\varepsilon_{i1}} \cdots \int_{\varepsilon_{iJ}=-\infty}^{V_{i1}-V_{iJ}+\varepsilon_{i1}} f(\varepsilon_{i1}, \varepsilon_{i2}, \ldots \varepsilon_{iJ})\, d\varepsilon_{i2} \ldots d\varepsilon_{iJ} \right] d\varepsilon_{i1}$$

$$= \int_{\varepsilon_{i1}=-\infty}^{\infty} F_1\left(\varepsilon_{i1}, V_{i1} - V_{i2} + \varepsilon_{i1}, \ldots . V_{i1} - V_{iJ} + \varepsilon_{iJ}\right) d\varepsilon_{i1} \qquad (8)$$

where:

f: joint density function of the disturbance terms

$F_j$: cumulative distribution function of the disturbances (partial derivative of F with respect to $\varepsilon_j$

The difference of the deterministic component is directly observable. For the difference of the unknown stochastic components some convenient distribution has to be specified. Different assumptions on the distribution of $\varepsilon_{ij}$ yield different choice models. Assume that the random components $\varepsilon_{ij}$ are identically and independently distributed with a Gumbel density function:

$$F(\varepsilon_1, \ldots . \varepsilon_j) = \exp[-\exp(-\varepsilon_1,) \ldots . \exp(-\varepsilon_j)] \qquad (9)$$

Given this distribution[13] for the unobserved components of utility, McFadden (1974) derived the conditional logit model with the following choice probabilities

$$P_{ij} = \frac{\exp(V_{ij})}{\sum_{h=1}^{J} \exp(V_{ih})} \quad \forall j, h \in A \qquad (10)$$

Luce (1959) originally derived this model by starting with the axiom of Independence of Irrelevant Alternatives (IIA). The McFadden model is a special case of the Luce model insofar as the representative component $V_{ij}$ is a linear function of the attributes $z_{ij}$[14].

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[13] The Gumbel distribution, also called extreme value distribution of type I and leading to the Multinomial Logit model, has been chosen for its relative ease of computation, whereas the more flexible multinomial probit basing on multivariate normal distributed random components is subject to computational intractability for more than three alternatives. Cf. McFadden 1984.

[14] The underlying idea of this model is the view of commodities as bundles of properties that make up their utility, earlier advocated by Lancaster (1966) as a general approach to consumer demand.

The MRUM type of logit model has been widely used in transportation economics[15] and marketing science[16] but no general voter response model has been formulated this way up to now. In order to aid the understanding of the specification of different types of explanatory variables and the specialized terminology (cf. Ben-Akiva 1985, Wrigley 1985) which has developed in this field of research some definitions and illustrative examples will be given.

In a first step we distinguish two broad types of variables: attributes of the parties/candidates and attributes of the voter. Voter attributes as for example socio-econonomic characteristics or revealed attitudes remain constant across alternatives. Attributes of the alternatives are termed 'generic variables' in transportation economics. These factors vary across alternatives for each individual: „The characteristics of a generic variable are that it varies in value across all response categories and has an associated generic parameter which remains constant across all response categories" (Wrigley 1985: 74). A mixed model containing characteristics of the voters as well as of the parties/candidates and a random utility function with a linear-in-parameters additive form, which is assumed in most practical applications would have the follwing form:

$$P_j = \frac{exp(\alpha_j + \beta' z_{ij} + \gamma' s_i)}{\sum_{h=1}^{J} exp(\alpha_h + \beta' z_{ij} + \gamma' s_i)} \quad j = 1, 2, \ldots, J \qquad (11)$$

where $z_{ij}$ is a vector of party/candidate characteristics and $s_i$ is a vector of the *i*th voter's characteristics. Considering only the attributes of alternatives i and j we can transform the equation $ln[\frac{P_j(z_{ij})}{P_h(z_{ih})}] = \beta'(z_{ij} - z_{ih})$, which makes clear that it is the difference between attributes which affect the choice probabilities and that the parameter vector remains constant.

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[15] For overview of these studies see Wrigley 1985.

[16] See respective contributions in: Journal of Marketing Research, and: Marketing Science.

Voter characteristics, on the other side, remain constant across alternatives. Consequently they provide no information about the choice process given this form[17]. In order to derive their impact on the choice probabilities these variables must be converted into so-called alternative-specific variables (ASVs) in the context of the MRUM allowing the explanatory variable to have differential impacts upon the choice probabilities: Alternative-specific variables can be defined as „variables which do not vary in value across all response categories (response alternatives) and which, therefore, take an 'assigned' value of zero for certain response categories (alternatives) in the choice set" (Wrigley 1985: 74).

A second type of alternative-specific variable is the result of a decomposition of generic variables into at most J alternative-specific variables if it is statistically proven that the attribute has a differentiated effect upon the choice probabilities.

Normally, a series of J-1 of constant terms are included in the specification of the representative utility. These are referred to as alternative-specific constants (ASCs) in the MRUM literature and are introduced as J-1 binary variables. The different treatment of the respective variables can be demonstrated by matrix and vector formulation as follows:

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[17] Compared to the MRUM, the choice probabilities $P_j$ of the generalized Multinomial Logit model (cf. Agresti 1990: 313) have different coefficient vectors in the case of the characteristics of the individual:

$$P_j = \frac{exp(\alpha_j + \gamma_j' s_i)}{\sum_{h=1}^{J} exp(\alpha_h + \gamma_h' s_i)} \quad j = 1, 2, \ldots, J$$

with $\alpha_j \equiv \gamma_j \equiv 0$

For these voter characteristics a single covariate vector is considered and J parameter vectors have to be estimated, where the *J*th has to be normalized to zero in order to identify the equation. Using the voter characteristics in standard Multinomial Logit Models yields a large number of coefficients with an awkward interpretation. However, algebraically the Multinomial Logit modell and MRUM are totally equivalent, cf. Maddala 1983: 42.

$$P\begin{bmatrix} y_i = 1 \\ y_i = 2 \\ y_i = 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & g_{i1} & a_{i11} & 0 & 0 & a_{i21} & 0 & 0 \\ 0 & 1 & 0 & g_{i2} & 0 & a_{i12} & 0 & 0 & a_{i22} & 0 \\ 0 & 0 & 0 & g_{i3} & 0 & 0 & a_{i13} & 0 & 0 & 0 \end{bmatrix} \bullet \begin{bmatrix} \beta_{C1} \\ \beta_{C2} \\ \overline{\beta}_{C3} \\ \beta_{G} \\ \beta_{A11} \\ \beta_{A12} \\ \beta_{A13} \\ \gamma_{A21} \\ \gamma_{A22} \\ \overline{\gamma}_{A23} \end{bmatrix} \qquad (12)$$

where:
C alternative-specific constant
G generic coefficient
A alternative-specific coefficient

and:

$\overline{\beta}, \overline{\gamma}$ coefficients normalized to zero

The example assumes a 3 alternatives model, specified with 2 ASCs, one generic variable, 3 ASVs resulting from decomposition of generic variable, and 2 ASVs as a result of the modification of a voter characteristic. This formulation illustrates clearly how ASVs and ASCs take an assigned value of zero for certain response categories.

The generic coefficients $\beta_k$ describe the weight that an average voter places on the various characteristics of the parties, which is the marginal utility of each characteristic. The ratio of one coefficient to another measures the marginal rate of substitution between one characteristic and another. Alternative-specific coefficients reflect the differences in preferences for different parties/candidates as functions of voter characteristics. They tell us the relative valuations of the alternatives' characteristics by different groups (Ben-Akiva/Lerman 1985: 75). The alternative specific constants $\alpha_j$ represent decision criteria which have not been explicitly specified in the model. They „...reflect the mean of $\varepsilon_{ih} - \varepsilon_{ij}$,

that is, the difference in the utility of alternative j from that of j when 'all else is equal'" (Ben-Akiva/Lerman 1985: 75).

