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Bulletin nr. 1999/32 van het ISPO

D/1999/1192/5

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ABSTRACT. In this paper a SAS macro is presented that can be used to compute different measures of party or candidate utility for the voter and test alternative models of issue voting, such as the proximity and the directional model. The presentation of the macro is preceded by a short introduction to models of issue voting. The bulk of the paper consists of four examples. For each example both the macro call and output are given.

1. INTRODUCTION

Although political scientists generally agree that the impact of issues on the vote has increased since the 1960's, the way in which the voters are influenced by the parties' issue-profiles remains a matter of considerable scientific controversy. The traditional Downsian spatial approach (Downs, 1957; Enelow and Hinich, 1984) assumes that the issue-stands of parties and voters can be presented as positions in a one or multi-dimensional space. The smaller the proximity between a voter and a party, the larger the utility of the party for the voter and the more positive the voter's evaluation of that party.

This proximity approach has been challenged by Rabinowitz and Macdonald (1989; Macdonald e.a. 1991; 1995), who propose a directional model of issue voting. This model assumes that a party's utility is a function of both the direction and the intensity of the voter's and party's issue stands. The evaluation of the party peaks when voter and party intensely favour the same direction on a given issue and is minimal when voter and party intensely favour opposite directions. The issue has no impact on the evaluation when either the party or the voter are indifferent to the issue. An alternative is the pure directional model proposed by Matthews (1979)(cfr. infra).

Models of issue-voting are normally tested by means of one or more bipolar eleven or seven point issue-scales on which both the parties and the individual voters are located. The utility of a party is computed as either the Euclidean distance between the party's and the voter's position, according to the traditional proximity approach, or as the scalar product between both positions, the middle of the scale being set to zero, according to the directional approach. Evaluating the models involves comparing the effects of the different utility measures on either party evaluation or party choice. It is a matter of scientific dispute whether the voter's position on the issue-scales should be related to the 'objective' position of a party on the issue-scales or to the party's 'subjective' position, i.e. as perceived by the individual voter (e.g. Merrill, 1995; Krämer and Rattinger, 1997). In the former case, a party's 'objective' position is usually estimated on the basis of its mean placement on the issue-scale by the voters.

The SAS macro presented in this paper computes utility measures, using either the individual or the mean placements of the parties, according to the above described models. In addition, the macro estimates the effects of the utility measures on the vote or the evaluation by means of either ordinary or logistic regression analysis, if need be across different subgroups of the sample. The aim is to facilitate the comparison and evaluation of the models.

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In the next section the different utility measures computed by the macro are mathematically defined. Section three discusses the regression models relating the utility measures to either the evaluation of the parties (or candidates) or the actual party (or candidate) choice. The macro and the macro call are described in section four. The last section contains four examples of the use of the macro.

2. Notation

Let v_{ik} be voter i's position on issue k, let p_{ijk} be voter i's perception of candidate (or party) j's position on issue k, let c_{jk} be candidate (or party) j's position on issue k [1] and let I be the number of respondents, J, the number of parties (or candidates), and K, the number of issues. The v_{ik}'s are collected in a voter's vector $\mathbf{V}_i = (v_{i1}, \ldots, v_{iK})$, and the c_{jk}'s in a candidate's vector $\mathbf{C}_j = (c_{j1}, \ldots, c_{jK})$. The proximity measure of utility of voter i for candidate j can now be defined as (Merrill and Grofman, 1997:30):

$$U_{ij}^{PR}(\mathbf{V}_i, \mathbf{C}_j) = -\|\mathbf{V}_i - \mathbf{C}_j\|, \tag{1}$$

where $\|\mathbf{X}\|$ is a vector's length, defined as $\sqrt{\sum_{k=1}^{K} x_k^2}$. This enables us to rewrite this measure as:

$$U_{ij}^{PR}(\mathbf{V}_i, \mathbf{C}_j) = -\sqrt{\sum_{k=1}^{K}(v_{ik} - c_{ik})^2}. \tag{2}$$

Sometimes a squared (quadratic) euclidean[2] distance is used, instead of a linear euclidean distance:

$$U_{ij}^{PS}(\mathbf{V}_i, \mathbf{C}_j) = -\|\mathbf{V}_i - \mathbf{C}_j\|^2 = -\sum_{k=1}^{K}(v_{ik} - c_{ik})^2. \tag{3}$$

The directional measure, proposed by Rabinowitz and Macdonald is defined as a scalar product:

$$U_{ij}^{DI}(\mathbf{V}_i, \mathbf{C}_j) = \mathbf{V}_i \bullet \mathbf{C}_j = \sum_{k=1}^{K} v_{ik} c_{ik}, \tag{4}$$

where the $\bullet$ symbol is the scalar or dot product.
The pure directional measure, proposed by Matthews is defined as:

$$U_{ij}^{DP}(\mathbf{V}_i, \mathbf{C}_j) = \cos(\alpha) = \frac{\mathbf{V}_i \bullet \mathbf{C}_j}{\|\mathbf{V}_i\|\|\mathbf{C}_j\|} = \frac{\sum_{k=1}^{K} v_{ik} c_{ik}}{\sqrt{\sum_{k=1}^{K} v_{ik}^2}\sqrt{\sum_{k=1}^{K} c_{jk}^2}}, \tag{5}$$

where α is the angle between the voter's vector $\mathbf{V}_i$ and the candidate's vector $\mathbf{C}_j$. The four models of issue voting presented above, can be illustrated graphically. In figure 1, for instance, an example is given of a candidate j, who is located in position -1 on issue 1, and in position 4 on issue 2 (or more formally: $\mathbf{C}_j = (-1, 4)$). The x-axis represents all possible positions x of a voter on issue 1, and the y-axis represents all possible positions y of a voter on issue 2. The planes describe the utility for a voter i, with $\mathbf{V}_i = (x, y)$ (with $x = -5, -4, \ldots, 4, 5$ and $y = -5, -4, \ldots, 4, 5$), according to the four models.
The graphical illustration of the pure directional model in figure 1 shows that even in this model intensity plays a role, albeit indirectly. As the pure directional measure is defined as the cosine of the angle between the voter's vector and the candidate's vector, it is still partly a function of the (relative) intensities of the issue stands. One could imagine a model that

[1] For convenience suppose that the values of v_{ik},c_{jk} and p_{ijk} are such that 0 is the neutral point.
[2] We will call this the squared proximity measure.

discards even this indirect intensity component. Such a model could be implemented by simply subtracting the number of times voter i and candidate j are on a different side of the neutral point on an issue scale from the number of times voter i and candidate j are on the same side of the neutral point on an issue scale. This would amount to calculating a pure directional model after substituting all (strictly) negative issue positions (i.e. $-5\cdots-1$) with -1, and all (strictly) positive issue positions (i.e. $1\ldots5$) with 1. Issues on the neutral point (0) would remain unchanged. Using the notation presented above this alternative measure could be defined as:

$$U_{ij}^{AL}(\mathbf{V}_i, \mathbf{C}_j) = \sum_{k=1}^{K} \frac{v_{ik}c_{ik}}{|v_{ik}||c_{jk}|}, \tag{6}$$

where $|x|$ is the absolute value of x. In that case the utility value would remain constant within each of the four quadrants of the two-dimensional space, resulting in a step-like graphical pattern.

The mean individual placements of the parties on the issue-scales are normally used as a proxy for the actual values of c_{ik}, which most often are not known. Those mean placements are defined as : $c_{jk} = \frac{\sum_{i=1}^{I} p_{ijk}}{I}$. When the models are evaluated across subgroups, the mean placements are additionally calculated per subgroup. Alternatively, as explained in section one, the individual placements by the voters can be used, defined as : $c_{jk} = p_{ijk}$, for $i = 1, \ldots, I$.

3. Regression analysis

Different models of issue voting are normally tested by means of either ordinary or logistic regression analysis. So called thermometer-scores, indicating the respondent's evaluation of the party or candidate, are generally used as the dependent variable in the former case, party or candidate choice in the latter. In the latter case, if the voter has a choice between more than two parties or candidates, dummy variables are created and as many logistic regression models are computed as there are dummies. The independent variables are the above described utility measures and a number of control variables. The models are evaluated by comparing the (standardized) regression coefficients of the alternative utility measures and the goodness of fit of the different regression models.

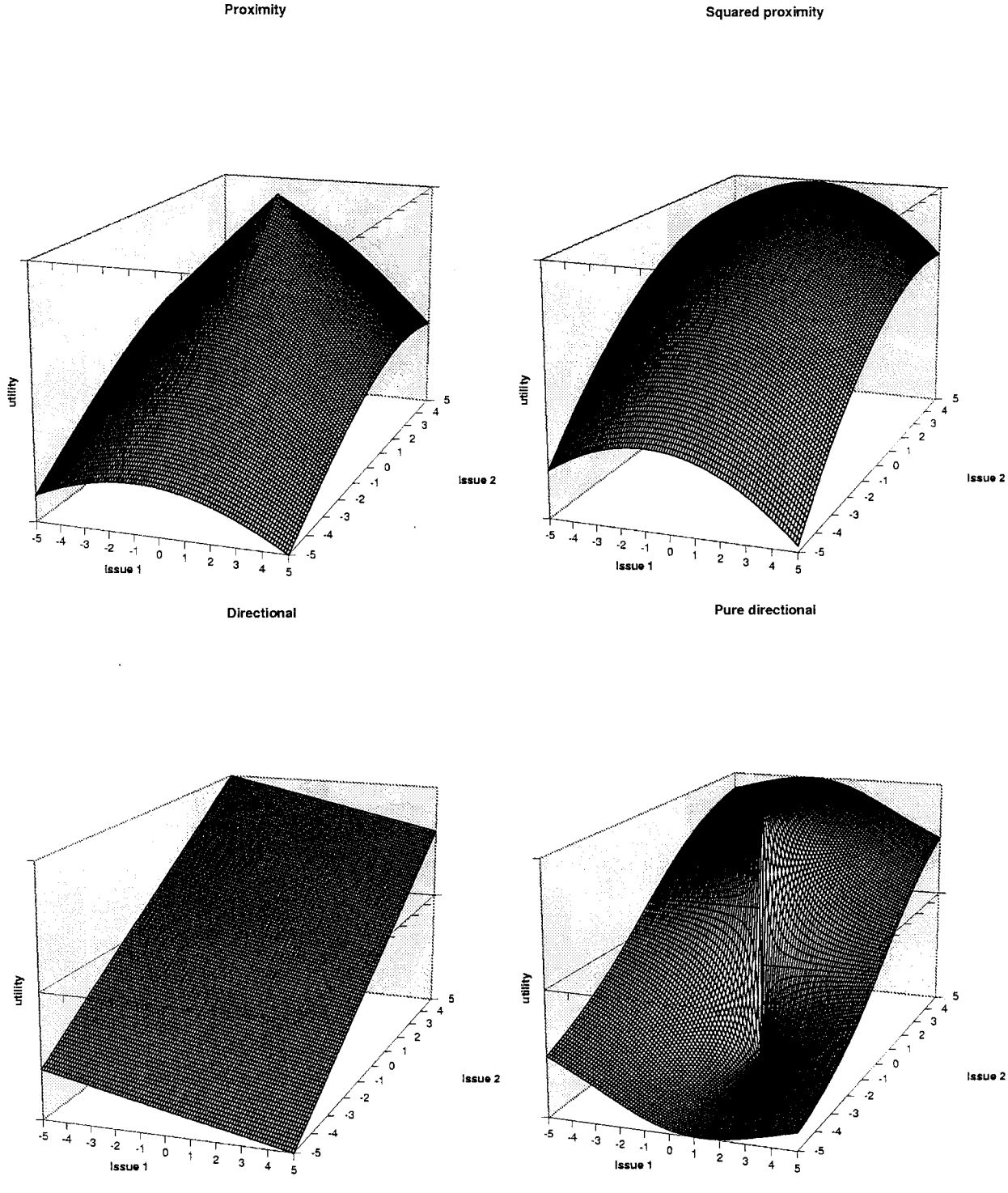
The attitude of voter i towards party or candidate j is denoted as y_{ij}. These y_{ij}'s can be thermometer values or dummy variables denoting party choice. In addition to the utility measures, L control variables x_{il} are entered into the regression model. The regression model predicting either voter i's evaluation of party or candidate j or the odds of choosing this party or candidate over any other candidate can now be written as:

$$y_{ij} = \alpha + \sum_{l=1}^{L}(\beta_l x_{il}) + \beta_u U_{ij}^{*} + \mu_{ij} \tag{7}$$

where μ_{ij} is an error term[3], α is the intercept, the β_l's are the regression coefficients of the L control variables, and β_u is the regression coefficient of interest, i.e. the coefficient of a particular utility measure (denoted by a *). In the case of (linear) regression analysis the model's R^2 is a logical measure of goodness of fit. In the case of logistic regression, Maddala's

[3]The distribution of the error term depends on the type of regression analysis.

FIGURE 1. Graphical representation of the four models of issue-voting in an example with candidate vector $\mathbf{C}_j = (-1, 4)$ on two 11 point issue-scales.



pseudoR^2 will be used[4]:

$$\text{Pseudo } F = \frac{R^2}{R^2_{max}} = \frac{1 - \exp\left(\frac{2 \ln L_0/L_1}{I}\right)}{1 - \exp\left(2 \ln L_0\right)}, \tag{8}$$

$$\text{with } 2\ln(L_0/L_1) = 2 \ln L_0 + (-2 \ln L_1),$$

$$\text{and } \ln L_0 = f_0 \ln f_0/I + f_1 \ln f_1/I,$$

[4]This formula for pseudo R^2 for a binary dependent variable can easily be derived from Maddala's more general formula for a polytomous dependent variable (Maddala, 1983 : 37-41).

while $-2 \ln L_1$ is the value of the log likelihood read from the output.
The difference in goodness of fit between the overall model and the model including only the control variables, the so called base model, is a straightforward measure of the contribution of the utility measure to the overall fit of the model[5]:

$$\Delta R^2 = R^2_{\text{full model}} - R^2_{\text{base model}}. \tag{9}$$

4. The IVMAC-macro

The IVMAC macro[6] computes four different utility measures, using equations (2), (3), (4) and (5)[7]. For each of the parties or candidates various (logistic) regression analyses are performed. (Pseudo) R^2 values are computed and compared with the base model 's (pseudo) R^2. The macro also outputs the regression coefficients[8] and an indication of the significance of the coefficient. The output is in the form of a LaTeX file[9].
The macro estimates J regression models for each of the four above described utility measures. The output consists for each party or candidate j, of four regression coefficients, and four R^2's. Additionally, each analysis is carried out using either *individual placements* or *mean placements*. The total number of regressions is $J \times 4 \times 2$. Analyses can also be carried out across different subgroups in the sample, in which case the mean placements of the parties or candidates are calculated per subgroup.
Below the macro's comment is shown.

```
/*****************************************************************************/;
/*** MACRO IVMAC: issue voting macro                                       ***/;
/*** parameters:                                                           ***/;
/***     dsname: name of input dataset                                     ***/;
/***     vote: name of transformed input dataset                           ***/;
/***     result: name of output dataset                                    ***/;
/***     depvar: name of dependent variable(s)                             ***/;
/***     deptype: type of dependent variable 1 -> dummy                    ***/;
/***                                         0 -> metrical                 ***/;
/***     controlv: control variable list                                   ***/;
/***     interv: interaction variable                                      ***/;
/***                                 -1-> not specified                    ***/;
/***     vissuevl:  voter s issues variable list                           ***/;
/***     cissuevl:  candidates  issues variable list                       ***/;
/***     issuenr:  number of issues                                        ***/;
/***     candnr:   number of candidates                                    ***/;
/***     issueor:  order of issues  1 -> candidates alternate fastest      ***/;
/***                                0 -> issues alternate fastest          ***/;
/***               remark: the number of elements in issuevl=issuenr*candnr***/;
/***     byvar:    by variable name                                        ***/;
/***     fname  : Latex file name                                          ***/;
/***     layoutl: Latex layout line                                        ***/;
/***     titlel : Latex title line                                         ***/;
/***     putl   : SAS (out)put line                                        ***/;
/***     title: : SAS title line                                           ***/;
/*****************************************************************************/;
%MACRO ivmac(dsname, vote, result, depvar, deptype, controlv, interv,
             vissuevl, cissuevl, issuenr, candnr, issueor,
             byvar, fname, layoutl, titlel,putl, title);
```

[5] In this equation R^2 must be replaced by pseudo R^2 in the case of logistic regression.

[6] The macro code can be downloaded from the website of the department of sociology of the University of Leuven at http://www.kuleuven.ac.be/facdep/social/soc/software.htm.

[7] To avoid problems due to missing values, the measures are divided by the number of issues with non-missing values.

[8] To make comparisons between the different utility measures easier, all independent variables were standardized before the analysis. In the case of ordinary regression the dependent variable was also standardized. In that case the regression coefficients are standardized coefficients.

[9] Users who are not familiar with the typesetting program LaTeX can use a text file with the same output, but without the fancy lay-out.

The first parameter of the macro, *dsname*, is the SAS data set used for the analysis, the second parameter, *vote*, is the name of a new SAS data set that will be used to store the computed utility measures. The next parameter is the name of a SAS data set that will be used to store the results of the different (logistic) regression analyses. The parameter *depvar* is the name of the dependent variable: when party or candidate choice is the dependent variable, the macro will transform this single variable to a set of dummy variables; when thermometer scores are used as dependent variable, the parameter *depvar* consists of a SAS variable list of those thermometer scores. Note that in both cases the order of the parties or candidates is important. The two types of dependent variable (thermometer scores or party/candidate choice) are denoted by the parameter *deptype*. When party or candidate choice is the dependent variable, the parameter *deptype* should be set to 1, when thermometer scores are used as dependent variable, *deptype* should be set to 0. Control variables are specified by a SAS variable list as parameter *controlv*. At least one control variable should be given. Only one interaction variable can be specified with the *interv* parameter. This variable should also be included in the *controlv* variable list. The macro computes the interaction term, i.e. the interaction variable times the utility measure, and estimates both the main effect of the interaction variable and the effect of the interaction term. In an analysis without an interaction variable the parameter *interv* should be set to -1. The parameters *vissuevl* and *cissuevl* are SAS variable lists with respectively the voters' and the parties' or candidates' issue positions. The order of the issues should be the same in both variable lists. Also, the values should be zero centered. If in the SAS variable list *cissuevl* the candidates alternate faster than the issues, then the parameter *issueor* should be set to 1. If the issues alternate faster than the candidates the value should be set to 0. In order to obtain different analyses across subgroups a BY-variable has to be specified with the *byvar* parameter. This parameter should be set to -1 if no BY-variable is used.

The remaining parameters deal with output and the lay-out of the output. *fname* is the name (without extension) of the LaTeX output file. The same name will be used to create a .TXT file with the same output, but without the lay-out that LaTeX provides [10]. The *layoutl* parameter must be a valid LaTeX table definition. The next parameter, *titlel* is the LaTeX title definition, and the *putl* parameter is similar to a SAS put statement. It defines what should be included in the output file. Finally, the *title* parameter provides a title for the analysis.

[10]Users who are not familiar with the LaTeX typesetting program can use this file instead. Those users can disregard the subsequent parameters. It is necessary, however, to give parameter values even if they are meaningless.

5. Examples

In this section, the application of the macro is illustrated with four examples. In the first three examples the 1995 ISPO data are used. The last example uses data from the 1996 American National Election Study (NES).

5.1. 1995 ISPO data.

The analysis, based on the 1995 election ISPO data[11], involves $I = 2099$ respondents, $J = 6$ parties, $K = 5$ issue variables, and $L = 1$ control variable. The input variables and the variables computed by the IV-macro are listed in tables 1 and 2.

5.1.1. *ISPO 1.*

The first example is a simple analysis without interaction or by- variables. The macro call is shown below.

```
%ivmac(vote,
       voteX,
       ispo.ispo1,
       q42,
       1,
       age ,
       -1,
       q75 q76 q77 q79 q81,
       q83_1--q83_6 q84_1--q84_6 q85_1--q85_6 q87_1--q87_6 q89_1--q89_6,
       5,
       6,
       1,
       -1,
       ispo1,
       l p{5.5cm} l l l,
       Party & Type of utility measure & Pseudo $R^2$ & $\Delta R^2$  & Regression coefficient\\,
       party " & " antype " & " pseudoR2 " & " deltar2 "& $" regcoef "^{" star "}$\\",
       ISPO 1. No interaction and no by-variable.);
run;
```

The SAS data set that is going to be used is called *vote*. The computed utilities will be stored in a SAS data set *voteX*, the results of the logistic regression analyses will be stored in a SAS data set *ispo.ispo1*. The dependent variable is party choice (*q42*), and hence the parameter *deptype* is set to 1. Only one control variable (*age*) is used, no interaction (hence the -1). The variable list *q75 q76 q77 q79 q81* are the issue positions of the voters, the variable list *q83_1q83_6 q84_1q84_6 q85_1q85_6 q87_1q87_6 q89_1q89_6* are the issue positions of the parties. The order of the issues is the same as in the previous parameter, and the order of the parties corresponds to the order used in *q42*. The original issue-variables were centered around zero. The number of issues is 5, the number of parties is 6. Since the candidates alternate the fastest in the *cissuevl* variable list, the next parameter is set to 1. There is no BY-variable, so the *byvar* parameter is set to -1. The next parameters define the output and are less important. It suffices to note that *ispo1* will be the name of the output file, and that the last parameter will be used as a title for the analysis.

