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Ecological Voting in Germany? Animal Welfare, Climate and Water Protection as Drivers of Voting Behaviour

Ökologisches Wählen in Deutschland? Tierwohl, Klima- und Gewässerschutz als Treiber des Wahlverhaltens

Michael H. Grunenberg*, Svetlana Petri and Christian H.C.A. Henning

Institute for Agricultural Economy, Department for Agricultural Policy, University of Kiel, Germany

Correspondence to: mgrunenberg@ae.uni-kiel.de

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Summary

Farm animal welfare, water protection and climate protection are in the focus of public's attention. Especially the former two challenge agriculture. But how do these ecological issues affect voter's decision? Based on a probabilistic voter model, we try to answer this question. In particular, we estimate a nested multinomial logit model and derive marginal effects quantifying the influence on party probabilities. Effects of ecological policies are compared to non-ecological issues in economic and social dimension. In the ecological policy space climate protection overweighs farm animal welfare while the estimate for water protection is not significant. Furthermore, party identification exceeds all policy motives of voting.

Keywords: farm animal welfare, climate, water protection, voting behaviour, Germany

Zusammenfassung

Tierwohl, Gewässerschutz und Klimaschutz stehen im Fokus der öffentlichen Aufmerksamkeit. Gerade die beiden erstgenannten stellen insbesondere die Landwirtschaft vor Herausforderungen. Die Frage ist, wie diese ökologischen Themen die Wahlentscheidung der Bürger beeinflussen. Auf Basis eines probabilistischen Wählermodells versuchen wir eine Antwort zu finden. Wir schätzen dazu ein genestetes multinomiales logit-Modell und leiten entsprechende marginale Effekte ab, die den Einfluss auf die Wahlwahrscheinlichkeiten für die Parteien quantifizieren und die wir mit Sachfragen aus den ökonomischen und sozialen Dimensionen vergleichen. Dabei zeigt sich, dass der Klimaschutz-Effekt größer ist als der des Tierwohls; der Gewässerschutz hat keinen signifikanten Einfluss. Darüber hinaus können wir zeigen, dass die Identifikation mit einer Partei alle politik-orientierten Motive der Wahl überwiegt.

Schlagworte: Tierwohl, Klima, Gewässerschutz, Wahlverhalten, Deutschland

1 Introduction

Questions of sustainability and ecology become more and more important in the public debate. Especially agriculture is challenged by increasing social requirements. This is especially true for livestock production, where animal husbandry is criticized due to a lack of farm animal welfare (FAW) (WBA, 2015). In particular, husbandry systems are perceived as offering not enough space per animal (Rovers et al., 2018; Rovers et al., 2019) or opportunities to express natural behaviour. Furthermore, painful management procedures like piglet castration without anaesthesia are criticized. At the same time, surveys show that German citizens want more animal welfare (BMEL, 2017a; 2017b). Economic studies suggest that the willingness to pay more money for FAW (Clark et al., 2017; Lagerkvist and Hess, 2011) exists. Nevertheless, the scientific advisory board of the German ministry of agriculture suggests a policy mix including three to five billion euro to finance husbandry changes (WBA, 2015). Another sustainability issue regarding agriculture is the nitrogen surplus, which pollutes the groundwater. A high concentration of reactive nitrogen compounds may not only lower biodiversity, but also harm human health (Sachverständigenrat für Umweltfragen, 2015, p. 33). The biggest share of nitrogen emissions comes from agricultural production (Umweltbundesamt, 2018): With an N-balance around 100 kilogram (kg) per ha surplus per year, the German government failed to reach its reduction goal (Taube, 2016). An important ecological topic beyond sectoral and national borders is climate change. Greenhous gas emissions drive the climate change, i.e. an increasing earth temperature. In order to reduce global warming, the Paris Agreement was adopted in 2015: for Germany the goal is a decrease of emissions by 55% until 2030, i.e. 562 million tons of CO2 equivalents (BMU, 2019).