The principles of maximum likelihood estimation apply also to the MRUM. Assuming independence of the observations, so that the sample likelihood is simply the product over i of the likelihoods of a single observation, the likelihood function for the general multinomial choice model is:

$$L = \prod_{i=1}^{I} P_{i1}^{y_{i1}} P_{i2}^{y_{i2}} \ldots\ldots P_{ij}^{y_{ij}} \qquad (13)$$

McFadden (1974: 119) has shown the conditions for the Hessian of this model to be negative definite for all parameter vectors, so that the log-likelihood function is globally concave and has a single unique maximum. The unknown parameters can be obtained by any convergent numerical optimization algorithm as for example, by Newton-Raphson method or the Berndt/Hall/Hall/Hausman method.

As we assume that the utility function is representative for the whole population/sample, each voter's choice probability equals the aggregate share for each choice alternative (Ben-Akiva/Lerman 1985, Cooper/Nakanishi 1988). This assumption is unlikely to be empirically tenable as most populations are structured. As a consequence more complex modelling will have to take account of population heterogeneity by appropriate segmentation. For this aim the market can be partitioned into a finite number of homogenous, mutually exclusive voter segments differing in both party preference and sensitivity to policy changes (cf. Ben-Akiva/Lerman 1985: 134).

The MRUM is therefore a suitable theoretical and econometric tool to model market reaction functions[18] for markets with product differentiation[19]: „The advantage of the approach is that it

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[18] Cf. Cooper/Nakanishi 1988, Hanssens et al. 1989.

[19] For a discussion of the most commonly used approach, the address or: characteristics approach, to modelling demand for differentiated products and the close affinities to MRUM see Anderson et al. 1992.

builds the demand system from aggregating over individual choices, where individual choice depends on the variable under consideration"(Anderson et al. 1992 a: 394 ff). Thus these models try to answer the perplexing question of parties and candidates:„How much will our election share or popularity change if we change a policy position by a certain amount?" It provides a powerful tool for deriving demand functions whose arguments were variables other than prices, such as advertising, product qualities but also policy positions, candidate images and government intervention as in the case of the political competition, which is a competition on nonprice variables since „there is no direct analogue in politics to prices" (cf. Shepsle 1991: 43).

The IIA assumption is, however, the primary drawback of all these models. It requires that the odds of a particular choice are unaffected by the presence of additional alternatives. Recent work has, however, proposed solutions to this problem of unequal cross-substitution between any pair of alternatives in the presence or absence of other alternatives. McFadden (1977, 1981) proposed a more general random utility model which is able to accommodate different degrees of cross-alternative substitution by partitioning of the choice set into nests where IIA holds within nests but not across nests. This so-called generalized extreme value (GEV) model or a special case of it, the nested logit model is a generalisation of the multinomial logit model. It maintains the extreme value distribution whereas the assumption of identically and independently distributed unobserved components is no longer necessary[20]:

Another strategy to deal with the IIA property that will also be followed in this article, is to test its validity and to try to respond to differentiated similarities between alternatives by reexamining the systematic component of the utility function and by adding adequate variables which account for population heterogeneities (Ben-Akiva/Lerman 1985: 109 ff, Train 1986: 21 ff). A general test that has been proposed by Hausman/McFadden (1984) is

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[20] For further formal details and an empirical application of the nested logit model imposing a tree structure on the choice set, see Thurner/Eymann 1996

based on a consequence of IIA: if the choice set is restricted so that it contains only a proper subset $S \subset \{1,..J\}$ of the original alternatives, the parameter estimates will not change systematically if the omitted alternative is truly irrelevant. The Hausman-McFadden test is a comparison of estimators obtained by maximum likelihood estimation and based on the whole sample with estimators based on the sample with a restricted choice set. The form of the test statistic is:

$$\chi^2(r) \sim (\hat{\beta}^r - \hat{\beta}^u)' \left[\hat{C}ov(\hat{\beta}^r) - \hat{C}ov(\hat{\beta}^u)\right]^{-1} (\hat{\beta}^r - \hat{\beta}^u) \qquad (14)$$

where:

| | |
|---|---|
| r: | number of restricted paramters |
| $\hat{\beta}^u$: | estimator based on full choice set |
| $\hat{\beta}^r$: | estimator based on restriced choice set |
| $\hat{C}ov(\hat{\beta})$: | estimated covariance matrix of estimator |

Under the null hypothesis that the population displays the IIA property embodied in the logit model, this test statistic is asymptotically $\chi^2$ distributed with degrees of freedom equal to the number of elements in the subvector of coefficients that is identifiable from the restricted model. If the null hypothesis of a logit model structure is rejected, this indicates the existence of unobserved characteristics of both alternatives and actors (Ben-Akiva/Lerman 1985: 108 ff) and has to be followed by further attempts to improve the specification of the utility functions. It will now be the task of the empirical part of the article to use MRUM for the estimation of policy reaction functions.

**Operationalization and Measurement**

The following empirical analyses are based on the German part of the international 'Comparative National Election Project' (CNEP)[21] containing the national study of the first all-German general election of December 2, 1990. For simplification, the following analyses will be restricted to the first wave of the West German study[22] with a target sample size of N=1400. Data were collected from a representative random sample carried out as face-to-face interviews.

Placing the analysis in the context of multiattributive decision theory we assume purposive, goal oriented, rational actors. Rationality refers to the selection of optimal alternatives in the light of the objectives of the decision maker. But, the model is utterly indifferent to the criteria employed by the voter. In order to develop an operational model, objectives have first to be specified by „subdividing an objective into lower-level objectives of more detail, thus clarifying the intended meaning of the more genereal objective" (Keeney/Raiffa 1992: 41)[23] and then be operationalized as attributes (Keeney/Raiffa 1992) measuring the degree to which lower-level objectives are achieved (Keeney/Raiffa 1992: 32). In this secondary study we take as attributes several position issues measured by bipolar seven-point issue scales. These 'constructed subjective attribute scales' (Keeney/Raiffa 1992: 40) have been introduced in the U.S. NES since 1964 and are also contained in the CNEP study. They have been developped in order to evaluate public attitudes toward public policies. The data set contains four subjective attribute scales for the higher-level objectives: German Unification, immigration policy, abortion and nuclear energy[24]. These scales have labeled end-points suggesting a

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[21] The German part of the project has been financed by Deutsche Forschungsgemeinschaft.

[22] This is due to differently structured party systems in East and West Germany. A detailed comparative analysis of voting decisions in East and West Germany can be found in Thurner 1996.

[23] „These lower-level objectives can also be thought of as the means to the end, the end being the higher-level objective" (Keeney/Raiffa 1992: 41)

[24] The exact wording of these items reads as follows:
A) German Unification: „The economic rehabilitation of the former GDR is regarded as the most urgent problem of German reunification. There are different opinions regarding the best policies for this rehabilitation. Some argue that it would be best if the state interfered as little as possible. Others argue that a far-reaching state intervention would be the best. What is your opinon? Use the 1-7 scale to indicate your own position. 1 represents few state interventions, 7 far-reaching state interventions. You can differentiate withe values between."

bipolar policy continuum. We assume that these attributes fulfill the desirable properties of a set of attributes: completeness, operational, decomposable, nonredundancy and minimum size (Keeney/Raiffa 1992 50 ff). The respondent's placement of himself and of each of the parties on each of the policy scales allows for the computation of the respective distances presented in the formal model. As the full cognitive impact of the individual perception onto the voting decision should be maintained, I do not use average placements of the parties but calculate arithmetic distances by considering the individually perceived location of each party.

