What does it take to sell Environmental Policy? An Empirical Analysis for Switzerland

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General Warning: This paper is highly incomplete. Not all the details have been worked out. The likelihood of mistakes is very high at this stage. Read this paper at your own risk, please do not quote or circulate!

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1 Introduction

In its very beginnings, environmental economics concentrated on a normative analysis of policy instruments. Specifically, the efficiency advantages of market instruments were pointed out at great length. More recently, positive analysis has made considerable progress. Theoretical models are now commonly used to understand why some policy instruments are applied more often than others. In particular, many authors have attempted to explain why market instruments have been used less frequently than command-and-control instruments.[1]

Even though the positive theory of environmental policy has its roots in the nineteen seventies, empirical analysis on these issues has been relatively rare. To our knowledge, there has been little empirical work identifying properties of environmental policy proposals that improve their chances of being applied. Even the claim that market instruments face (or used to face) greater political resistance than command-and-control is based on anecdotal evidence rather than on any more systematic testing. Some authors have used questionnaires to find out the preferences of different groups with respect to abstract policy instruments.[2] However, there has been little systematic econometric analysis investigating why some environmental policies have been introduced, whereas others have not.

This paper uses Swiss referendum data to analyze which factors improve the chances of acceptance for environmental policy in a direct democracy. More than half of the referendums deal with transportation issues. The applicability of the results to other political systems is not self-evident, but most of them would appear to carry over to representative democracies as well.

We start from a simple theoretical model to analyze voter behavior in an

[1]Related discussions are familiar from the literature on regulatory instruments in the transportant sector, where normative analysis has recently been supplemented by positive analysis as well (see Verhoef).

[2]Examples include Dijkstra, Verhoef, Wallart and Bürgenmeier.

environmental referendum. We suppose there is a large group of voters who vote on some proposal. Each voter is concerned about his consumption and general environmental quality. If the proposal is implemented, environmental quality will improve, whereas the consumption effect may be positive or negative. Consumers differ with respect to the intensity of their preferences for the environment. The preference parameter is distributed randomly over the set of all voters. This distribution may change over time, reflecting exogenous changes in the weight that environmental problems have in the political discussion. A person who votes will vote for a proposal if and only if it does not decrease her utility, that is, if the environmental gains outweigh any possible costs in terms of reduced consumption.[3]

In this setting, the following simple hypotheses can be derived:

1. The smaller the negative effects of a proposal on individual consumption possibilities, the greater its chances of acceptance.

2. The greater the positive effects of a proposal on the environment, the greater its chances of acceptance.

3. The stronger the environmental preferences at the time of the vote, the greater are the project's chances of acceptance.

4. The higher the overall income level at the time of the vote, the greater the chances of accepting environmental proposals.

To understand our approach to testing hypothesis 1, first note that voters may have problems figuring out the total effects of a proposal on consumption. Of course, some effects may be very tangible. If the measure in question is "Do not build a motorway from A to B", consumer-voters will realize that the measure will restrict some consumption possibilities in a very direct fashion. Conversely, if the measure consists of a support for public transport,

[3]A voter may of course abstain from voting alltogether if she considers the issues at stake as being of minor importance.

they will easily realize that the measure has a direct positive effect on certain types of consumption. Slightly less directly, if the measure involves the introduction of an environmental tax, voters will realize that this reduces their consumption possibilities by reducing their budget. Similarly, if some measure involves a subsidized public project, they might expect a reduction in their consumption because of resulting tax increases. Finally, a project might influence consumption by affecting general economic conditions. If an environmental regulation is likely to inhibit economic growth, it is less likely that it will be accepted, other things being equal. This last effect, however, is so indirect that it would appear to be harder for voters to identify than a direct restriction on consumption or a tax. Our empirical model thus distinguishes between three different (dummy) variables to measure the effect of a project on consumption: A *consumer sovereignty variable* capturing direct restrictions to consumer choice, a *tax variable* and a *general economic impact* variable.

We make no attempt to test hypothesis 2 in the paper. At this stage, we have not been able to construct a meaningful variable to measure the impact of a proposal on the environment. The referendums took place over a period of more than twenty years, and addressed very different issues. It thus seems very hard to rank the variables with respect to environmental impact. We do, however, realize that our failure to do so is presumably the greatest weakness of the paper.

We approach hypothesis 3 in two fashions. First, our regression includes a variable measuring the importance that society puts on environmental problems. Second, we make use of the fact that we have cantonal data, so that we can show how regional differences that are likely to correlate with preferences for the environment affect voting behavior.

Finally, with respect to hypothesis 4 above, we investigate the effects of income and unemployment on voting behavior. The main results are as follows.