Facing these environmental challenges, one might ask how they affect the voting behaviour of German citizens. Political science literature suggests that for example votes in presidential elections in United States of America are only slightly influenced by "green issues" (Davis et al., 2008). For Germany it was noted that environmental issues influence elections and the political landscape as a whole (Fietkau, 1979). Hence, a new political culture including environmental issues has overcome traditional class voting (Achterberg, 2016). But to our best knowledge, there are no recent studies investigating and comparing the magnitude of ecological issues' effects on voting behaviour. Thus, we want to contribute to the literature by quantifying the effect of these issues on voting behaviour using a probabilistic model of voting behaviour which is briefly described in the next section, followed by the description of the econometric approach and the data in section 3. Subsequently, we show the main results. A conclusion follows in the last section.

2 Voting Behaviour

Citizens are assumed to be rational utility maximizers. They vote for the party from which they expect the highest utility V. Thus, if

$$V_{ij} > V_{ij'} \tag{1}$$

voter i would chose party j. Voting behaviour is driven by three motivational components. Accordingly, we divide V_{ij} into three sub-utilities reflecting these components.

First, voters decide *policy-oriented*. This refers to the work of Anthony Downs (1957): Citizens evaluate the platforms of competing parties regarding the expected utility, if the program is transformed into policies. Based on Hotelling (1929), spatial models of voting behaviour assign voters and parties along n policy dimensions (or just one). A voter would decide for a party that is next to his own position, i.e. having the smallest distance (Adams et al., 2005; Enelow and Hinich, 1984). Hence, the policy component corresponds

$$V_{ij}^{POL} = -\sum_n \mu_n \sqrt{\left(x_{in} - c_{ijn}\right)^2} \tag{2}$$

with x_{in} denoting voter position and c_{ijn} denoting party js position in policy dimension n where μ_n denotes the weight of the policy dimension.

Second, voters evaluate governmental performance using observable indicators or state of satisfaction with situation in certain policy domains. This evaluation process and its effect on voting behaviour are labelled as *retrospective voting* (Fiorina, 1981).

$$V_{ij}^{RETRO} = \sum_k \theta_k z_{ik} \tag{3}$$

with z_{ik} as the evaluation of issue k by voter i and θ_k as the corresponding weight.

Third, *non-policy* motives also drive voter decisions. In particular, the identification with a party can influence the decision at the ballot box (Bartels, 2000) as well as characteristics of candidates or party leaders (Schofield, 2007). Although sociostructurally class voting (Schoen, 2014) is seen as weakened through a new political culture (Achterberg, 2016), social and economic voter characteristics can still influene the choice of a party. If r_{is} denotes the characteristic s of a voter i and w_{mj} the non-policy characteristic m of a party j, then

$$V_{ij}^{NONPOL} = \sum_m \varphi_m w_{mj} + \sum_s \varphi_s r_{is} \tag{4}$$

where φ_m is voter's weight of party characteristic m and φ_s is the weight of voter's characteristic s. If considering all kind of voting motives, overall utility corresponds to

$$V_{ij} = V_{ij}^{POl} + V_{ij}^{RETRO} + V_{ij}^{NONPOL} \tag{5}$$

which corresponds to "a unified theory of party competition, which integrates the behavioralist's perspective on voting

into the spatial-modeling framework" (Adams et al., 2005, p. 3). In the next section we first outline how theory is transformed into an econometric model, derive corresponding marginal effects and describe our data.