In order to take account of population heterogeneity, mutually exclusive voter segments differing in both party preference and sensitivity to policy changes will be created. Numerous bases for segmentation can be advanced, each with its own set of advantages and disadvantages for particular types of campaign issues. Differing long standing party preferences will be captured by the concept of party loyalty as measured by a version of the classic Party Identification question[25] which explicitly accentuated its long term aspect.

For differing sensitivity to policy changes I propose a specific political segmentation into highly involved issue publics measuring the individual saliency of one of the four considered position issues. Voters have been classified into a dummy variable according to their first answer to the open-ended question of the most important problem facing the country. Naming

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B) Immigration:
„The German Constitution grants asylum to victims of political persecution from other countries. The discussion at the moment is if this right of political asylum should be restricted or not. What is your opinion?"

C) Abortion:
„There is a lot of discussion about the state's position towards abortion. Here there are also quite different points of view. One group says that the state should generally make abortion a punishable offence, the other group says that the woman herself should decide about possible abortion. What is your opinion?"

D) Nuclear Energy:
"Concerning nuclear energy, there are as well contradictory attitudes. Some say the use of nuclear energy should be further extended, others say all nuclear power plants should be switched off immediatley. What is your opinion?"

[25] „Many people lean towards one particluar party over a long period of time, although they do vote for another party once in a while. How about you: Do you - generally speaking - lean towards a particular party and if yes, to which one?"
„How strong is -all in all - your affiliation to this party: very strong, rather strong, moderate, rather weak, very weak?"
Another alternative would have been to classify the voters according to proxy variables as f.ex., of age, sex, region indicating the relatively stable membership of interest groups. For a discussion of probabilistic choice models with interest groups see Coughlin 1992. As there are parties, as f.ex. the Greens and the FDP, in the German party system for which it is not clear if they have a special social structured basis, this proceeding did not prove to be an adequate proceeding.

one of the four global objectives makes it possible to test if the assumption of a representative utility function is appropriate and to show whether voters highly involved by one political objective make statistically significant differing evaluations of attributes.

The voting choice is conceptualized by the respondent's prospective report of his or her vote for one of the parties resulting in a multicategorial dependent variable. The German electoral rules allows the voter to cast two votes and the CNEP-study, therefore, differentiated between the first vote and the second vote[26]. As the share of seats in the federal parliament, the Bundestag, depends on the second vote where the voter marks his preference for a party, the second vote will be predicted in the empirical analysis. Due to the very limited number of minor party responses, the following analysis is carried out for four alternatives: SPD, CDU/CSU, FDP, and the Greens[27].

**Empirical Applications[28]**

In 1990, the first all-German national election in almost 60 years, the German public assisted a unification nobody had thought possible a few years before. The pivotal question in the political and scientific interpretations has been, if and how the offered policy proposals during the process of unification had an impact on the election result. The scientific community in electoral research agreed easily that this issue to a major extent influenced the voters decision, leading to a clear victory of the government, the Christian Democrats (CDU/CSU) and the Free Democrats (FDP) on the one hand and the defeat of the challenging Social Democrats (SPD) and the Green Party on the other[29].

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[26] „The next national parliamentary election will take place on 2 December this year as an all-German election. Will you go to the polls?....At this national election you have two votes: the firts vote for electing the constituency representative, the second vote for electing the 'Länder' list of a party. Here is a ballot card similar to the one you will get in the national election. The candidate of which party would you vote for?...And which party will you vote for with your second vote?

[27] As criterion for inclusion into the choice set at least 30 cases per alternative should remain.

[28] The following empirical analysis has been conducted by using LOGIT, a stand alone module of SYSTAT, and LIMDEP 7.0.

[29] Cf. the contributions in: Dalton 1993 und Kaase/Klingemann 1994

The campaign had, indeed, been predominated by the debate on controversial policy options to the accomplishment of the unification. But the definition of a conflict dimension was also difficult for the parties: „In this atmosphere of uncertainty it was not at all clear which kind of unification policy would lead to success" (Norpoth/Roth 1993: 210). However, unification quickly became framed as an economic issue (Kuechler 1993: 45). West Germans regarded the emotions of older Germans and East Germans with considerable reservation, viewing the financal burdens of unity as an outrageous imposition upon their own prosperity and expecting significant tax increases. Following the Downsonian scale, the political conflict can be spanned by the degree of state intervention to reach a recovery of the East Germany economy as soon as possible.

Since the mid-1980s immigration and the asylum right figured constantly as among the most important issues. The sharp increase of the immigration rate since 1985 has been paralleled by short term successes of right-wing new entry parties like the 'Republicans'. This issue continued during the process of unification to be an important additional decision criterion.

Legislation on abortion constitutes a permanently structured element of German party competition. In search of an all German abortion law in the course of the unification process this debate has been fueled by the liberal abortion law of the former GDR which was contrasted with the restrictive West German §218 StGB. The debate evolved around the question whether the unification treaty should allow abortion in the first trimester of pregnancy as in the former GDR, or whether the law of West Germany should apply, which allowed abortion only in very specific cases and prescribed consequent prosecution. The political controversy was accompanied by demonstrations and petitions during the election campaign.

Nuclear energy was also debated in the context of German unification. It gained especially importance when the Federal Minister of the Environment Toepfer ordered the closure of three out of four Soviet-built nuclear plants due to grave security deficits. Overall, the issue of

nuclear energy constitutes a longterm ecological dimension and Lafontaine, the SPD's chancelor candidate made his main strategy the accentuation of the environmental issue in the 1990 election, originally the trademark issue of the Greens.

## The Ideal-Points-Only Model

What probability-change results if the voters ideal points on a certain policy dimension change by one unit, and what substitutional pattern does it imply? To address this question I will present average partial derivatives[30] of a simple Multinomial Logit Model (MNL).

**Table 1:** **Policy Preferences and Vote in the Multinomial Logit Model: Average Partial Derivatives /West Germany**[31]

| Policy | SPD | CDU/CSU | FDP | GREENS |
|---|---|---|---|---|
| Unification* | -0,5 | 2,8 | -0,6 | -1,7 |
| Immigration* | -2,7 | 7,4 | -0,6 | -4,2 |
| Abortion* | 3,4 | -3,2 | -0,3 | 0,1 |
| Nuclear Energy* | 2,8 | -5,4 | -0,4 | 2,9 |

* simultaneous Wald tests on MNL coefficients across choice groups, significant on the 5% level
(N = 865)

Simultaneous Wald tests of each MNL-parameters across choice groups confirm that all policy dimensions have effects which are significantly different from zero, with immigration and nuclear energy showing the highest impact on the change of choice probabilities. Policy preferences in the case of the accomplishment of the unification show the slightest effect. Of particular interest are the patterns of cross-substitution which can be detected: Each one-unit change on the immigration scale toward a restrictive legislation increases the choice probability of the CDU/CSU by 7,4% on average, when pari passu the choice probabilities of

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[30] Partial derivatives: $\frac{\partial P_j}{\partial X} = \beta_j P_j - P_j \sum_{h=1}^{J} \beta_h P_h = P_j \left( \beta_j - \sum_{h=1}^{J} \beta_h P_h \right)$. Normally, direct and cross-market share elasticities are considered when regarding demand systems. Market share elasticities can be informally defined as the ratio of the relative change in a market share corresponding to a relative change in a marketing-mix variable. We prefer to present partial derivatives instead of elasticities, because it is not useful to measure the cross-substitutional effects of a one-percentage change in the case of the seven-point issue scale.