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[11]The data were made available by the ISPO and PIOP Interuniversity Centres for Political Opinion Research, sponsored by the Federal Services for Technical, Cultural and Scientific Affairs. The data were originally collected by Jaak Billiet, Marc Swyngedouw, Ann Carton and Roeland Beerten. Neither the original collectors of the data nor the Centre bears any responsability for the analysis or the interpretations presented here.

[12]VU and Vl.Blok were swapped.

[13]j stands for party number

TABLE 1. Input variables for the ISPO 1995 examples

Voter's issue position	SAS variable name	Variable label	v_k
	q75	free enterprise/government	v_1
	q76	immigrants equal/unequal rights	v_2
	q77	environment/jobs	v_3
	q79	security/privacy	v_4
	q81	Flanders/Belgium	v_5
Party's issue position	SAS variable name	Variable label	p_{jk}
	q83_1	free enterprise/government (Agalev)	p_{11}
	q83_2	free enterprise/government (CVP)	p_{21}
	q83_3	free enterprise/government (VLD)	p_{31}
	q83_4	free enterprise/government (SP)	p_{41}
	q83_5	free enterprise/government (VU)	p_{51}
	q83_6	free enterprise/government (Vl.Blok)	p_{61}
	q84_1	immigrants equal/unequal rights (Agalev)	p_{12}
	q84_2	immigrants equal/unequal rights (CVP)	p_{22}
	q84_3	immigrants equal/unequal rights (VLD)	p_{32}
	q84_4	immigrants equal/unequal rights (SP)	p_{42}
	q84_5	immigrants equal/unequal rights (VU)	p_{52}
	q84_6	immigrants equal/unequal rights (Vl.Blok)	p_{62}
	q85_1	environment/jobs (Agalev)	p_{13}
	q85_2	environment/jobs (CVP)	p_{23}
	q85_3	environment/jobs (VLD)	p_{33}
	q85_4	environment/jobs (SP)	p_{43}
	q85_5	environment/jobs (VU)	p_{53}
	q85_6	environment/jobs (Vl.Blok)	p_{63}
	q87_1	security/privacy (Agalev)	p_{14}
	q87_2	security/privacy (CVP)	p_{24}
	q87_3	security/privacy (VLD)	p_{34}
	q87_4	security/privacy (SP)	p_{44}
	q87_5	security/privacy (VU)	p_{54}
	q87_6	security/privacy (Vl.Blok)	p_{64}
	q89_1	Flanders/Belgium (Agalev)	p_{15}
	q89_2	Flanders/Belgium (CVP)	p_{25}
	q89_3	Flanders/Belgium (VLD)	p_{35}
	q89_4	Flanders/Belgium (SP)	p_{45}
	q89_5	Flanders/Belgium (VU)	p_{55}
	q89_6	Flanders/Belgium (Vl.Blok)	p_{65}
Control variable	SAS variable name	Variable label	x_l
	AGE	Age of the respondent	x_1
Other variables	SAS variable name	Variable label	
	q42[12]	Party choice chamber 1995	
	factor1	political knowledge (factor score)	
	polit4	political knowledge (4 category variable)	

Table 3: ISPO 1. No interaction and no by-variable.

Party	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
1	Proximity (individual)	0.177762584	0.1079500295	0.978254305***
1	Squared proximity (individual)	0.1599108171	0.0900982626	1.2181513465***
1	Directional (individual)	0.1677491822	0.0979366278	0.8190393846***
1	Pure directional (individual)	0.104817561	0.0350050065	0.5496843829***
1	Proximity (mean)	0.1944175961	0.1225642079	1.0935547624***
1	Squared proximity (mean)	0.1888861314	0.1170327433	1.411726301***
1	Directional (mean)	0.2109653813	0.1391119932	0.995903597***
1	Pure directional (mean)	0.160401802	0.0885484138	16.334309238***
2	Proximity (individual)	0.0955760813	0.055277479	0.498709454***
2	Squared proximity (individual)	0.091649236	0.0513506337	0.565136387***
2	Directional (individual)	0.0786507981	0.0383521958	0.3862883468***
2	Pure directional (individual)	0.0453157227	0.0050171203	0.1395822154*
2	Proximity (mean)	0.0622061519	0.0262711203	0.328046201***
2	Squared proximity (mean)	0.0596153162	0.0236802846	0.3331502915***

Table 3: ISPO 1. No interaction and no by-variable.

Party	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
2	Directional (mean)	0.0444289133	0.0084938817	0.1765053415**
2	Pure directional (mean)	0.04882525	0.0128902185	0.3373031875***
3	Proximity (individual)	0.0616778272	0.0559953838	0.513849333***
3	Squared proximity (individual)	0.055263442	0.0495809986	0.5695886659***
3	Directional (individual)	0.1131906315	0.1075081881	0.7197508119***
3	Pure directional (individual)	0.0097054626	0.0040230193	0.1270059103*
3	Proximity (mean)	0.0133675234	0.0090509537	0.1978903368**
3	Squared proximity (mean)	0.0125336215	0.0082170518	0.2067080584**
3	Directional (mean)	0.0573260473	0.0530094776	0.473442546***
3	Pure directional (mean)	0.0223415924	0.0180250227	0.6876798441***
4	Proximity (individual)	0.0195701226	0.0170467846	0.274041312***
4	Squared proximity (individual)	0.0215849277	0.0190615897	0.3301572885***
4	Directional (individual)	0.055015289	0.052491951	0.4708933255***
4	Pure directional (individual)	0.0053979496	0.0028746116	0.1039197276
4	Proximity (mean)	0.0073657771	0.0036259723	0.1243988882*
4	Squared proximity (mean)	0.0083329365	0.0045931317	0.1485810638*
4	Directional (mean)	0.0280807009	0.0243408962	0.3180923677***
4	Pure directional (mean)	0.0062763706	0.0025365658	0.16167491
5	Proximity (individual)	0.0814987101	0.07289754	0.821826211***
5	Squared proximity (individual)	0.0852315723	0.0766304022	1.2711122423***
5	Directional (individual)	0.044265616	0.0356644459	0.4816973983***
5	Pure directional (individual)	0.0118556659	0.0032544958	0.1253881582
5	Proximity (mean)	0.0625928117	0.0552178325	0.6824144698***
5	Squared proximity (mean)	0.0587622538	0.0513872746	1.0325996293***
5	Directional (mean)	0.0473393039	0.0399643247	0.5056803158***
5	Pure directional (mean)	0.0256424853	0.0182675062	0.3299445354***
6	Proximity (individual)	0.0526375994	0.0450467004	0.543046182***
6	Squared proximity (individual)	0.0464473539	0.0388564549	0.6036707128***
6	Directional (individual)	0.0999808071	0.0923899081	0.7343703302***
6	Pure directional (individual)	0.016561367	0.008970468	0.188487347**
6	Proximity (mean)	0.0396694165	0.028692901	0.4536588553***
6	Squared proximity (mean)	0.0324721305	0.021495615	0.5522468606***
6	Directional (mean)	0.1678226042	0.1568460886	1.0790602095***
6	Pure directional (mean)	0.0635705987	0.0525940831	0.5443689266***

$* \; p < 0.05$

$** \; p < 0.01$

$*** \; p < 0.001$

The IV-macro outputs a LaTeX file with a table containing the results of the analysis. The LaTeX table is included above (see table 3). The table lists the Pseudo R^2 and the ΔR^2 for each combination of the four types of utility measures and the two types of party placement. The table also shows the regression coefficient and an indication of the significance of the coefficient (based on the the associated p-value).

The average value of ΔR^2 is 0.044136. Table 4 shows that the directional measure has the highest average ΔR^2 (0.0705), and that the pure directional measure has the lowest ΔR^2 (0.0101). The two proximity models have average values between those two [14]. The difference between the two types of party placement (individual and mean) is much smaller, as is shown in table 5. Differences in ΔR^2 can also occur between parties. Table 6 shows that Agalev has the highest ΔR^2 and SP has the lowest ΔR^2. A question that was not adressed above is the significance off the effects. One possible way to deal with this problem is by means of an Anova. This is demonstrated in table 7, where all factors (type of utility measure, type of party placement, and party) are combined in an Anova, with ΔR^2 as the

[14]The alternative model presented in equation 6 had an average value of ΔR^2 of 0.049052 for this data set!

TABLE 2. Computed variables for the ISPO 1995 examples

SAS variable name	Variable label	U^*
_PRIPj[13]	Proximity measure with individual placements	U^{PR}
_PSIPj	Squared proximity measure with individual placements	U^{PS}
_DIIPj	Directional measure with individual placements	U^{DI}
_DPIPj	Pure Directional measure with individual placements	U^{DP}
_PRMPj	Proximity measure with mean placements	U^{PR}
_PSMPj	Squared proximity measure with mean placements	U^{PS}
_DIMPj	Directional measure with mean placements	U^{DI}
_DPMPj	Pure directional model with mean placements	U^{DP}
_PRMIj	Proximity measure with mean placement across subgroups	U^{PR}
_PSMIj	Squared proximity measure with mean placement across subgroups	U^{PS}
_DIMIj	Directional measure with mean placement across subgroups	U^{DI}
_DPMIj	Pure directional measure with mean placement across subgroups	U^{PD}
SAS variable name	Variable label	y_j
_PARTY1	Agalev (dummy variable)	y_1
_PARTY2	CVP (dummy variable)	y_2
_PARTY3	PVV (dummy variable)	y_3
_PARTY4	SP (dummy variable)	y_4
_PARTY5	VU (dummy variable)	y_5
_PARTY6	Vl.Blok (dummy variable)	y_6

TABLE 4. Average ΔR^2 for four types of utility measures

Mean	N	MEASURE
0.070509	12	3 (Directional)
0.049970	12	1 (Proximity)
0.045999	12	2 (Squared proximity)
0.010067	12	4 (Pure directional)

TABLE 5. Average ΔR^2 for 2 types of issue placements

Mean	N	PLACEMNT
0.046485	24	1 (Individual)
0.041788	24	2 (Mean)

TABLE 6. Average ΔR^2 for 6 parties

Mean	N	PARTY
0.092113	8	1 (Agalev)
0.051552	8	6 (Vl.Blok)
0.042348	8	5 (VU)
0.037193	8	3 (VLD)
0.026384	8	2 (CVP)
0.015227	8	4 (SP)

dependent variable[15]. The column with the p-values shows that all effects are significant, except the main effect of issue placement. However, this approach poses some methodological problems. The main problem is that by doing logistic regressions on a set of dummy variables, a certain degree of 'dependence' between the models' ΔR^2's is created, which is

[15]For technical reasons the table does not include the highest order interaction.