3 Modelling and Data

3.1 Econometric Model

We use the random utility framework to model the decision of voters. In particular, we model the voting decision in a probabilistic fashion. Thus, we do not predict voter's choice precisely, but the probability of choosing a certain party. Assume a voter i who has to choose between a set of J parties, where $J \geq 2$. The utility that i receives from party j consists of two components (Hensher et al., 2015, p. 45): V_{ij} refers to the deterministic part of voter i's utility, which is based on observable characteristics. In contrast, ε_{ij} is the unobserved stochastic error component. Thus,

$$U_{ij} = V_{ij} + \varepsilon_{ij}. \quad (6)$$

The probability to vote for party j then corresponds to

$$P_{ij} = Prob\left(U_{ij} > U_{ij'}\right) = Prob\left(U_{ij} - U_{ij'} > 0\right) \quad (7)$$

If assuming ε_{ij} is independently, identically extreme value distributed, the conditional logit (CL) or multinomial logit model (MNL) can be used (Greene, 2009). The former takes attributes of alternatives into account, while the latter considers individual's characteristics. Both kind of models are established in studying voting behaviour (see for example Thurner, 1998; 2000; Thurner and Eymann, 2000; Dow and Endersby, 2004; Adams et al., 2006). Consider the voting motives mentioned above. While the policy and (parts of) the non-policy component consist of varying attributes of the parties, retrospective voting and non-policy voting include voters' characteristics. Thus, a mixture of both approaches is used (see Greene, 2012, pp. 801–807). Hence,

$$P_{ij} = \frac{\exp\left(V_{ij}\right)}{\sum_{j=1}^{J} exp(V_{ij})} \quad (8)$$

where

$$V_{ij} = \alpha_j + \boldsymbol{\beta x_{ji}} + \boldsymbol{\gamma z_i}. \quad (9)$$

Note that $\boldsymbol{x_{ij}}$ here refers to a vector of party attributes while $\boldsymbol{z_i}$ refers to the vector with individual characteristics. The parameter sets β and γ as well as the alternative specific constant (ASC) α_j are estimated. The distance between voter and party in a policy dimension x_{jin} is treated as an attribute (see Thurner, 1998 and Thurner, 2000):

$$x_{ijn} = \sqrt{\left(x_{in} - c_{ijn}\right)^2}. \quad (10)$$

The model described relies on the assumption of independence of irrelevant alternatives (IIA), which states that ratio of two alternatives probabilities are independent of the set containing both alternatives. If this assumption holds only for subsets of all alternatives, the nested multinomial Logit Model (NMNL) is more appropriate (Greene, 2009; Hensher et al., 2015). This applies for the consideration of non-voting as an alternative, since it differs from parties. Particularly, one can think of a nested decision: A voter not only decides which party to vote, but also whether he or she wants to participate at the election at all (Thurner and Eymann, 2000). We follow this approach and implement a nested model structure. Thus, the probability to vote party j now depends on the corresponding nest (Greene, 2012):

$$P_{ij} = P_{ij|b}\, P_b \quad (11)$$

where

$$P_{ij|b} = \frac{\exp\left(\alpha_j + \boldsymbol{\beta x_{ji|b}} + \boldsymbol{\gamma z_i}\right)}{\sum_{j=1}^{J_b} \exp\left(\alpha_j + \boldsymbol{\beta x_{ji|b}} + \boldsymbol{\gamma z_i}\right)} \quad (12)$$

and

$$P_b = \frac{\exp\left(\lambda_b\, IV_b\right)}{\sum_{b=1}^{B} \exp\left(\lambda_b\, IV_b\right)}. \quad (13)$$

The term IV_b refers to the inclusive value for nest b and corresponds

$$IV_b = \log\left(\sum_{j=1}^{J_b} \exp\left(V_{ij|b}\right)\right). \quad (14)$$

As all other parameters, λ_b is estimated by the researcher.

We derived the marginal effects which quantify the effect of a change in an independent variable by one unit on the probability to vote a party. For variables with a generic coefficient (the attributes), we get:

$$\frac{\partial P_j}{\partial x_{ijn}} = \frac{\partial P_{j|b}}{\partial x_{ijn}} P_b + \frac{\partial P_b}{\partial x_{ijn}} P_{j|b} = P_j\left(1 - P_j\right)\beta_n \left[\frac{\left(1 - P_{j|b}\right)}{\left(1 - P_j\right)} + \lambda_b \frac{\left(P_{j|b} - P_j\right)}{\left(1 - P_j\right)}\right] \quad (15)$$

3.2 Data

Data for the study come from an online survey regarding sustainability. It was carried out by the company *infratest dimap* in November 2018 using a representative sample of 1002 German people in the age of 18 – 93 years. The following question sets up our dependent variable: Respondents had to state for which party they would vote, if a national election would take place on the next Sunday. According to the econometric model we set up two nests: we assigned the parties to the nest "Participation (yes)" and the alternative NOTVOTE to the "No participation (no)" nest (table 1).