[31] Actual market shares of the alternatives in the sample: SPD: 37,8 %, CDU/CSU: 42,8 %, FDP: 8,5 %, GREENS: 10,8 %

the SPD are diminishing by 2,7% and the choice probabilities of the Greens by 4,2%. It is only the CDU/CSU which profits from supporters of strong state intervention for the economic reconstruction of East Germany.

Preferences for a more liberal abortion law diminish the chances of the CDU/CSU. But it is only the SPD which makes capital from these losses whereas in the case of the Greens the internal fragmentation into value conservatives on the one hand and radical adherents of the women's right movement completely neutralizes any effect. Changes on the nuclear energy scale also lead to notable consequences. As to be expected, the Greens make the most of preferences for a complete closure of nuclear plants, albeit competing in this segment with the policy offers of the SPD. Their gains are exclusively compensated by losses of the CDU/CSU. This presentation of direct and cross partial derivatives examplifies that we can gain important insights in substitutional patterns of the policy competition of the parties considered.

**Individual Policy Preferences as Alternative Specific Variables**

In this section the individual ideal points will be allowed to have differential impacts upon the odds of choosing one alternative rather than another. For this aim, the MRUM will be applied and the coefficient vector will be made alternative-specific[32]. J-1 alternative-specific variables will be specified by using the Free Democrats as the reference party.

[32] Cf. Ben-Akiva/Lerman 1985, Wrigley 1985.

**Tabelle 2: Policy Preferences as Alternative-specific Variables and Vote Decision /West Germany**

| Variable | ß | T-Ratio | P-Value | Effect[33] |
|---|---|---|---|---|
| SPD-Unification | 0,123 | 1,631 | 0,103 | 1,131 |
| CDU/CSU-Unification. | 0,150 | 2,017 | 0,044 | 1,162 |
| GREENS-Unification. | 0,074 | 0,753 | 0,451 | 1,077 |
| SPD-Immigration | 0,023 | 0,334 | 0,738 | 1,023 |
| CDU/CSU-Immigration | 0,272 | 3,900 | 0,000 | 1,313 |
| GREENS-Immigration | -0,254 | -3,023 | 0,003 | 0,776 |
| SPD-Abortion | 0,198 | 2,960 | 0,003 | 1,219 |
| CDU/CSU-Abortion | -0,064 | -1,005 | 0,315 | 0,938 |
| GREENS-Abortion | 0,302 | 3,041 | 0,002 | 1,353 |
| SPD-Nuclear Energy | 0,253 | 2,945 | 0,003 | 1,288 |
| CDU/CSU-Nuclear Energy | -0,137 | -1,632 | 0,103 | 0,872 |
| GREENS-Nuclear Energy | 0,798 | 6,081 | 0,001 | 2,221 |
| 2*LL(N)-LL(0) = 304,252, DF = 12, P-Value = 0,000, Pseudo $R^2$ = 14,9% | | | | |
| Percent Correctly Predicted: | Prediction table: | | 43,70% | |
| | Classification table: | | 55,70% | |
| (N= 865) | | | | |

Considering only the results significant on the 5% level, all signs are in the expected direction. Looking at the unification issue, it becomes obvious that this criterion influenced in a significant way only the choice of the Christian Democrats whereas the SPD and the Greens cannot capitalize on this issue. Voters of these parties frequently did not appreciate the policy positions of their parties in this dimension or they have been indifferent in this dimension. But as before, even the effect for the CDU/CSU fares poorly compared with the other issues, especially with the eminent effect of the nuclear energy issue onto the choice for the Greens. One remarkable result can be seen in the insignificance of the immigration issue on the SPD chances. It shows up the internal fragmentation of the voters of the Social Democrats. A descriptive analysis of the distribution of the SPD-voter over this issue dimension would illustrate that many SPD-voters did not share the location of their party on this issue promoting no restrictions on asylum rights[34]. Only the Greens and the CDU/CSU are able to

[33] So-called effect coefficient, cf. Long 1987. The effect coefficient is calculated as $\exp(\beta_k)$ and represents the estimated multiplicative change of the odds for a one-unit increase in the *k*th predictor and is therefore easier to interpret: $100[\exp(\beta_k)-1]$ is the estimated percentage change in the odds for a one-unit increase in the *k*th predictor, cf. Demaris 1992: 46.

[34] Consequently, the party changed its position after the election and cooperated with the new government in tightening the asylum laws in 1993.

reach, by their diametrically opposed policy offers, the homogenous policy preferences of their respective voters in this issue.

Specifying variables in this way, the coefficients represent the difference in the utility of respective alternatives compared to the reference alternative conditional on individually varying ideal points. In interpreting the coefficients it should be noticed that changes of respective variables are influencing the deterministic utility component of several alternatives. In order to calculate the increase or decrease of the relative chances of one party in comparison with another party we have, therefore, to take the difference between respective coefficients and to exponentiate it. For example, a change of ideal point on the nuclear energy dimension by one unit in the direction of closing down the plants, increases the relative[35] chances of the Greens constantly by the multiplicative factor of exp(0.789), at the same time diminishing the relative chances of the CDU/CSU by a factor exp(-0.137). Together, the chances to vote for the Greens instead of the CDU/CSU would increase by the factor exp(0.935), that is a constant multiplicative factor of 2.6.

Looking at the model fit represented by McFaddens[36] Pseudo $R^2$ = 14.9% and two summary measures of prediction success[37], with the prediction success table (PCP = 43.7%) and the classification table (PCP = 55.7%) the result is not exciting, but it has to be considered that the dependent variable contains four alternatives, thus reducing the overall fit.

The Hausman/McFadden-Test yields in the case of this model that the IIA assumption is guaranteed when removing each of the four parties from the full choice set[38]. Therefore, one

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[35] Relative to the changes of the FDP.

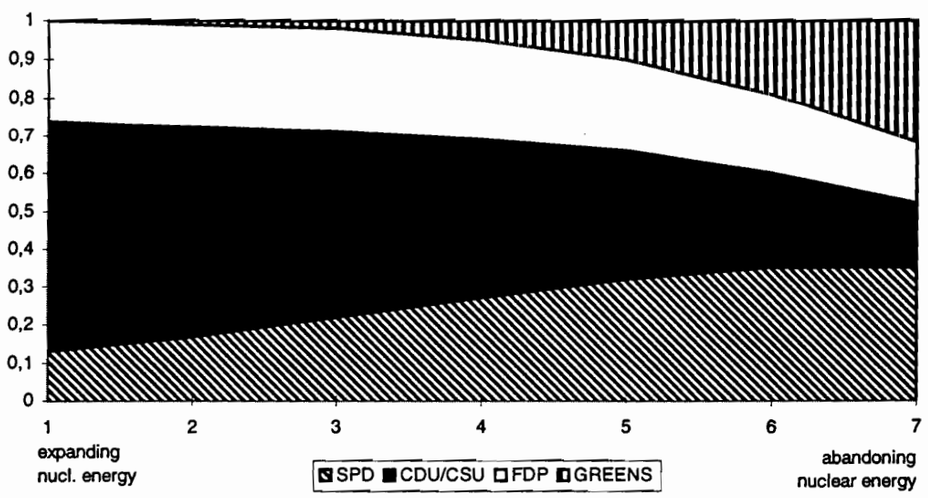
[36] $\rho^2 = 1 - \frac{\ln L(N)}{\ln L(0)}$, also termed as likelihood ratio index, where ln L(N)is the log likelihood of the unconstrained model and lnL(0) is the log likelihood of the model defined by the null hypothesis, in most practical applications the constants only model. McFadden (1979: 307) has suggested that $\rho^2$ values betweeen 0.2 and 0.4 could be considered to represent a very good fit.