TABLE 7. ISPO 1. Effect sizes of Anova on ΔR^2

Effect	Df	SS	F	Prob	η^2	$\sum\eta^2$
PARTY	5	0.0284723895	31.615147759	0.000000	0.3616083568	0.3616083568
MEASURE	3	0.0227245359	42.054751632	0.000000	0.2886087976	0.6502171544
MEASURE*PARTY	15	0.0161386879	5.9733542002	0.000654	0.2049664433	0.8551835977
PLACEMNT*PARTY	5	0.0060971425	6.7701399052	0.001728	0.0774356389	0.9326192367
MEASURE*PLACEMNT	3	0.0023389068	4.3284556021	0.021869	0.0297048566	0.9623240933
PLACEMNT	1	0.0002647531	1.4698814695	0.244115	0.0033624478	0.9656865411

TABLE 8. ISPO 1. Average ΔR^2 by measure and party

Party Measure	1	2	3	4	5	6	
1	0.115257	0.040774	0.032523	0.010336	0.064058	0.03687	0.04997
2	0.103566	0.037515	0.028899	0.011827	0.064009	0.030176	0.045999
3	0.118524	0.023423	0.080259	0.038416	0.037814	0.124618	0.070509
4	0.031105	0.003822	0.007092	0.000329	0.003512	0.014545	0.010067
	0.092113	0.026384	0.037193	0.015227	0.042348	0.051552	0.044136

TABLE 9. ISPO 1. Average ΔR^2 by placement and party

Party Placement	1	2	3	4	5	6	
1	0.074746	0.03737	0.053394	0.022166	0.046434	0.044798	0.046485
2	0.10948	0.015397	0.020992	0.008288	0.038262	0.058307	0.041788
	0.092113	0.026384	0.037193	0.015227	0.042348	0.051552	0.044136

a violation of one of the assumptions of Anova. A second problem is that the significance of an effect is influenced by the number of observations. More observations will increase the significance of the effects. In this type of analysis, the number of observations is a function of the number of variables and categories. Still, the Anova results are interesting, especially, when the number of factors increases. So, instead of using the Anova as a means of significance testing, we merely use it as a way of summarizing the results. To this extent the following measure of effect size was used (Kirk, 1995: 180):

$$\eta^2_{effect} = \frac{SS_{effect}}{SS_{tot}} \tag{10}$$

where SS_{effect} is the sum of squares of an effect and SS_{tot} is the total sum of squares. The effects where sorted by η^2 and the cumulative η^2 was computed [16] (see last two columns of table 7).

[16]The last row of the column with the cumulative η^2's is, of course, the (Anova-)model's R^2.

5.1.2. *ISPO 2.*
The second example is very similar to the first one, but an interaction variable is now added. Only one interaction variable is allowed in the macro, and the interaction variable should also be included in the control variable list. The interaction term is automatically computed. In this case, we use political sophistication as interaction variable. A factor analysis of five variables (political knowledge, interest in politics, interest in the electoral campaign, talking about politics with friends, read political news in newspapers) yields a factor that can be considered as an indicator of political sophistication, involving both interest in and knowledge about politics (Maddens and Dewachter, 1998: 143-144). The factorscores *factor1* are used as the interaction variable. The other macro parameters are the same as in the first example.

```
%ivmac(vote,
       voteX,
       ispo.ispo2,
       q42,
       1,
       age factor1,
       factor1,
       q75 q76 q77 q79 q81,
       q83_1--q83_6 q84_1--q84_6 q85_1--q85_6 q87_1--q87_6 q89_1--q89_6,
       5,
       6,
       1,
       -1,
       ispo2,
       1 p{4cm} 1 1 1 1,
       Party & Type of utility measure & Pseudo $R^2$ & $\Delta R^2$ & r.c. interaction &
              r.c. main effect\\,
       party " & " antype " & " pseudoR2 " & " deltar2 " & $" interac  "^{" star2 "}$"  "& $"
              regcoef "^{" star "}$\\",
       ISPO 2. Interaction and no by-variable.);
run;
```

Table 10: ISPO 2. Interaction and no by-variable.

Party	Type of utility measure	Pseudo R^2	ΔR^2	r.c. interaction	r.c. main effect
1	Proximity (individual)	0.1821391117	0.1073626473	0.3171227686	0.974877293***
1	Squared proximity (individual)	0.1664528137	0.0916763494	0.4859134817	1.2192647067***
1	Directional (individual)	0.1816164012	0.1068399368	0.3073972369**	0.8632847048***
1	Pure directional (individual)	0.0926640095	0.0178875451	0.511381661***	0.5910652234***
1	Proximity (mean)	0.1995271057	0.1197927379	0.7386940813	1.0795672063***
1	Squared proximity (mean)	0.1951477473	0.1154133795	0.6760047544*	1.4279598968***
1	Directional (mean)	0.2131201554	0.1333857876	0.1272240865	0.9801584584***
1	Pure directional (mean)	0.1432453079	0.0635109401	0.3706751564**	0.9411404375***
2	Proximity (individual)	0.1076538457	0.0584086144	0.306134601*	0.5052575788***
2	Squared proximity (individual)	0.1023212072	0.0530759759	0.1390774439	0.5725000397***
2	Directional (individual)	0.0914486405	0.0422034092	0.1825802043**	0.4221875613***
2	Pure directional (individual)	0.0535425427	0.0042973114	−0.013392283	0.131787136
2	Proximity (mean)	0.0724320426	0.0279633926	0.1344409662	0.3402863482***
2	Squared proximity (mean)	0.0698166386	0.0253479886	0.0565296607	0.3482743096***
2	Directional (mean)	0.0531602078	0.0086915578	0.066428895	0.1691774671**
2	Pure directional (mean)	0.049917931	0.005449281	0.1431280251	0.1985593893*
3	Proximity (individual)	0.0879889456	0.0710334648	0.6952208009***	0.5164143125***
3	Squared proximity (individual)	0.0860237418	0.069068261	0.6164299524***	0.5785527101***
3	Directional (individual)	0.1478209507	0.1308654698	0.3743226376***	0.7769650256***
3	Pure directional (individual)	0.0181264504	0.0011709696	0.0700579888	0.0861201822
3	Proximity (mean)	0.0345157998	0.0166142204	0.6131902652**	0.1950650871**
3	Squared proximity (mean)	0.033231833	0.0153302536	0.377632649**	0.204394781**
3	Directional (mean)	0.0915651089	0.0736635294	0.2789352389***	0.4978639116***
3	Pure directional (mean)	0.0487578428	0.0308562634	0.373374224***	0.5235058254***
4	Proximity (individual)	0.0296049322	0.0192384576	0.1945307153	0.2805910603***
4	Squared proximity (individual)	0.03137052	0.0210040453	0.1632464723	0.3279841777***
4	Directional (individual)	0.0695820596	0.0592155849	0.146541895*	0.5172667727***
4	Pure directional (individual)	0.0113304933	0.0009640187	0.0743677968	0.0448092328

TABLE 11. ISPO 2. Effect sizes of Anova on ΔR^2

Effect	Df	SS	F	Prob	η^2	$\sum \eta^2$
PARTY	5	0.0270715252	25.422388491	0.000001	0.3530447872	0.3530447872
MEASURE	3	0.0232141912	36.333391014	0.000000	0.3027405777	0.6557853649
MEASURE*PARTY	15	0.0143999038	4.5075646194	0.002986	0.1877918189	0.8435771838
PLACEMNT*PARTY	5	0.0051628216	4.8483140422	0.007746	0.0673293149	0.9109064987
MEASURE*PLACEMNT	3	0.0032851269	5.1416738103	0.012101	0.0428419494	0.9537484481
PLACEMNT	1	0.0003519673	1.6526310776	0.218095	0.0045900706	0.9583385187

TABLE 12. ISPO 2. Average ΔR^2 by measure and party

Party Measure	1	2	3	4	5	6	
1	0.113578	0.043186	0.043824	0.014088	0.062339	0.043889	0.053484
2	0.103545	0.039212	0.042199	0.016316	0.061236	0.039587	0.050349
3	0.120113	0.025447	0.102265	0.048133	0.039734	0.12719	0.077147
4	0.040699	0.004873	0.016014	0.006024	0.008238	0.017317	0.015528
	0.094484	0.02818	0.051075	0.02114	0.042887	0.056996	0.049127

Table 10: ISPO 2. Interaction and no by-variable.

Party	Type of utility measure	Pseudo R^2	ΔR^2	r.c. interaction	r.c. main effect
4	Proximity (mean)	0.0208606912	0.0089372952	0.4650026407*	0.1279480117*
4	Squared proximity (mean)	0.0235504892	0.0116270931	0.3325852619**	0.1674832613*
4	Directional (mean)	0.0489731218	0.0370497257	0.2449359247***	0.3207734347***
4	Pure directional (mean)	0.0230075624	0.0110841663	0.3933893853*	0.1087957601
5	Proximity (individual)	0.0969454612	0.0733222356	0.1239915721	0.8358777908***
5	Squared proximity (individual)	0.0988783595	0.0752551338	0.0157857904	1.2858828722***
5	Directional (individual)	0.0625002691	0.0388770434	0.1360995673	0.4859609175***
5	Pure directional (individual)	0.026736121	0.0031128953	0.1656965724	0.1930949373
5	Proximity (mean)	0.0765842124	0.0513563341	−0.012198357	0.6712059889***
5	Squared proximity (mean)	0.0724437903	0.0472159119	−0.035162129	1.0123576606***
5	Directional (mean)	0.0658182609	0.0405903825	0.1563593904	0.4697096292***
5	Pure directional (mean)	0.0385912401	0.0133633617	0.225784852*	0.3273472613**
6	Proximity (individual)	0.065728293	0.0525854124	0.61277344**	0.5810961153***
6	Squared proximity (individual)	0.0613702707	0.0482273901	0.5448334767**	0.6809093982***
6	Directional (individual)	0.1083465339	0.0952036534	0.1921227367*	0.7711965039***
6	Pure directional (individual)	0.0162806789	0.0031377984	−0.072815532	0.0597131472
6	Proximity (mean)	0.0496335913	0.0351929821	0.6178774095*	0.4772073142***
6	Squared proximity (mean)	0.04538715	0.0309465408	0.5924543418**	0.6418283483***
6	Directional (mean)	0.1736170102	0.159176401	0.1547010731	1.0941723204***
6	Pure directional (mean)	0.0459361349	0.0314955257	0.2247453045*	0.529723326***

$* \; p < 0.05$

$** \; p < 0.01$

$*** \; p < 0.001$

Again the LaTeX table was included (see table 10). This time the regression coefficient of the interaction term is also listed. Inclusion of the interaction term increases the average value of ΔR^2 slightly, to 0.049127. A few cases of significant interaction effects between the utility measure and political sophistication were found. The effect size of the Anova is shown in table 11. Tables 12 and 13 are very similar to the tables 8 and 9.