Table 1: Categories of dependent variable

Nest	Alternative	Answer
Participation (yes)	AfD	Alternative für Deutschland
	FDP	Freie Demokratische Partei
	GREEN	Bündnis 90/Die Grünen
	LEFT	Die Linke
	SPD	Sozialdemokratische Partei Deutschland
	UNION	Christlich Demokratische Union Deutschlands (CDU)
		Christlich-Soziale Union in Bayern e. V. (CSU)
No Participation (no)	NOTVOTE	Aussage: "Ich würde nicht wählen."

Source: Own presentation.

Subsequently, participants of the study were asked to state their positions in different policy issues as well as how they perceive the positions of every party being part of the national parliament "Deutscher Bundestag". From the stated own position and the party positions we calculated distances according equation 10. Moreover, we set up the negative of a respondents' minimal distance to the parties as the distance for the alternative NOTVOTE. This is due to the expected negative signs of estimated parameters for distances and the assumption that people would rather not vote if the distance to the party system (i.e. the minimal distance used) increases. There are only perceived positions for the six parliamentary groups in the federal parliament and the non-voting alternative available. Thus, we removed 193 cases which stated that they would vote for other parties or did not know which party they would vote for. The sample used then consists of 809 cases. Table 2 presents all distance variables, which we assigned to the three dimensions of sustainability. Please note that the suffix "*.percentage*" labels the variables we converted into a percentage scale as described below since our variables have different scales and different units.

Table 2: Overview policy issues

Dimension	Issue	Variable
Ecology	Farm Animal Welfare	*ANIMALWELFARE.percentage*
	CO2 Emissions	*CLIMATE.percentage*
	Water protection (reduce nitrogen surplus)	*WATER*
Social	Educational spending	*EDUCATION.percentage*
	Security	*SECURITY.percentage*
	Social policy	*SOCIALSECURITY.percentage*
	Development aid	*GLOBALJUSTICE.percentage*
Economy	Economic growth	*GROWTH.percentage*

Source: Own presentation.

Within the ecological policy space, *ANIMALWELFARE.percentage* deals with the questions how much money the government should spend in order to promote farm animal welfare. The original variable's absolute values range from zero (current) to 4.5 billion Euro governmental spending for animal welfare improvements. This is in line with suggestions of WBA (2015): the report states, that up to 3-5 billion euro per year are needed to change livestock conditions. For the distances, we transformed animal welfare positions into percentage of maximum value (4.5 billion euro). Moreover, *CLIMATE.percentage* addresses reduction of greenhouse gas emissions. The final unit of measurement is the reduction in percentage, with values between 0 and 63.3 compared to the status quo. The reference here are the 909 million tons CO2 equivalent in 2016 (BMU, 2019). Our third issue of interest is reduction of nitrogen surplus in order to protect water which is measured in kg of nitrogen (N) per hectare (ha). The corresponding Variable *WATER* contains the distance in kg N per ha. Since the variable describes the reduction and thus, has an equal numeric scale as percentage measured variables, we did not convert it. We also control for the influence of the social and economic dimension. The corresponding issues are listed in table 2. With governmental spending for education, security, social policy and development aid (social dimension) as well as economic growth (economic dimension) we selected governmental key issues. Note that we also converted the original variables into percentage where we set the current spending as reference point.