[37] Both summary measures are the result of cross-classifying the actual choice with the predicted choice. Whereas in the prediction success table the predicted choices are represented by the estimated choice probabilities, in the classification table a classification rule has to be defined, which, in our case, accords to the assumption that the category with the highest predicted probability is selected, cf. McFadden 1979: 307.

[38] Removing CDU/CSU yields: c=1.764, df.=10, P-Value =1.0; SPD: c= 0.2750, df. =10, P-Value = 1.00, FDP: c= 2.922, df. = 10. P-Value= 0.983; GREENS: c= 0.864, df.=10, P-Value = 1.0

can also calculate the estimated market shares and to present them grafically, assuming for this purpose a homogenous population. As an example the shares in the question of nuclear energy will be shown:

**Figure 1:** **Estimated Choice Probabilities/Market Shares of the Parties Conditional on Voters' Policy Preferences towards Nuclear Eenergy /West Germany**




(N= 865)

Figure 1 illustrates estimated choice probabilities/ market shares conditional on preferences in the nuclear energy dimension, multivariately controlled by the other policy dimensions. Once again the vicinity of Greens and SPD in ecological questions is evident. These two parties are competing on the segment of voters supporting a closure of nuclear plants. The potential of the CDU is mainly located in the segment of adherents of the further development of nuclear energy. The equal distribution of the market shares over the whole space can be interpreted as a (perceived) lack of policy profil of the FDP in this dimension

**Policy-Distances as Party Attributes**

In the following section the vote will be explicitly modelled as a function of the distances between candidates and the voter, regardless of where the voter is located. There has been an

intense discussion in electoral research whether issue attitudes constitute only rationalizations of otherwise formed judgements. So, for example Page/Jones (1979) focus on so-called persuasion effects and projection effects. Although not intending a socio-psychological explanation of such effects, in our context, it must be clear that these biases are relevant in predicting the vote. Therefore, it is the individually perceived distances which will consequently be taken as generic predictors of the choice behavior of voters. These effects should be indirectly detectable, if the distance model will lead to an improvement of model fit compared with the ideal-points-only model.

The structure of the MRUM makes it possible to treat policy-specific distances to each of the parties as attributes of these parties and to specify it as a generic variable. Laver/Hunt (1992) plead for making it an empirical question which cognitive algorithm actors apply and therefore to derive empirically appropriate utility functions. As indicated in the theoretical model, there are multiple different specifications. With the estimation of more than one specification it is useful to compare goodness-of-fit measures. The testing of non-nested hypotheses of discrete choice models (cf. Ben-Akiva/Lerman 1985: 171 ff) requires an adjusted likelihood ratio index[39] $\bar{\rho}^2$ which takes account of differing degrees of freedom in the compared models by using the Akaike information criterion (Ben-Akiva/Lerman 1985: 167).

We present both, additive linear and additive quadratic utility loss functions in the case of the decompositional MRUM and that proves that the linear model fares better[40] in terms of model fit.

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[39] $\bar{\rho}^2 = 1 - \frac{\ln L(N) - K}{\ln L(0)}$, with K denoting the number of parameters to be estimated in the nonrestricted model.

[40] For an equal empirical result, see Page/Jones 1979: 1073.

**Table 3:** **Comparison of Model Fit of Different Specifications of the Utility Function /West Germany**

| Spezification | 2*LL(N)-LL(0) | DF | P-Value | $\bar{\rho}^2$ | Prediction | Classification |
|---|---|---|---|---|---|---|
| dec. multiattributive distances | 538,364 | 4 | 0,000 | 28,58% | 53,70% | 66,80% |
| dec. squared multiattr.distances | 473,672 | 4 | 0,000 | 25,09% | 51,30% | 64,40% |
| compos. City-Block-Distance* | 515,915 | 1 | 0,000 | 27,69% | 52,80% | 65,50% |
| compos. Euclidian Distance* | 473,712 | 1 | 0,000 | 25,42% | 51,30% | 65,20% |

*unweighted
(N=775)

Comparing compositional City-Block-distance with compositional Euclidean distances which are commonly assumed in the theoretical literature surprisingly shows that the former seems to more appropriately capture the process of decision making. Contrasting, now, compositional and decompositional models it turns out that the last one better reproduces the data. Despite of loosing 3 degrees of freedom by specifying the decompositional model the adjusted likelihood ratio index the consideration of single policy dimensions seems to make sense and corroborate that the assumption of equal weights is inappropriate although the difference between this model and the City-Block specification is far from being exciting.

Nevertheless, these results confirm the decision to use the decompositional model in the following analyses and to determine the weights of each of the four dimensions. This linear-compensatory functional form supposes a constant marginal disutility represented by the coefficient $\beta$. The relative impact of the four decision criteria are shown in table 4:

**Table 4:** **Decompositional Multiattributive Policy Distances (Generic) and Vote /West Germany**

| Policy | ß | T-Ratio | P-Value | Effect |
|---|---|---|---|---|
| Unification | -0,365 | -6,92 | 0,000 | 0,694 |
| Immigration | -0,330 | -8,14 | 0,000 | 0,719 |
| Abortion | -0,179 | -5,18 | 0,000 | 0,836 |
| Nuclear Energy | -0,442 | -10,02 | 0,000 | 0,643 |
| 2*LL(N)-LL(0) = 538,364, DF =4, P-Value = 0,000, Pseudo $R^2$ = 29 % | | | | |
| Peecent correctly predicted: | | Prediction table: | | 53,70% |
| | | Classification table: | | 66,80% |

(N = 775) [41]

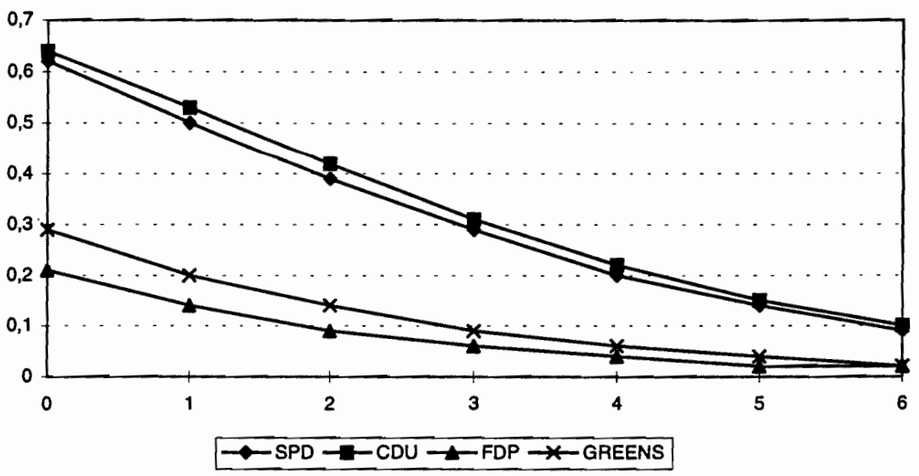
[41] Market shares of the alternatives in the choice set: SPD: 37,2%, CDU/CSU: 42,3%, FDP: 9,0 %, GRÜNE: 11,5%. The reduction of the sample is due to missings in party placements.