TABLE 13. ISPO 2. Average ΔR^2 by placement and party

Party Placement	1	2	3	4	5	6	
1	0.080942	0.039496	0.068035	0.025106	0.047642	0.049789	0.051835
2	0.108026	0.016863	0.034116	0.017175	0.038132	0.064203	0.046419
	0.094484	0.02818	0.051075	0.02114	0.042887	0.056996	0.049127

5.1.3. *ISPO 3.*
In the third example, a BY-variable is included in the analysis, i.e. the same analysis as in example one is performed across different subgroups. The by-variable is political sophistication, as defined in example two. Respondents are now divided into four equal groups on the basis of the factorscores. This new variable is called *polit4*. The data set is first sorted by *polit4*. Apart from the inclusion of the BY-variable, the macro call remains unchanged.

```
proc rank data=out groups=4 out=out;
var factor1;
ranks polit4;
data vote;
merge vote out;
if polit4=. then delete;
proc sort data=vote; by polit4;

%ivmac(vote,
       voteX,
       ispo.ispo3,
       q42,
       1,
       age ,
       -1,
       q75 q76 q77 q79 q81,
       q83_1--q83_6 q84_1--q84_6 q85_1--q85_6 q87_1--q87_6 q89_1--q89_6,
       5,
       6,
       1,
       polit4,
       ispo3,
       l l p{5.5cm} l l l,
       Party & Polit4 & Type of utility measure & Pseudo $R^2$ & $\Delta R^2$  & Regression coefficient\\,
       party " & " Polit4 " & " antype " & " pseudoR2 " & " deltar2 "& $" regcoef "^{" star "}$\\",
       ISPO 3. No interaction but a by-variable.);
run;
```

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
1	0	Proximity (individual)	0.1709679625	0.0827785041	0.767146231**
1	1	Proximity (individual)	0.1558934159	0.0883016075	0.856919733***
1	2	Proximity (individual)	0.2067855806	0.1521975716	1.256424306***
1	3	Proximity (individual)	0.1951680999	0.1016882657	1.043019631***
1	0	Squared proximity (individual)	0.1266405252	0.0384510668	0.5931280165
1	1	Squared proximity (individual)	0.1571833331	0.0895915247	1.1675415737***
1	2	Squared proximity (individual)	0.19711162	0.142523611	1.7878770386***
1	3	Squared proximity (individual)	0.1807358817	0.0872560475	1.3463117987***
1	0	Directional (individual)	0.1238897441	0.0357002856	0.4080663015*
1	1	Directional (individual)	0.1464454665	0.0788536581	0.7192554292***
1	2	Directional (individual)	0.2070330081	0.1524449991	1.1384522304***
1	3	Directional (individual)	0.2470283398	0.1535485056	1.27477627***
1	0	Pure directional (individual)	0.0883528491	0.0001633907	0.0158412276
1	1	Pure directional (individual)	0.0857363329	0.0181445245	0.5886898211
1	2	Pure directional (individual)	0.1293947784	0.0748067694	2.4905310611***
1	3	Pure directional (individual)	0.1124085899	0.0189287557	1.3201466249
1	0	Proximity (mean)	0.1485718279	0.0511471552	0.6884316846**

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
1	1	Proximity (mean)	0.1799394195	0.1068079764	0.9779975249***
1	2	Proximity (mean)	0.1970393008	0.139910058	1.1623275544***
1	3	Proximity (mean)	0.2582760088	0.1656833276	1.4470440041***
1	0	Squared proximity (mean)	0.1440393697	0.0466146971	0.7629990786*
1	1	Squared proximity (mean)	0.1959067883	0.1227753452	1.3915985432***
1	2	Squared proximity (mean)	0.176766749	0.1196375061	1.4192782623***
1	3	Squared proximity (mean)	0.258993695	0.1664010138	2.1696512124***
1	0	Directional (mean)	0.166787502	0.0693628294	0.7254068451**
1	1	Directional (mean)	0.175540003	0.1024085599	0.8917979694***
1	2	Directional (mean)	0.2128392697	0.1557100269	1.0098931375***
1	3	Directional (mean)	0.2956540196	0.2030613384	1.295870119***
1	0	Pure directional (mean)	0.1655389179	0.0681142453	0.7041622171*
1	1	Pure directional (mean)	0.0908632486	0.0177318055	0.3082438824
1	2	Pure directional (mean)	0.1631798499	0.1060506071	1.4037027477***
1	3	Pure directional (mean)	0.2342563696	0.1416636884	2.3435332213***
1	0	Proximity (by-group mean)	0.1321741588	0.0347494861	0.5734405679*
1	1	Proximity (by-group mean)	0.1760089056	0.1028774625	0.9680087118***
1	2	Proximity (by-group mean)	0.1928158361	0.1356865933	1.1358313725***
1	3	Proximity (by-group mean)	0.2745387045	0.1819460233	1.3912047594***
1	0	Squared proximity (by-group mean)	0.1290363438	0.0316116711	0.6345688326*
1	1	Squared proximity (by-group mean)	0.1910186005	0.1178871574	1.3661948658***
1	2	Squared proximity (by-group mean)	0.172702006	0.1155727631	1.37029537***
1	3	Squared proximity (by-group mean)	0.2739307043	0.1813380231	1.9899190693***
1	0	Directional (by-group mean)	0.1489520239	0.0515273513	0.7447281051**
1	1	Directional (by-group mean)	0.1733163785	0.1001849354	0.9405693494***
1	2	Directional (by-group mean)	0.2112513926	0.1541221498	1.0301081721***
1	3	Directional (by-group mean)	0.2818252048	0.1892325236	1.0245094382***
1	0	Pure directional (by-group mean)	0.1360103218	0.0385856491	0.4948513163*
1	1	Pure directional (by-group mean)	0.0917722694	0.0186408264	0.3633694061*
1	2	Pure directional (by-group mean)	0.1649012471	0.1077720043	1.607786517***
1	3	Pure directional (by-group mean)	0.2296767114	0.1370840302	2.9293767341***
2	0	Proximity (individual)	0.046186079	0.0261406536	0.300655757*
2	1	Proximity (individual)	0.0761292923	0.0532044307	0.454362139***
2	2	Proximity (individual)	0.1530631862	0.068615457	0.628530717***
2	3	Proximity (individual)	0.1253491399	0.0769464947	0.647780302***
2	0	Squared proximity (individual)	0.0491154518	0.0290700264	0.3711418245*
2	1	Squared proximity (individual)	0.0858411457	0.0629162841	0.5845341589***
2	2	Squared proximity (individual)	0.1411290924	0.0566813632	0.6745248266***
2	3	Squared proximity (individual)	0.1074221895	0.0590195444	0.6629254204***
2	0	Directional (individual)	0.0408678439	0.0208224184	0.2119028217*
2	1	Directional (individual)	0.0621988535	0.0392739919	0.3621228239**
2	2	Directional (individual)	0.1265766869	0.0421289576	0.5187210848***
2	3	Directional (individual)	0.1056743495	0.0572717043	0.6180207736***
2	0	Pure directional (individual)	0.0310796475	0.0110342221	0.195624257
2	1	Pure directional (individual)	0.0287197895	0.0057949279	0.1379735293
2	2	Pure directional (individual)	0.0844498141	2.0848646E-6	−0.00300306
2	3	Pure directional (individual)	0.0882520478	0.0398494026	2.3848999194**
2	0	Proximity (mean)	0.0228803676	0.0117998838	0.1954109188
2	1	Proximity (mean)	0.0601008914	0.0348011389	0.3787590047**
2	2	Proximity (mean)	0.1200901602	0.0363654751	0.4251169844***
2	3	Proximity (mean)	0.0805973991	0.0316077591	0.3779084288**
2	0	Squared proximity (mean)	0.0221030457	0.0110225619	0.1927174891
2	1	Squared proximity (mean)	0.061745557	0.0364458044	0.4175989396**
2	2	Squared proximity (mean)	0.1221692351	0.03844455	0.491479612**
2	3	Squared proximity (mean)	0.0712670587	0.0222774187	0.3433457163**
2	0	Directional (mean)	0.0123085519	0.0012280682	0.0632101138
2	1	Directional (mean)	0.0375174828	0.0122177302	0.2054879936
2	2	Directional (mean)	0.0935442188	0.0098195337	0.2177282806
2	3	Directional (mean)	0.0609454498	0.0119558098	0.2094729513
2	0	Pure directional (mean)	0.0114189416	0.0003384578	0.0276468487
2	1	Pure directional (mean)	0.0334033219	0.0081035693	0.1380537502