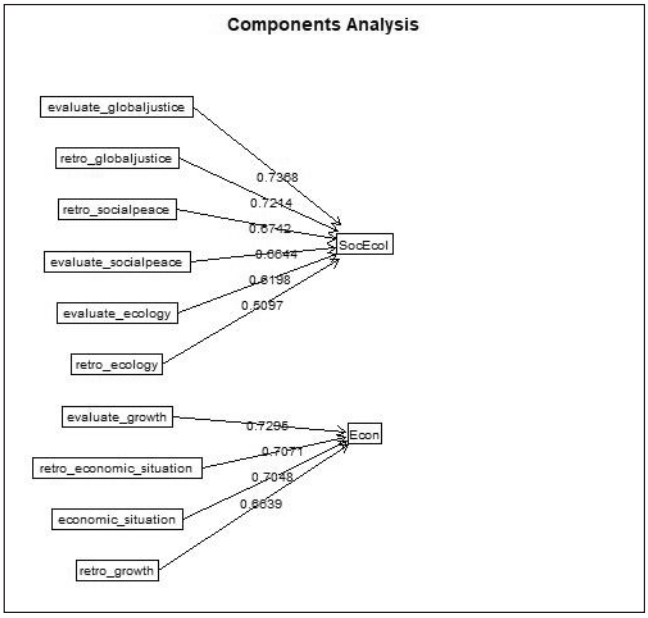
Beyond policy voting, we also integrate a variable that measures the identification with a party. The corresponding variable *PI* is a dummy coded attribute of the parties with value 1 if a voter identifies with party and 0 otherwise. We control for gender effects (dummy variable *man*) and the age in years (variable *age*). These three variables and the alternative specific constants ASC form the non-policy component. The projects database provides a set of ten retrospective variables. Each issue was evaluated from a current perspective as well as in comparison to situation five years ago (prefix "retro"), with a range from 1 ("very good" or "much better") to 5 ("very bad" or "much worse"). The variables

- *economic_situation*,
- *retro_economic_situation,*
- *evaluate_growth* and
- *retro_growth*

deal with the own economic situation as well as the state of economic growth in Germany. Furthermore, *evaluate_globaljustice* and *retro_globaljustice* are judgements towards global justice while *evaluate_socialpeace* and *retro_socialpeace* address the state of the social peace in Germany. Finally, *evaluate_ecology* and *retro_ecology* are evaluations of the state of ecology.

In order to reduce the dimensions, we conducted a principal component analysis (PCA). We decided for a two component solution as parallel analysis suggested. Figure 1 shows that all economic variables load on one component. We label the corresponding variable *Econ*.

Figure 1: PCA loadings



Source: Own presentation.

Furthermore, social related and environmental judgements load on the same component, resulting in the variable *SocEcol* (social ecological concerns). Interestingly, we only have issue components, but no time components. Hence, *Econ* and *SocEcol* set up our retrospective component. We performed PCA, estimation and post-estimation analysis using the statistical environment R (3.6.1). In the following section we present our results.

4 Results

4.1 Estimation

We estimated the specified model for 809 cases (see table 3). The model was selected based on Akaike information criterion (AIC). Compared with other specifications, this model has the lowest AIC.

Table 3: Model fit

N	Log-Likelihood	AIC	McFadden R^2
809	-748.26	1578.52	0.481

Source: Own presentation.

Table 4 presents the generic and the party specific coefficients as well as the lambda parameters for the nests. Note that we set the alternative UNION as the reference alternative. Hence, the party specific coefficients have to be interpreted in relation to this party.

The estimated parameters of the attributes behave as expected. As one can easily see in table 4, all distances in the policy space have a negative sign. The effect of animal welfare is highly significant. Moreover, the effect of climate protection is significant on a five percent level. On the other hand, water protection has no significant effect. The control variable *GROWTH.percentage* also delivers a non-significant estimate. As expected, the identification with a party increases the choice probability. Economic concerns increase the probability to vote for AfD significantly, compared to the choice probability of the alternative UNION (table 4). As table 4 show, this also applies for LEFT and NOTVOTE. In contrast, only the positive effect of negative evaluation of social ecological situation for the probability to vote the left party is significant.