Each of the criteria shows a significant effect on the decision of the voters. As expected, the signs are all negative: the larger the perceived distance the smaller the chance to get the vote. In this type of specification the voters place the greatest importance on the nuclear energy issue. In magnitude, the effect of unification ranks between the estimates for nuclear energy and immigration. Perceived distances in nuclear energy and unification had an impact which more than doubles the one of abortion. Expressed in terms of marginal rate of substitution this would mean that if the distance perceived to a party location on the unification issue is increased by two units, the distance in abortion would have to decrease by two units in order to remain indifferent. These generic coefficients hold for the impact on the relative chances of each of the parties in the same way. For example, if the perceived distance to the SPD in the immigration issue increases by one unit, then the odds of this party are decreasing with relation to each of the other parties by 100(exp(-0,33)-1), i.e. by 28 %. This holds for all parties. Compared with the ideal points-only model the fit of the distance model fares much better, which points to the fact, noted also by Enelow/Hinich (1985: 268), that variables exogenous to the specified model make their influence felt through the variables of the estimated model. These effects should not impair the determination of the relative weights of, and the trade offs between policy dimensions as long as we can plausibly assume that these biases turn out to be equal in all dimensions and are averaging out over alternatives (Enelow/Hinich 1984: 171).

Using the results of table 4 the message of the multiatttributive model can now for examplary reasons also be visualized. Analogous to marketing studies where a brand's market share is a linear function in marketing-mix variables, in the following analyses the decision for a party will be determined dependent on their evaluation of attributes of the alternatives. Assuming a homogenous population the estimated choice probabilities can be, once again, considered as estimated market shares conditional on perceived distances. In order to determine the conditional aggregate shares of one party we have to hold constant perceived distances to all

other parties. The c.p. conditions will be defined as the respective average perceived distance to the other parties. This enables us to visualize distance based policy reaction fuctions for the immigration issue:

**Figure 2:** **Estimated Choice Probabilities/Market Shares Conditional on Distances in Immigration Policy /West Germany**



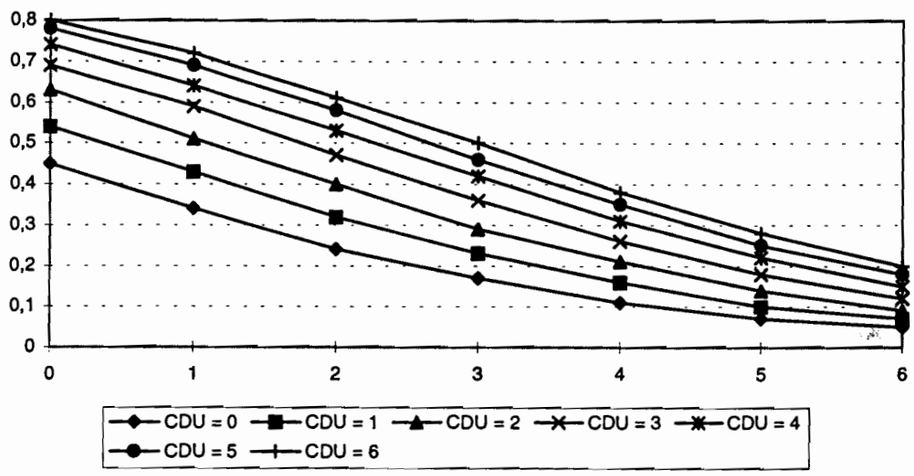

(N= 775)

Perceiving a congruence with the SPD in the case of the immigration issue and an average distance to the other parties results in a share of 60 % of this party, i.e. the SPD is voted for with a choice probablity of .6. Contrary to deterministic models, perceived issue congruence and non-indifference to any other party does not lead to an unambiguous decision, but to a probabilistic one. As we have assumed specific c.p. conditions and controlled for other policy attributes it is readily comprehensible, that an issue congruence with a party does not lead to a choice probability of one. This effect is amplified in the case of the two minor parties, where interest congruence does only lead to very small choice probabilities. If decision criteria important for the evaluation of these parties are not specified in the model, such as strategic calculus, then the probability diminishes. But the small choice probabilities for the minor parties are also due to unrealistic assumption on the c.p. conditions: Perceiving an interest

congruence with the Greens obviously implicates also perceived closeness of the SPD and a larger distance on the part of CDU/CSU and FDP.

This effect of a genuine individual level perception of the party system can be illustrated if the reaction function is calculated only for one party by varying c.p. conditions for the other parties as in figure 3.

**Figure 3:** **SPD-Share Conditional on Distances in Immigration Policy and Varying CDU Distances West Germany**




(N=775)

This graph shows only the conditional shares of the SPD by varying the distance perceived to the CDU/CSU and holding the distances to the remaining parties constant. The lowest curve presents the shares of the SPD with varying distances to this party and a constant distance towards the CDU/CSU of zero. In the case of perceiving an interest with both, the SPD and the CDU/CSU in the immigration question, this leads to a share of the SPD of 45 %. If we allow the voter to perceive a larger and larger distance toward the CDU/CSU- as indicated in the other curves - this results in a monotonically increasing share of the SPD with an estimated maximum of 80 % when the location of the SPD is perceived as identical with the own bliss point, and at the same time the CDU/CSU is perceived as being located at the other

pol of the policy space. This increase of choice probabilities is remarkable as it illustrates very clearly the effect of the individual perception of the party space.

By using policy distances as generic variables it was assumed that a specific issue is evaluated equally by the voters of all parties. It is, however, quite possible that perceived policy distances have differentiated effects on the chances of different parties to be voted for. For example, an additional unit of distance in the abortion issue may have a stronger, negative impact on the chances of the more church-oriented CDU/CSU than on the chances of the more liberal-secular FDP. This possibility can be examined by the test of generic attributes (cf. Ben-Akiva/Lerman 1985: 168) where the restriction of equality of coefficients imposed by the generic model on the more general model with alternative-specific attributes is tested. The results of the likelihood ratio test statistic for the null hypothesis of generic attributes are presented in table 5.

**Tabelle 5:** **Likelihood Ratio Test: The Splitting of Generic Distances into Alternative specific Distances /West Germany**

| | $\chi^2$-Statistic | P-Value | DF |
|---|---|---|---|
| Unification | 2,288 | 0,515 | 3 |
| Immigration | 7,24 | 0,065 | 3 |
| Abortion | 0,982 | 0,806 | 3 |
| Nuclear Energy | 6,026 | 0,111 | 3 |

(N =775)

Table 5 presents the results of the likelihood ratio test against the base specification. With this evidence one can reject equality of coefficients across alternatives only for the immigration issue when choosing, for examplary reasons, a low significance level at 10%, but we cannot reject the null hypothesis for all the other dimensions In the case of the other issues the greater parsimony of the generic specification does not justify the splitting into alternative-specific attributes. Table 6 presents the estimation results for the resulting model with the alternative-specific specification with 3 more parameters for immigration.