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
2	2	Pure directional (mean)	0.0837256607	9.756694E-7	0.0036778011
2	3	Pure directional (mean)	0.082097162	0.033107522	0.9652880713**
2	0	Proximity (by-group mean)	0.0232830672	0.0122025835	0.1982253423
2	1	Proximity (by-group mean)	0.0615614574	0.0362617048	0.3819257864**
2	2	Proximity (by-group mean)	0.1213301753	0.0376054903	0.4337549206***
2	3	Proximity (by-group mean)	0.0793056769	0.0303160369	0.3703356411**
2	0	Squared proximity (by-group mean)	0.0221246303	0.0110441466	0.1910362298
2	1	Squared proximity (by-group mean)	0.0631635615	0.0378638089	0.4083904702**
2	2	Squared proximity (by-group mean)	0.1233076742	0.0395829891	0.4962488283***
2	3	Squared proximity (by-group mean)	0.0696940598	0.0207044198	0.3333041258*
2	0	Directional (by-group mean)	0.0121726065	0.0010921227	0.0571128672
2	1	Directional (by-group mean)	0.0375707173	0.0122709648	0.1822890139
2	2	Directional (by-group mean)	0.0938265838	0.0101018987	0.2223086723
2	3	Directional (by-group mean)	0.063646597	0.014656957	0.310548879*
2	0	Pure directional (by-group mean)	0.0113802673	0.0002997836	0.0251998558
2	1	Pure directional (by-group mean)	0.0330341401	0.0077343875	0.1406034251
2	2	Pure directional (by-group mean)	0.0837309463	6.261224E-6	0.0088531479
2	3	Pure directional (by-group mean)	0.0883064439	0.0393168039	0.8504120937***
3	0	Proximity (individual)	0.0419819895	0.0413803909	0.38833927**
3	1	Proximity (individual)	0.0161401744	0.006389726	0.176258196
3	2	Proximity (individual)	0.0651792712	0.0598717025	0.553801252***
3	3	Proximity (individual)	0.17238327	0.1551195983	0.967788157***
3	0	Squared proximity (individual)	0.0194596144	0.0188580158	0.2895706485
3	1	Squared proximity (individual)	0.0132669021	0.0035164537	0.1382824012
3	2	Squared proximity (individual)	0.0811548596	0.0758472908	0.7804260857***
3	3	Squared proximity (individual)	0.1575461175	0.1402824457	1.095833435***
3	0	Directional (individual)	0.0559565615	0.0553549629	0.3884908733**
3	1	Directional (individual)	0.040992715	0.0312422666	0.4299214577**
3	2	Directional (individual)	0.1450510173	0.1397434486	0.878730598***
3	3	Directional (individual)	0.2675039638	0.2502402921	1.3523449514***
3	0	Pure directional (individual)	0.00158453	0.0009829314	−0.045249022
3	1	Pure directional (individual)	0.0119938002	0.0022433518	0.0786171872
3	2	Pure directional (individual)	0.0059731343	0.0006655656	0.1033293976
3	3	Pure directional (individual)	0.0211671419	0.0039034701	0.2799514789
3	0	Proximity (mean)	0.0020393474	0.0014590798	0.0772799283
3	1	Proximity (mean)	0.0104359215	0.0020423548	0.0971323621
3	2	Proximity (mean)	0.0143985141	0.0085609885	0.187165821
3	3	Proximity (mean)	0.0523266455	0.0349339757	0.4220480574**
3	0	Squared proximity (mean)	0.001808895	0.0012286274	0.0767519721
3	1	Squared proximity (mean)	0.0092307416	0.0008371749	0.0672448922
3	2	Squared proximity (mean)	0.0163065268	0.0104690011	0.2304055154
3	3	Squared proximity (mean)	0.0474481964	0.0300555265	0.4299113461**
3	0	Directional (mean)	0.004644854	0.0040645865	0.133282932
3	1	Directional (mean)	0.0533359087	0.044942342	0.4502889574***
3	2	Directional (mean)	0.0808379925	0.0750004668	0.5700172709***
3	3	Directional (mean)	0.1575228092	0.1401301393	0.8230488573***
3	0	Pure directional (mean)	0.0025616835	0.001981416	0.0736356827
3	1	Pure directional (mean)	0.0296553802	0.0212618135	0.371827948*
3	2	Pure directional (mean)	0.0130915194	0.0072539938	0.1710814604
3	3	Pure directional (mean)	0.1317173813	0.1143247115	1.6583051893***
3	0	Proximity (by-group mean)	0.0024169213	0.0018366537	0.08868318
3	1	Proximity (by-group mean)	0.0086986757	0.000305109	0.0389182178
3	2	Proximity (by-group mean)	0.0148083546	0.0089708289	0.1976801406
3	3	Proximity (by-group mean)	0.0914132123	0.0740205424	0.6231027041***
3	0	Squared proximity (by-group mean)	0.0024179125	0.001837645	0.1013138322
3	1	Squared proximity (by-group mean)	0.0083958384	2.2716816E-6	0.0036543935
3	2	Squared proximity (by-group mean)	0.0168312886	0.0109937629	0.2403166416
3	3	Squared proximity (by-group mean)	0.0817077204	0.0643150505	0.5950984057***
3	0	Directional (by-group mean)	0.0099736123	0.0093933447	0.282349465
3	1	Directional (by-group mean)	0.0460955455	0.0377019788	0.5123166119**
3	2	Directional (by-group mean)	0.0844216112	0.0785840855	0.6096931883***

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
3	3	Directional (by-group mean)	0.1861848529	0.168792183	0.6839256596***
3	0	Pure directional (by-group mean)	0.0021461326	0.0015658651	0.0508219121
3	1	Pure directional (by-group mean)	0.0238533234	0.0154597567	0.3708768733
3	2	Pure directional (by-group mean)	0.0142787738	0.0084412481	0.282097715
3	3	Pure directional (by-group mean)	0.1642665069	0.1468738371	3.6433846514***
4	0	Proximity (individual)	0.010767344	0.0072281858	0.15298072
4	1	Proximity (individual)	0.0418091692	0.0340178771	0.387689954**
4	2	Proximity (individual)	0.0014999563	0.0013647295	0.082428005
4	3	Proximity (individual)	0.050342615	0.0478167881	0.506909938***
4	0	Squared proximity (individual)	0.0085527623	0.0050136041	0.1346892249
4	1	Squared proximity (individual)	0.0418031567	0.0340118647	0.442841987**
4	2	Squared proximity (individual)	0.0050458862	0.0049106594	0.1741947958
4	3	Squared proximity (individual)	0.0528841192	0.0503582923	0.6178551563***
4	0	Directional (individual)	0.041408382	0.0378692238	0.3052451108**
4	1	Directional (individual)	0.0847262921	0.076935	0.6063967568***
4	2	Directional (individual)	0.0418878772	0.0417526505	0.4569788894***
4	3	Directional (individual)	0.0830352494	0.0805094225	0.7362159477***
4	0	Pure directional (individual)	0.0035523442	0.000013186	0.0068664513
4	1	Pure directional (individual)	0.0077971388	5.8467778E-6	−0.003763891
4	2	Pure directional (individual)	0.0005339116	0.0003986848	−0.053195954
4	3	Pure directional (individual)	0.0531321454	0.0506063185	4.5415112414***
4	0	Proximity (mean)	0.0110006518	0.0001646202	−0.02516658
4	1	Proximity (mean)	0.0145350498	0.0064516036	0.1646685548
4	2	Proximity (mean)	0.000656347	0.0003662173	−0.040945069
4	3	Proximity (mean)	0.0400147826	0.037722155	0.4261622007**
4	0	Squared proximity (mean)	0.0112475674	0.0004115357	−0.039278986
4	1	Squared proximity (mean)	0.0172304742	0.0091470281	0.2079077515
4	2	Squared proximity (mean)	0.0003690724	0.0000789427	−0.020113455
4	3	Squared proximity (mean)	0.0487136003	0.0464209727	0.5452181127***
4	0	Directional (mean)	0.0129798749	0.0021438432	0.0923392299
4	1	Directional (mean)	0.0281385473	0.0200551011	0.2776345851*
4	2	Directional (mean)	0.016293851	0.0160037214	0.2790353395*
4	3	Directional (mean)	0.0974201367	0.0951275091	0.6498835558***
4	0	Pure directional (mean)	0.0283628783	0.0175268467	−0.198281811
4	1	Pure directional (mean)	0.0080958003	0.0000123542	0.007610859
4	2	Pure directional (mean)	0.0004647364	0.0001746067	0.0337166503
4	3	Pure directional (mean)	0.0566407533	0.0543481257	1.2491333709***
4	0	Proximity (by-group mean)	0.01093962	0.0001035884	−0.020151816
4	1	Proximity (by-group mean)	0.0137293798	0.0056459336	0.1566600383
4	2	Proximity (by-group mean)	0.0011376426	0.0008475129	−0.061984082
4	3	Proximity (by-group mean)	0.0559551659	0.0536625383	0.4986115801***
4	0	Squared proximity (by-group mean)	0.0113149124	0.0004788807	−0.043566215
4	1	Squared proximity (by-group mean)	0.0158451432	0.007761697	0.1946373651
4	2	Squared proximity (by-group mean)	0.0006499944	0.0003598647	−0.042373484
4	3	Squared proximity (by-group mean)	0.0642304899	0.0619378623	0.5979296415***
4	0	Directional (by-group mean)	0.0134614502	0.0026254185	0.1119749554
4	1	Directional (by-group mean)	0.024254787	0.0161713409	0.2616628262*
4	2	Directional (by-group mean)	0.0134517988	0.0131616691	0.268861021
4	3	Directional (by-group mean)	0.1118067784	0.1095141508	0.6120115993***
4	0	Pure directional (by-group mean)	0.0275281491	0.0166921175	−0.171805282
4	1	Pure directional (by-group mean)	0.0080995201	0.0000160739	0.0098839346
4	2	Pure directional (by-group mean)	0.0003654737	0.000075344	0.0241727807
4	3	Pure directional (by-group mean)	0.0663325803	0.0640399527	1.6903082796***
5	0	Proximity (individual)	0.1335628733	0.1177410114	1.033045156**
5	1	Proximity (individual)	0.0344014751	0.0243975728	0.457947353
5	2	Proximity (individual)	0.1102151156	0.092565624	0.973096649***
5	3	Proximity (individual)	0.0875054904	0.083991069	0.936199037***
5	0	Squared proximity (individual)	0.1282078903	0.1123860284	1.7133112987**
5	1	Squared proximity (individual)	0.0405117589	0.0305078566	0.6712589088
5	2	Squared proximity (individual)	0.1288591894	0.1112096979	1.7765847619***
5	3	Squared proximity (individual)	0.0802170573	0.0767026359	1.279452824**

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
5	0	Directional (individual)	0.0493062159	0.033484354	0.407874621
5	1	Directional (individual)	0.027461326	0.0174574237	0.3482728372
5	2	Directional (individual)	0.0421445682	0.0244950766	0.422327342*
5	3	Directional (individual)	0.0881508664	0.0846364449	0.8468684935***
5	0	Pure directional (individual)	0.0161399853	0.0003181234	−0.029230432
5	1	Pure directional (individual)	0.0128112123	0.00280731	0.118525856
5	2	Pure directional (individual)	0.0206932655	0.0030437739	0.2246800779
5	3	Pure directional (individual)	0.0106459145	0.007131493	0.6134780219
5	0	Proximity (mean)	0.0525286139	0.0475927679	0.6170492089*
5	1	Proximity (mean)	0.0438417558	0.029906248	0.536057386*
5	2	Proximity (mean)	0.1092250964	0.0907922541	0.9266856696***
5	3	Proximity (mean)	0.0485372304	0.0449417189	0.5995037192**
5	0	Squared proximity (mean)	0.0469860795	0.0420502335	0.8602070577*
5	1	Squared proximity (mean)	0.0433724001	0.0294368923	0.8085594992
5	2	Squared proximity (mean)	0.1121082998	0.0936754575	1.6537486912***
5	3	Squared proximity (mean)	0.0412931973	0.0376976859	0.8364485493*
5	0	Directional (mean)	0.0207087892	0.0157729432	0.3206725574
5	1	Directional (mean)	0.0253053359	0.0113698282	0.2905024645
5	2	Directional (mean)	0.0481254766	0.0296926344	0.4361158542*
5	3	Directional (mean)	0.1074119832	0.1038164718	0.8207157604***
5	0	Pure directional (mean)	0.0059637361	0.0010278901	0.0587339192
5	1	Pure directional (mean)	0.0219723569	0.0080368491	0.1895592408
5	2	Pure directional (mean)	0.0237874743	0.005354632	0.2399616335
5	3	Pure directional (mean)	0.0588160582	0.0552205467	1.1619500399***
5	0	Proximity (by-group mean)	0.0484751388	0.0435392929	0.5904347899*
5	1	Proximity (by-group mean)	0.0383476961	0.0244121883	0.4794814873
5	2	Proximity (by-group mean)	0.1093220671	0.0908892249	0.9090445365***
5	3	Proximity (by-group mean)	0.0722250856	0.0686295741	0.7189168011***
5	0	Squared proximity (by-group mean)	0.0454970477	0.0405612017	0.8160207718*
5	1	Squared proximity (by-group mean)	0.0369241462	0.0229886385	0.6389059351
5	2	Squared proximity (by-group mean)	0.1121330161	0.0937001738	1.4513230776***
5	3	Squared proximity (by-group mean)	0.059027455	0.0554319436	0.8575437951**
5	0	Directional (by-group mean)	0.0169732601	0.0120374141	0.38558448
5	1	Directional (by-group mean)	0.0181948256	0.0042593178	0.1832865655
5	2	Directional (by-group mean)	0.0487954111	0.0303625688	0.4308471475*
5	3	Directional (by-group mean)	0.126233157	0.1226376456	0.7368006226***
5	0	Pure directional (by-group mean)	0.0054855011	0.0005496552	0.0354292361
5	1	Pure directional (by-group mean)	0.0207277009	0.0067921931	0.1802055716
5	2	Pure directional (by-group mean)	0.0241265668	0.0056937246	0.3190969279
5	3	Pure directional (by-group mean)	0.0706766267	0.0670811152	1.9994550442***
6	0	Proximity (individual)	0.05524551	0.0161176518	0.273374186
6	1	Proximity (individual)	0.0234298156	0.0220743405	0.381598992*
6	2	Proximity (individual)	0.1194778224	0.1033549223	0.944467428***
6	3	Proximity (individual)	0.0785291924	0.073603173	0.788769938***
6	0	Squared proximity (individual)	0.0550601265	0.0159322684	0.3102754741
6	1	Squared proximity (individual)	0.0175022923	0.0161468172	0.3621181061
6	2	Squared proximity (individual)	0.1030422777	0.0869193777	1.1424502355**
6	3	Squared proximity (individual)	0.0761713607	0.0712453413	0.9607769513**
6	0	Directional (individual)	0.106254018	0.0671261599	0.518938781***
6	1	Directional (individual)	0.0963777353	0.0950222601	0.7872122692***
6	2	Directional (individual)	0.1114465363	0.0953236362	0.8390830957***
6	3	Directional (individual)	0.1183437167	0.1134176974	0.9312258395***
6	0	Pure directional (individual)	0.0483449217	0.0092170636	0.1603696753
6	1	Pure directional (individual)	0.0025763167	0.0012208415	0.0714278783
6	2	Pure directional (individual)	0.0164772927	0.0003543926	0.0464809355
6	3	Pure directional (individual)	0.0072572383	0.0023312189	0.3887367649
6	0	Proximity (mean)	0.0591062351	0.0020613528	0.1110591806
6	1	Proximity (mean)	0.0417691194	0.0375793163	0.5442473577**
6	2	Proximity (mean)	0.0739666146	0.0563231141	0.7084236541**
6	3	Proximity (mean)	0.0493581875	0.0444409524	0.5622713359**
6	0	Squared proximity (mean)	0.0573125596	0.0002676773	0.0508258418