Regarding the other predictors, one can see a negative effect of age on the probability to vote for the green party and for the non-voting option when compared to UNION. This implies that it is more likely, that younger people vote green or do not participate in election. Moreover, being a man has a positive effect on all parties compared to UNION, where only the parameter for FDP is not significant.

4.2 Marginal Effects

We calculated the marginal effects for all policy issues according equation (15). The median values for the marginal effects of animal welfare and climate protection are presented in table 5.

Table 4: Estimation results

Nested Multinomial Logit Model					
Generic coefficients					
PI	2.9725466***				
	(0.1587886)				
ANIMALWELFARE.percentage	-0.0092424***				
	(0.0034481)				
CLIMATE.percentage	-0.0100824**				
	(0.0051017)				
WATER	-0.0033195				
	(0.0028367)				
EDUCATION.percentage	-0.0083410***				
	(0.0021612)				
SECURITY.percentage	-0.0103498***				
	(0.0021584)				
SOCIALSECURITY.percentage	-0.0790581***				
	(0.0193037)				
GROWTH.percentage	-0.0029507				
	(0.0026101)				
GLOBALJUSTICE.percentage	-0.0071517***				
	(0.0021945)				
Party specific coefficients					
	ASC	*age*	*man*	*Econ*	*SocEcol*
AfD	0.1750522	-0.0043618	1.0048967***	0.6236013***	0.2468747
	(0.6559577)	(0.0111198)	(0.3624503)	(0.2164142)	(0.1772427)
FDP	-0.1113056	-0.0082456	0.4423195	0.1245194	0.3105806
	(0.6892734)	(0.0127964)	(0.4109347)	(0.2431356)	(0.2320232)
GREEN	1.1363529**	-0.0183168*	0.8621904***	0.0953518	0.2918229
	(0.5637948)	(0.0099508)	(0.3199301)	(0.2043939)	(0.1924583)
LEFT	-1.2207657	-0.0028549	1.5635602**	0.8725184**	0.8854244**
	(1.0318779)	(0.0164534)	(0.6421833)	(0.3592242)	(0.3455413)
NOTVOTE	-3.2081950***	-0.0333411**	1.5159473***	0.4541247*	0.1029730
	(0.7671033)	(0.0146551)	(0.5008617)	(0.2373717)	(0.2134351)
SPD	-0.9486043	0.0005422	0.6668723*	0.2744299	-0.1909698
	(0.6346426)	(0.0111437)	(0.3630819)	(0.2162499)	(0.2083315)
Lambda					
iv:no	0.8569388***				
	(0.1198975)				
iv:yes	1.4360750***				
	(0.2558212)				
***p < 0.01, **p < 0.05, *p < 0.1					

Source: Own presentation.

Table 5: Median values for marginal effects of animal welfare and climate protection

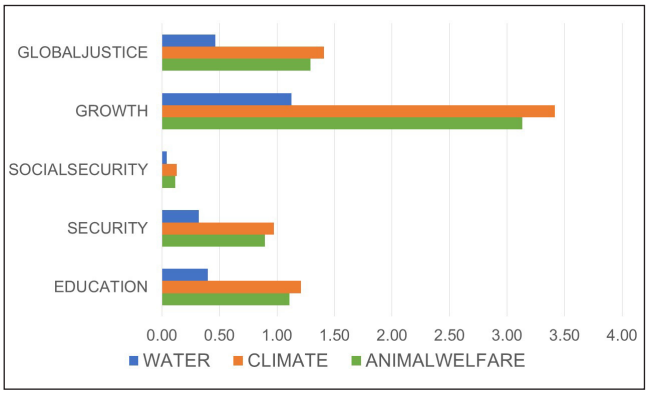
	Animal welfare	Climate protection
Overall	0.000305	0.000332
Alternative		
AfD	0.000333	0.000363
FDP	0.000261	0.000284
GREEN	0.000728	0.000794
LEFT	0.000215	0.000234
NOTVOTE	0.000032	0.000034
SPD	0.000388	0.000423
UNION	0.000601	0.000656

Source: Own presentation.