**Table 6: Policy Distances and Vote Decision after Test of Generic Attributes /West Germany**

| Variable | ß | T-Ratio | P-Value | Effect |
|---|---|---|---|---|
| Unification | -0,363 | -6,895 | 0,000 | 0,696 |
| SPD-Immigration. | -0,273 | -4,624 | 0,000 | 0,761 |
| CDU/CSU-Immigration | -0,326 | -5,016 | 0,000 | 0,722 |
| FDP-Immigration | -0,464 | -4,323 | 0,000 | 0,629 |
| GREENS-Immigration | -0,372 | -4,800 | 0,000 | 0,689 |
| Abortion | -0,177 | -5,123 | 0,000 | 0,838 |
| Nuclear Energy | -0,439 | -9,927 | 0,000 | 0,645 |
| 2*LL(N)-LL(0) = 541,655, DF = 7, P-Value = 0,000, Pseudo $R^2$ = 29,2% | | | | |
| Percent Correctly Predicted | Prediction success table: | | 53,80% | |
| | Classification table: | | 66,80% | |

(N=775)

Perceived distances in the immigration issue have the relatively strongest effect onto the chances of the FDP, the party which indeed propagated an image of representing classical liberal values in the domain of human rights. While the model fit measured by pseudo $R^2$ has now to be considered as excellent in the context of MRUM, the additional variable does not appear to add sufficient explanatory power to increase the prediction results.

Furthermore, the computation of several Hausman/McFadden-tests, indicates that the IIA assumption is violated in this model and that the model, therefore, is not yet correctly specified. This shows up especially when restricting the choice set by removing CDU/CSU and SPD respectively. whereas in the case of the two minor parties the null hypothesis cannot be rejected[42]. It will be shown in the next section whether the control of population heterogeneity (cf. Ben-Akiva/Lerman 1985: 110) improves the model to a substantial degree and whether this contributes to reach the IIA property.

## Controlling for Population Heterogeneity: Party Loyalty and Highly Involved Issue Publics

By assuming a homogenous population in the preceding analyses individual differences have been nivelled and the average responsiveness of the sample has been determined. But, in general, different voters react in a different manner on identical conditions. Unmeasured,

[42] Removing: CDU/CSU yields a chi-square value c=67.726, df = 6, P-Value = 0.000; SPD: c= 42.346, df =6, P-value= =0.000; FDP: c=5.170, df =6, P-Value= 0.522; GREENS: c= 2.117, df=6, P-Value=0.908.

voter-specific factors may influence voters' choice behavior. Even with the specification of demographic variables, voters may differ in their responses to marketing instruments of parties. Failure to control for such heterogeneity is likely to yield biased and inconsistent estimates, and more importantly, biased and inconsistent parameter estimates of choice probabilities. It is therefore important to capture systematic taste variations in the utility functions. The understanding and identification of market structures is, therefore, a precondition for the formulation of effective party strategies such as policy positioning, targeting and campaigning. Most of the theoretical literature assumes that the political market has a single structure. Transferring the insights of marketing science suggests, however, that these approaches could lead to incorrect results in a market characterized by heterogenous structure. In general, there exist asymmetries in markets and competition reflected in differential cross-effects among parties. Heterogenous populations differ in both preferences and responsiveness to marketing efforts of parties. Therefore, it is necessary to incorporate multiple sources of heterogeneity.

So, for example, some parties can create strong voter loyalties leading to an imparity in competitive interdependencies. This conception of structured markets in politics has also been put forward by Shepsle: „Parties and candidates stake out locations well in advance of any specific election....their respective locational 'types' constitute reputations which are relatively durable and not readily altered in the short run of a specific campaign. Positions on the specific issues salient during a given campaign, however, allow for more flexibility...(1991: 42). That is, some bases of voter evaluation are fixed and durable (Party 'types' are analogous to location-specific capital) while others may be varied by parties (specific issue positions are analogous to product prices)" (Shepsle 1991: 43). This conceptualization leads to a segmentation of the market into a segment of 'switchers', highly responsive to changes in the short-term campaigning variables and another one of 'loyal' voters, relatively unresponsive to short-term policy programs. Empirical students of voting extensively use the concept of party

identification to predict and explain voting behavior. In the context of the Michigan approach this concept means the long standing sociopsychological attachment to a party. In rational choice approaches, however, this concept captures the effect of an individual's past voting behavior on the actual and future votes and the carry-over effects of past campaigning and party reputation (Fiorina 1981). Fiorina's 'running tally' model conceptualizes the development of party identification as the ongoing result of comparative evaluation of the party platforms and performance of party politicians contributing towards a cumulative evaluation of the parties by voters[43].

Another way of segmentation proposed in this article is to allow sensitivities for the offered policies in the 1990 national election campaign to vary across segments. Recent literature on voting and elections is stressing the growing heterogeneity of the public's issue interests and a fragmentation into a variety of distinct issue publics. I propose, therefore, a segmentation by specific issues of immediate or personal importance. Different measures of issue saliency (RePass 1971, Rabinowitz et al. 1982, Niemi/Bartels 1985) have been proposed with no clear result[44]. Following RePass (1971) and the conclusion of Rabinowitz (1982: 57) who have found „that any issues singled out as personally most important plays a substantially greater role for those who so view it than it does for others", I will utilize open-ended responses about selective concerns about the policies we have chosen as being the campaign issues. Specifying policy distances and these so-called highly involved issue publics (HIIP) by interaction terms enables us to capture the selective emphasis of voters and to determine statistically their differentiated sensitivities to these policies.

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[43] Marketing researchers generally have examined brand choice behavior using Multinomial Logit models calibrated on scanner panel data. A household then is assigned to a segment by updating the household invariant segment membership probabilities by the purchase history of that household. These probabilities are introduced as a measure of brand loyalty into the utility function to account for differences in utility across households and over time. One of the most widely used measures of brand loyalty, proposed by Guadagnis and Little (1983), is an exponential smoothing model of past choice behavior by the household. This loyalty variable captures 'not only much of the cross-sectional heterogeneity but also a good part of the purchase-to-purchase dynamics' (Guadagni/Little 1983: 216). As we cannot observe long-term individual vote histories, we content ourselve achieving a cross-sectional preference segmentation by the concept of party identification.

[44] For an overview see Niemi/Bartels 1985.

The unique feature of our approach is that we are able to determine how parties compete within each structured market by the use of policy variables. The approach considers heterogeneity by segmenting the market. Two distinct groups of explanatory variables are used in the following model. The first group consists of the policies offered in the campaign. The second group consists of voter specific variables, namely party loyalty and classification of the voters into segments of highly involved issue publics indicating an individual saliency of one of the four policies considered. The first distinguish loyal party voters from the rest . The latter classifies the voters into HIIP according to their answer on the most important political problem question. These variables allow us to model the heterogeneity in choice probabilities while treating the voters as being homogenous.

**Tabelle 7: Policy Distances, Party Loyalty, Individual Saliency Effects and the Vote /West ^ Germany**

| Variable | ß | T-Ratio | P-Value | Effect |
|---|---|---|---|---|
| Unification | -0.179 | -2.189 | 0.029 | 0.836 |
| CDU/CSU-Immigration | -0.131 | -1.590 | 0.112 | 0.877 |
| SPD-Immigration | -0.140 | -1.920 | 0.055 | 0.869 |
| FDP-Immigration | -0.311 | -2.676 | 0.007 | 0.733 |
| GREENS-Immigration | -0.357 | -3.981 | 0.000 | 0.700 |
| Abortion | -0.038 | -0.900 | 0.368 | 0.963 |
| Nuclear Energy | -0.299 | -5.589 | 0.000 | 0.742 |
| Party Loyalty | 2.130 | 16.089 | 0.000 | 8.415 |
| Unification*HIIP | 0.074 | 0.627 | 0.530 | 1.077 |
| CDU/CSU-Immigration*HIIP | -0.574 | -2.176 | 0.030 | 0.563 |
| SPD-Immigration*HIIP | -0.499 | -2.165 | 0.030 | 0.607 |
| FDP-Immigration*HIIP | -0.364 | -1.028 | 0.304 | 0.695 |
| GREENS-Immigration*HIIP | -0.174 | -0.651 | 0.515 | 0.840 |
| Abortion*HIIP | -0.012 | -0.011 | 0.992 | 0.988 |
| Nuclear Energy*HIIP | -0.104 | -0.623 | 0.533 | 0.901 |
| 2*LL(N)-LL(0) = 882.658, dF = 15, P-Value = 0,000, Pseudo $R^2$ = 47.6 % | | | | |
| Percentage Correctly Predicted | | Prediction | | 68.60% |
| | | Classification | | 80.40% |

(N=775)

Table 7 shows the outstanding effect of the loyal segment. This variable has been specified as a binary generic variable in order to take into account the comparative character of the 'running tally'. Therefore, for the first time, we are able to specify the party loyalty variable

simultaneously for each of $n \geq 2$ parties/candidates. A test on generic variables yields that the decomposition into alternative-specific variables is not justified. Consequently, the effect being classified into the segment of party loyals is equal for all four parties. Experiments with the follow-up question of party identification which has been transformed into an intensity scale and also specified as generic variable, showed that this part of the question does not lead to a linear scale and is therefore disregarded in this analysis.