Table 14: ISPO 3. No interaction but a by-variable.

Party	Polit4	Type of utility measure	Pseudo R^2	ΔR^2	Regression coefficient
6	1	Squared proximity (mean)	0.0357994755	0.0316096724	0.7146476696*
6	2	Squared proximity (mean)	0.0575660647	0.0399225642	0.8875142978*
6	3	Squared proximity (mean)	0.0521299733	0.0472127382	0.8880766526**
6	0	Directional (mean)	0.1423236812	0.0852787988	0.7535735332***
6	1	Directional (mean)	0.2693667354	0.2651769323	1.5775453836***
6	2	Directional (mean)	0.1807995783	0.1631560779	1.1158303625***
6	3	Directional (mean)	0.1405433423	0.1356261072	0.9958909638***
6	0	Pure directional (mean)	0.0675062287	0.0104613463	0.1565591687
6	1	Pure directional (mean)	0.0613125376	0.0571227345	0.7638803866***
6	2	Pure directional (mean)	0.054990565	0.0373470645	0.5387511746**
6	3	Pure directional (mean)	0.0401317322	0.035214497	0.8356411158*
6	0	Proximity (by-group mean)	0.0571089387	0.0000640564	0.0199333236
6	1	Proximity (by-group mean)	0.0423529064	0.0381631033	0.5444707493**
6	2	Proximity (by-group mean)	0.0784539229	0.0608104224	0.7354727637**
6	3	Proximity (by-group mean)	0.0576112503	0.0526940151	0.5977553842**
6	0	Squared proximity (by-group mean)	0.0570960184	0.0000511361	−0.022191171
6	1	Squared proximity (by-group mean)	0.036780081	0.0325902779	0.6646790748*
6	2	Squared proximity (by-group mean)	0.0605633072	0.0429198067	0.8367560374*
6	3	Squared proximity (by-group mean)	0.0589141084	0.0539968732	0.7846809569**
6	0	Directional (by-group mean)	0.1524391361	0.0953942537	0.9756800339***
6	1	Directional (by-group mean)	0.2727952366	0.2686054336	1.6005054699***
6	2	Directional (by-group mean)	0.1847388485	0.167095348	1.1215244665***
6	3	Directional (by-group mean)	0.1366502939	0.1317330587	0.8581305287***
6	0	Pure directional (by-group mean)	0.0685781859	0.0115333036	0.1517730752
6	1	Pure directional (by-group mean)	0.0634427107	0.0592529076	0.8161468482***
6	2	Pure directional (by-group mean)	0.0540092064	0.0363657059	0.5461879071**
6	3	Pure directional (by-group mean)	0.041220214	0.0363029788	1.0329930973*

$* p < 0.05$

$** p < 0.01$

$*** p < 0.001$

The output table is the same as in the previous examples, but the results are now listed by *polit4* (see table 14). This table shows that the effect of the utility measures on the vote, as indicated by the ΔR^2, systematically increases with political sophistication. The average ΔR^2 is 0.04995. The Anova results (see table 15) show that the effects of both type of utility measure and level of political sophistication on ΔR^2 are substantial. The effect of type of party placement however is not, contrary to what we would expect on the basis of the literature (e.g. Merrill, 1995; Krämer and Rattinger, 1997). The main results are summarized in a three-way table with the average ΔR^2 by polit4, measure and party (see table 16).

TABLE 15. ISPO 3. Effect sizes of Anova on ΔR^2

Effect	Df	SS	F	Prob	η^2	$\sum\eta^2$
PARTY	5	0.1890091007	153.79255926	0.000000	0.2425172776	0.2425172776
POLIT4	3	0.1312289797	177.96357046	0.000000	0.1683796959	0.4108969735
MEASURE*PARTY	15	0.1001511888	27.163608492	0.000000	0.1285038316	0.5394008051
MEASURE	3	0.086309207	117.04651422	0.000000	0.1107432067	0.6501440119
PARTY*POLIT4	15	0.0851439809	23.0932632	0.000000	0.109248107	0.7593921188
MEASURE*PARTY*POLIT4	45	0.0466473809	4.2173278482	0.000000	0.0598531805	0.8192452994
PLACEMNT*PARTY	10	0.024824014	10.099377835	0.000000	0.031851653	0.8510969524
PLACEMN*PARTY*POLIT4	30	0.0247737745	3.3596461531	0.000005	0.0317871908	0.8828841432
MEASUR*PLACEMN*PARTY	30	0.0194704214	2.6404424733	0.000221	0.0249824669	0.9078666101
MEASURE*PLACEMNT	6	0.0187587031	12.719621032	0.000000	0.0240692622	0.9319358724
MEASURE*POLIT4	9	0.0164226083	7.423731192	0.000000	0.0210718227	0.9530076951
PLACEMNT*POLIT4	6	0.0070751259	4.7973956327	0.000274	0.0090780828	0.9620857779
MEASUR*PLACEM*POLIT4	18	0.006350465	1.4353427998	0.134713	0.0081482716	0.9702340495
PLACEMNT	2	0.0010767224	2.1902635917	0.117816	0.0013815409	0.9716155904

TABLE 16. ISPO 3. Average ΔR^2 by polit4, measure and party

Polit3								
1	Party Measure	1	2	3	4	5	6	
	1	0.056225	0.016714	0.014892	0.002499	0.069624	0.006081	0.027673
	2	0.038892	0.017046	0.007308	0.001968	0.064999	0.005417	0.022605
	3	0.052197	0.007714	0.022938	0.014213	0.020432	0.0826	0.033349
	4	0.035621	0.003891	0.00151	0.011411	0.000632	0.010404	0.010578
		0.045734	0.011341	0.011662	0.007523	0.038922	0.026125	0.023551
2	Party Measure	1	2	3	4	5	6	
	1	0.099329	0.041422	0.002912	0.015372	0.026239	0.032606	0.036313
	2	0.110085	0.045742	0.001452	0.016974	0.027644	0.026782	0.038113
	3	0.093816	0.021254	0.037962	0.03772	0.011029	0.209602	0.068564
	4	0.018172	0.007211	0.012988	1.14E-05	0.005879	0.039199	0.01391
		0.08035	0.028907	0.013829	0.017519	0.017698	0.077047	0.039225
3	Party Measure	1	2	3	4	5	6	
	1	0.142598	0.047529	0.025801	0.000859	0.091416	0.073496	0.063617
	2	0.125911	0.044903	0.032437	0.001783	0.099528	0.056587	0.060192
	3	0.154092	0.020683	0.097776	0.023639	0.028183	0.141858	0.077705
	4	0.09621	3.11E-06	0.005454	0.000216	0.004697	0.024689	0.021878
		0.129703	0.02828	0.040367	0.006625	0.055956	0.074158	0.055848
4	Party Measure	1	2	3	4	5	6	
	1	0.149773	0.04629	0.088025	0.0464	0.065854	0.056913	0.075542
	2	0.144998	0.034	0.078218	0.052906	0.056611	0.057485	0.070703
	3	0.181947	0.027961	0.186388	0.09505	0.103697	0.126926	0.120328
	4	0.099225	0.037425	0.088367	0.056331	0.043144	0.024616	0.058185
		0.143986	0.036419	0.110249	0.062672	0.067327	0.066485	0.08119

5.2. **1996 NES data.**

In the previous examples party choice was used as the dependent variable. In this section the use of the macro with thermometer scales will be demonstrated. This time we will use National Election Studies data from the 1996 elections in the United States [17]. The analysis

[17]The National Election Studies, Center for Political Studies, University of Michigan. The NES Guide to Public Opinion and Electoral Behavior (http://www.umich.edu/ nes/nesguide/nesguide.htm). Ann Arbor, MI: University of Michigan, Center for Political Studies [producer and distributor], 1995-1998. These materials are based on work supported by the National Science Foundation under Grant Nos. : SBR-9707741,