As one can easily see, a distance change by one percentage point regarding animal welfare affects probability to vote for the green party by 0.0007, and UNION by 0.0006 (table 5). Thus, probabilities for these two parties react most sensitive. The overall average marginal effect of animal welfare equals a probability change of 0.00031. Regarding climate protection, we see a median effect of 0.0008 for the GREEN probability if distance is changing by one percentage point (table 5). For the UNION alternative, the corresponding effect is 0.0007, for non-voting 0.000034 (table 5). Overall, the median effect of climate protection is 1.09 times higher than animal welfare.

With figure 2 we compare the marginal effects of animal welfare (green bar), climate (orange) and water protection (blue). In particular, the bars represent the ratio of the medians of ecological issues and the control issues which are placed at the y-axis. The average marginal effect of a distance change regarding animal welfare is 3.13 times higher than economic growth and 1.29 times higher than global justice. Moreover, it is also 1.11 times higher than education.

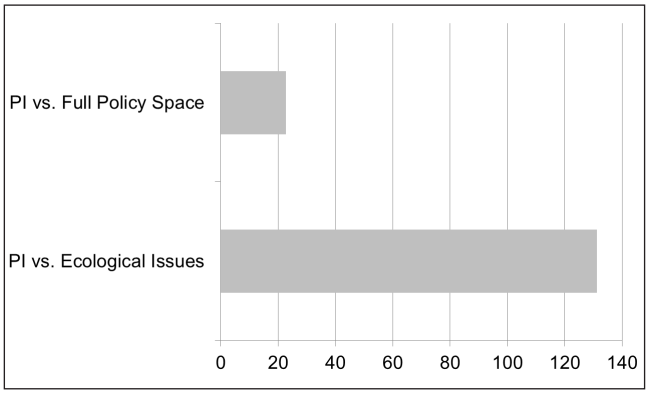
Figure 2: Ratio of ecological and control issues



Source: Own presentation.

The average effect of climate protection is 3.42 times higher than economic growth, 1.41 times higher than global justice and 1.21 times higher than education spending's effect. Thus, climate protection has a stronger influence on voting behaviour than animal welfare. We summed up the marginal effects of the ecological issues as well as the full policy space (including *all* policy distances) and compared them with the marginal effect of PI. The latter is 131.27 times higher than the ecological issues (figure 3). Moreover, it outweighs the effect of the full policy space by a factor of 22.78. Thus, neither the ecological nor all policy issues together are more important than party identity.

Figure 3: Ratio of PI and summed up marginal effects in policy space



Source: Own presentation.

5. Conclusion

Ecological issues gained importance in public debates the last decades. Using a probabilistic model of voting behaviour, we quantified the effects of farm animal welfare, climate and water protection on voting behaviour. Our results suggest that climate protection overweighs farm animal welfare by factor 1.09 and the effect of water protection is not significant. Furthermore, we could show that economic growth (non-significant estimate) is offset by all environmental issues. Nevertheless, party identification is more important than policy oriented voting. Of course, this only applies for people who identify with a party. Thus, parties have to move along policy dimensions in order to gain additional votes.

The effect of climate protection might be explained by the cross-sectoral nature of the issue: while financing animal welfare and N-surplus are agricultural specific questions, greenhouse gas emissions address also other economic sectors. Hence, it is no surprise that the issue affects voters' behaviour more than farm animal welfare or reduction of N-surplus.

One limitation of our study might be the econometric model used. The MNL-family assumes homogeneous preferences for attributes and predictors. To deal with *heterogeneous* weighting of the single policy issues, latent class models of choice have already been applied to voters' choice (Petri, 2015; Henning et al., 2018). But one crucial part here

is the modelling of nested decision structures. Here we see room for future work.

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