As indicated by the interaction effects, only in the case of the immigration issue a varying valuation of policy distances in this dimension can be observed. But the significance of the varying sensitivities depends on the considered parties. Naming the immigration issue as the most important political problem increases considerably the effect of perceived distances in this issue onto the relative chances of the CDU/CSU and the SPD only whereas in the case of the two other parties this has no additional negative impact on the vote of these parties. At the same time simple alternative-specific effects of immigration had been significant only onto the chances of the latter parties. This clarifies that in the representative utility function, immigration constitutes a substantial decision criterion only for the vote of the FDP and the Greens, while considering the segment of the respective highly involved issue public illustrates the particular sensitivity of these members for the vote of the two major parties. Furthermore, the consideration of population heterogeneity results in an appropriate model with regard to the IIA assumption. An examination of the results of several Hausman/McFadden tests[45] conducted to this specification confirm that the logit structure now fully applies.

In order to visualize the effects of the preference segmentation, figure 4 demonstrates the different resulting market shares of the CDU/CSU conditional on perceived distance in the immigration issue and party loyalty:

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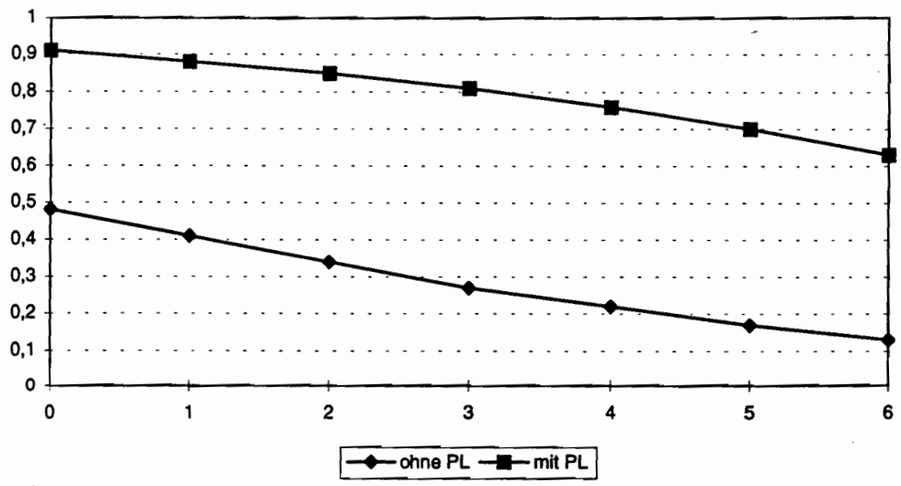
[45] Removing CDU/CSU yields: c=9.423, df=7,P-value= 0.233; SPD: c=1.444,df.= 7, P-Value=1.0;FDP: c= 11.751, df.=7, P-value=0.109; GREENS: c= 8.873, df.=7, P-value= 0.261.

**Figure 4:** **CDU/CSU Shares Conditional on Perceived Distance in the Immigration Issue and Party Loyality- West Germany**




(N = 775)

Having a longstanding party loyalty toward the CDU dampens the effect of a perceived disagreement with ones party on actual policies of the day. In the segment of party loyals even being in complete divergence on immigration policy with the CDU/CSU leads to 60% of votes for that party whereas in the case of the non loyal switchers this percentage goes down to about 10 %. By segmenting the sample it was, therefore, possible to discover strong preference biases on the one side and differentiated effects of actual policy instruments on the other side.

## Summary, Improvements and Future Research.

### Summary

Political scientists have proceeded to subject the spatial representation of the structure of political interaction to theoretical analyses of increasing complexity and sophistication in the last years. In this study, an empirically operational approach for the analysis of spatial voting theory was developed, borrowing from the multiattributive random utility model of McFadden. Initially, the structure of this probabilistic approach was presented. Then, estimates of individual level utility functions and party demand and policy reaction functions

are made in terms of parties attributes. The methodology was illustrated by using survey data of the 1990 German national election campaign. Empirically, multidimensionality of policy spaces and multipartism are no longer untractable problems. In the empirical analysis strong segmentational effects have been shown up. Several interesting and partly counterintuitive results have been discovered. Contrary to preceding conclusions of scholars of the 1990 German elections, unification has not been the most important decision criterion for West German voters. As to be expected, party loyalty turned out to be the strongest predictor of party choice. The most counterintuitive effects have been shown by the immigration issue, the most polarizing issue in West Germany since the mid 1980s, where alternative-specific effects and segmentational effects of highly involved issue publics could be proven.. This result has been achieved by the use of a new theoretical and econometric approach which is distinguished by theoretical flexibility and computational practicality. Multiattributive random utility models provide a promising tool for applied research and have yet to be discovered in Political Science.

**Improvements**

The methodology described in this paper can be improved in a number of ways. Key areas concern the data and instruments used to determine policy reaction functions. Improvements in these areas require a more complex study design. As indicated, there is still a need of survey instruments to elicit the voters' evoked party set in order to avoid the modelling of market interaction where there is in fact no perceived competition. The MRUM is pertinent to consider individually varying choice sets. Another improvement would be to include non-policy characteristics, as, for example, candidate images, scandals, advertising and so on, which can now be also theoretically integrated in the spatial model interpreted in terms of party/candidate characteristics. In order to overcome the crude measurement and the

insufficient statistical specification of party loyalty, this concept should be based in future applications on stated preferences collected in a panel design.

In situations where there are distinct similarities between parties, the MRUM with its restrictive properties of cross-substitutions is inappropriate to provide realistic predictions. Such types of structured markets require the use of the more flexible nested logit model as long as it is not possible to improve the specification of the utility function with appropriate variables.

**Future Research**

Along the article, several shortcuts in the form of simplifying assumptions were made. These assumptions leave room for improvements in the proposed methodology and also suggest unaddressed issues to be left for future research. The first crucial assumption, the separability of k-dimensions has to be generalized by more flexible functional forms allowing interdependencies of dimensions (Davis/Hinich/Ordeshook 1970: 433, Keeney/Raiffa 1992: 282 ff). But the relaxation of this assumption has at the same time to be followed by new tools of empirical data collection (cf. Judd/Krosnick 1989). Further work remains to be done on the problem of strategic voting. There is a lot of formal literature now on institutional rules, voter uncertainty and so on in the case of the coalition building process which should be very stimulating in order to derive empirically testable hypotheses. Last but not least, the abstention option should become part of the choice set in order to model the complete choice situation of the voter (cf. Thurner 1996).

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