TABLE 17. Input variables in the NES 1996 example

Voter's issue position	SAS variable name	Variable label	v_k
	v960365	R's self-placement on liberal/conservative scale	v_1
	v960450	R's self-placement on services/spending scale	v_2
	v960463	R's self-placement on defense spending scale	v_3
	v960479	R's self-placement on govt health insurance scale	v_4
	v960483	R's self-placement on guar job/standard of living scale	v_5
	v960487	R's self-place on aid to blacks scale	v_6
	v960519	R's self-placement on reduction of crime scale	v_7
	v960523	R's self-placement on jobs/environment scale	v_8
	v960537	R's self-placement on environmental regulation scale	v_9
	v960543	R's self-placement on women's rights scale	v_{10}
Candidate's issue position	SAS variable name	Variable label	p_{jk}
	v960369	R's placement of Clinton on liberal-con scale	p_{11}
	v960371	R's placement of Dole on lib-con scale	p_{21}
	v960373	R's placement of Perot on lib-con scale	p_{31}
	v960453	R's placement of Clinton on services/spending scale	p_{12}
	v960455	R's placement of Dole on services/spending scale	p_{22}
	v960457	R's placement of Perot on services/spending scale	p_{32}
	v960466	R's placement of Clinton on defense spending scale	p_{13}
	v960469	R's placement of Dole on defense spending scale	p_{23}
	v960472	R's placement of Perot on defense spending scale	p_{33}
	v960480	R's placement of Clinton on govt hlth insurance scale	p_{14}
	v960481	R's placement of Dole on gov hlth insurance scale	p_{24}
	v960482	R's placement of Perot on govt hlth insurance scale	p_{34}
	v960484	R's placement of Clinton on guar job/standard of living scale	p_{15}
	v960485	R's placement of Dole on guar job/standard of living scale	p_{25}
	v960486	R's placement of Perot on guar job/standard of living scale	p_{35}
	v960490	R's placement of Clinton on aid to blacks scale	p_{16}
	v960492	R's placement of Dole on aid to blacks scale	p_{26}
	v960494	R's placement of Perot on aid to blacks scale	p_{36}
	v960520	R's placement of Clinton on reduction of crime scale	p_{17}
	v960521	R's placement of Dole on reduction of crime scale	p_{27}
	v960522	R's placement of Perot on reduction of crime scale	p_{37}
	v960526	R's placement of Clinton on jobs/environment scale	p_{18}
	v960529	R's placement of Dole on jobs/environment scale	p_{28}
	v960532	R's placement of Perot on jobs/environment scale	p_{38}
	v960538	R's placement of Clinton on environmental regulation scale	p_{19}
	v960539	R's placement of Dole on environmental regulation scale	p_{29}
	v960540	R's placement of Perot on environmental regulation scale	p_{39}
	v960544	R's placement of Clinton on women's rights scale	p_{110}
	v960545	R's placement of Dole on women's rights scale	p_{210}
	v960546	R's placement of Perot on women's rights scale	p_{310}
Control variable	SAS variable name	Variable label	x_l
	AGE(v960605)	Age of the respondent	x_1
	GENDER(v960066)	Gender of the respondent	x_2
	RACE(v960067)	Race of the respondent	x_3
Dependent variables	SAS variable name	Variable label	y_j
	v960272	Clinton feeling thermometer	y_1
	v960273	Dole feeling thermometer	y_2
	v960274	Perot feeling thermometer	y_3

involves $I = 1714$ respondents, $J = 3$ candidates, $K = 10$ issue variables, and $L = 3$ control variables. The input variables for this analysis are listed in table 17.

The SAS program including the macro call are shown below. The SAS data set that will be used is *nes96*. The computed utilities will be stored in a SAS data set *nes96X*. The dependent variables are feeling thermometers for the three candidates: Clinton, Dole and

SBR-9317631, SES-9209410, SES-9009379, SES-8808361, SES-8341310, SES-8207580, and SOC77-08885. Any opinions, findings and conclusions or recommendations expressed in these materials are those of the author(s) and do not necessarily reflect those of the National Science Foundation.

Perot (*v960272, v960273, v960274*), and hence this time the parameter *deptype* is set to 0. Three control variables are used (*gender, race and age*), no interaction (hence the -1). The variable list *n1 n5 n9 n13 n17 n21 n25 n29 n33 n37* are the issue positions of the voters, the variable list *n2-n4 n6-n8 n10-n12 n14-n16 n18-n20 n22-n24 n26-n28 n30-n32 n34-n36 n38-n40* are the issue positions of the candidates. The order of the issues is the same as in the previous parameter, and the order of the candidates corresponds to the order used in the dependent variables. The original issue-variables were centered around zero. The number of issues is 10, the number of candidates is 3. Since the candidates alternate the fastest in the *cissuevl* variable list, the next parameter is set to 1. There is no BY-variable, so the *byvar* parameter is set to -1 (The remaining parameters deal with lay-out issues, and they will not be discussed here).

```
%include 'c:\issues\ivmacro.sas';
libname nes 'c:\issues\nes';
data nes96;
set nes.nes1996 (keep=v960066 v960067 v960070 v960605
                      v960272-v960274
                      v960365 v960369 v960371 v960373
                      v960450 v960453 v960455 v960457
                      v960463 v960466 v960469 v960472
                      v960479-v960482
                      v960483-v960486
                      v960487 v960490 v960492 v960494
                      v960519-v960522
                      v960523 v960526 v960529 v960532
                      v960537-v960540
                      v960543-v960546
                      v960547 v960548 v960550);
array newname n1-n40;
array neutral v960365--v960546;
do i=1 to 40;
   newname(i)=neutral(i)-4;
end;
if v960066=1 then gender=1; else gender=0;
if v960067=1 then race=1; else race=0;
age=v960605;
if v960070 = 1 then informed=1; else informed=0;
        ******************;
        *** Macro call ***;
        ******************;
%ivmac(nes96,
       nes96X,
       nes.nes96,
       v960272 v960273 v960274,
       0,
       gender race age,
       -1,
       n1 n5 n9 n13 n17 n21 n25 n29 n33 n37,
       n2-n4 n6-n8 n10-n12 n14-n16 n18-n20 n22-n24 n26-n28 n30-n32 n34-n36 n38-n40,
       10,
       3,
       1,
       -1,
       nes96,
       l p{5.5cm} l l l,
       Party & Type of utility measure & $R^2$ & $\Delta R^2$  & Regression coefficient\\,
       party " & " antype " & " _RSQ_ " & " deltar2 " & $" regcoef "^{" star "}$\\",
       NES 96. No interaction and no by-variable.);
run;
```

TABLE 19. NES 96. Effect sizes of Anova on ΔR^2

Effect	Df	SS	η^2	$\sum \eta^2$
PLACEMNT	1	0.1195468899	0.3133421621	0.3133421621
MEASURE	3	0.0854064394	0.2238572531	0.5371994152
PARTY	2	0.0670457089	0.1757322787	0.7129316939
MEASURE*PLACEMNT	3	0.0486122722	0.1274167357	0.8403484295
MEASURE*PARTY	6	0.0307356269	0.0805605884	0.9209090179
PLACEMNT*PARTY	2	0.0213292286	0.05590565	0.9768146679
MEASUR*PLACEMN*PARTY	6	0.0088457114	0.023185332	0.9999999999

Table 18: NES 96. No interaction and no by-variable.

Candidate	Type of utility measure	R^2	ΔR^2	Regression coefficient
1	Proximity (individual)	0.4448631434	0.3679381545	0.613169935***
1	Squared proximity (individual)	0.4150020506	0.3380770617	0.5855428775***
1	Directional (individual)	0.4202414946	0.3433165057	0.6102832898***
1	Pure directional (individual)	0.0895310267	0.0126060377	0.1123509869***
1	Proximity (mean)	0.1138049143	0.0360699815	0.1931571275***
1	Squared proximity (mean)	0.0828416325	0.0051066997	0.0723816436**
1	Directional (mean)	0.245089728	0.1673547952	0.424331649***
1	Pure directional (mean)	0.078623628	0.0008886952	0.0298020317
2	Proximity (individual)	0.3113588765	0.2951980379	0.5643326812***
2	Squared proximity (individual)	0.2612194558	0.2450586171	0.5124679189***
2	Directional (individual)	0.2721061648	0.2559453261	0.5141007769***
2	Pure directional (individual)	0.0197236591	0.0035628204	0.0611086556*
2	Proximity (mean)	0.0746774478	0.0577314198	0.2561816515***
2	Squared proximity (mean)	0.0413370431	0.024391015	0.1621177566***
2	Directional (mean)	0.1523628343	0.1354168063	0.3802830401***
2	Pure directional (mean)	0.0263492347	0.0094032066	0.0969927104***
3	Proximity (individual)	0.126246028	0.1133637646	0.3436047983***
3	Squared proximity (individual)	0.118173246	0.1052909826	0.3341211081***
3	Directional (individual)	0.0538479524	0.040965689	0.2052157659***
3	Pure directional (individual)	0.0262409682	0.0133587048	0.1149890167***
3	Proximity (mean)	0.0190371114	0.0013507987	0.0397077124
3	Squared proximity (mean)	0.0202106092	0.0025242965	0.0536841871*
3	Directional (mean)	0.0182689701	0.0005826574	−0.02503697
3	Pure directional (mean)	0.0176983707	0.000012058	0.0034700739

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Again the LaTeX table was included (see table 18). The effect sizes of the Anova are shown in table 19. Table 19 shows that there is a substantial interaction effect between measure and placement, indicating that the difference between the effects of the various utility measures is highly dependent upon the type of party placement. As already shown by Merrill (1995) and Krämer and Rattinger (1997) the directional measure outperforms the proximity measure when mean placements are used. When individual placements are used, the proximity measure is superior (table 20).

TABLE 20. NES 96. Average ΔR^2 by measure and placement

Placement Measure	individual	mean	
1	0.258833	0.031717	0.145275
2	0.229476	0.010674	0.120075
3	0.213409	0.101118	0.157264
4	0.009843	0.003435	0.006639
	0.17789	0.036736	0.107313

TABLE 21. NES 96. Average ΔR^2 by measure and candidate

Candidate Measure	Clinton	Dole	Perot	
1	0.202004	0.176465	0.057357	0.145275
2	0.171592	0.134725	0.053908	0.120075
3	0.255336	0.195681	0.020774	0.157264
4	0.006747	0.006483	0.006685	0.006639
	0.15892	0.128338	0.034681	0.107313

6. DISCUSSION

In this paper we have presented a SAS macro to facilitate testing different models of issue voting. Such a macro is useful because recent issue voting research involves elaborate comparisons of the effects of different utility measures across different subgroups, using different data sets. The SAS macro computes four different utility measures, the traditional proximity measure, the squared proximity measure, the directional measure as proposed by Rabinowitz and Macdonald and the pure directional measure proposed by Matthews. The macro estimates the effect of those measures on either the parties' (or candidates') thermometer scores or party (or candidate) choice itself, controlling for a number of other variables, by means of respectively ordinary and logistic regression analysis. The analysis can be performed across different subgroups. The macro yields a data set including the regression coefficients, their standard deviations, the (pseudo) R^2's of the model and the increase of (pseudo) R^2 due to the utility measures. This data set can be used to compute means and test the difference between them.

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