First, the consumer sovereignty variable has a strong and highly signifi-

cant effect on acceptance chances. Proposals involving no direct restriction on consumer sovereignty (*neutral proposals*) have much better chances of being accepted than measures that restrict choices. Proposals that offer improvements of some kind of public service have much better chances of being accepted than neutral proposals.

Second, our overall economic impact variable also has a significant effect on acceptance chances. Projects with positive impact have higher chances of being accepted.

Third, the rank of environmental problems in terms of social attention plays a significant role. When environmental problems are considered to be important, corresponding measures meet with high support. In other words, stated preferences correspond to those revealed through voting behavior.

Finally, regional differences in voting behavior are closely related to characteristics that would suggest lower preferences for the environment: The density of population is positively correlated with acceptance chances, whereas the extent of motorization is negatively correlated.

Our analysis is closely related to a recent study by Vatter et al. (2000) who analyzes voter behavior in 27 Swiss referendums on transportation issues. All of these referendums are included in our data set. However, our analysis differs in several respects.

First, we added 22 referendums on other environmental issues (mainly landscape conservation and energy policy) to improve the statistical validity of the results. Second, we use a (simple) theoretical economic model to motivate our approach. Third, as a result, our explanatory variables are very different from those used in Vatter et al. We attempt to rely exclusively on variables that relate directly to the contents of the proposal or to the state of the economy (including preferences) at the time of the referendum. We deliberately exclude measures of societal support among the explanatory variables.

The paper is organized as follows. Section 2 introduces the theoretical model. Section 3 contains a description of the data. In section 4, we present

the results. Section 5 discusses the limitations and problems of the paper.

2 The Model

This section is particularly preliminary. Most notably, the results have not yet been derived precisely.

The model is designed to capture the decision problem of individuals in environmental referendums in one jurisdiction at different moments in time. We suppose that, at the moment in time t,in which the referendum takes place, the voters in the population are characterized by an income variable $Y_i^t \geq 0$ and a parameter $\theta_i^t \geq 0$ characterizing environmental preferences.

Each voter has a utility function $U_i\left(C_i^t, E^t, \theta_i\right)$, where C_i^t is a sub-utility index summarizing total consumption of household i and E^t denotes environmental quality.[4] C_i^t is supposed to reflect both private consumption and consumption of goods provided by the public sector, P^t, such as railroads, motorways, etc. Private Consumption clearly depends on disposable income, Y_i^t. In addition, it is assumed to depend on the extent of regulation R^t imposed on consumers. The value of a certain income level in terms of consumption is lower the more consumption activities are prohibited by law. For instance, it decreases as driving is prohibited in certain areas, on certain days, etc. We thus think of C_i^t as a function $C_i^t\left(Y_i^t, P^t, R^t\right)$ that is increasing in the first two arguments and decreasing in the third.

The effect of a referendum t on consumer i can be summarized by the effects of changes on consumption and the environment. Using lower-case letters to denote changes of variables, we write c_i^t for the effect of a project on consumption, and e^t for the effect on the environment.[5] Throughout the

[4]The formulation implies that environmental quality is the same for all voters. Strictly speaking, this excludes the possibility of local quality differences, but the approach can be extended to such a more general case.

[5]For notational convenience, we identify a referendum with the date at which it takes place, even though, in reality, there are occassionally two or more environmental referendums on one day.

paper, we assume that $e^t > 0$, that is, the measure has a beneficial effect on the environment. This is merely a matter of normalization: If a proposed measure has a negative effect on the environment (for instance, a proposal to build a motorway), we simply interpret saying 'no' to the proposal as saying 'yes' to the corresponding environmental proposal (e.g. 'Do not build the motorway'). c_i^t may be positive or negative in principle though most relevant environmental proposals entail negative effects on consumption one way or another. The sign and size of c_i^t reflects changes in income (y_i^t), regulation (r^t) and publicly provided goods (p^t). Again, all of these variables may be positive or negative in principle.

The effect of a referendum on voter i can thus be summarized as

$$u_i^t \equiv U_i\left(C_i^t + c_i^t, E^t + e^t, \theta_i\right) - U_i\left(C_i^t, E^t, \theta_i\right).$$

We shall assume that voter i votes in favor of a proposal if $u_i^t \geq \varepsilon$ and against a proposal if $u_i^t \leq -\varepsilon$ for a suitable $\varepsilon > 0$. $\varepsilon > 0$ reflects the fact that voting itself involves costs.[6]

With respect to U_i, we introduce the following assumptions:

(A1) U_i is increasing in C_i and E

(A2) The positive effect of C_i on U_i is decreasing in θ_i, but the positive effect of E on U_i is increasing in θ_i.[7]

(A3) The slope of the indifference curve in a consumption-environment diagram decreases along every ray from the origin.

(A1) is a standard assumption. (A2) serves to define the parameter θ_i: By (A2), a higher value of this parameter implies that the slope of the indifference curve in a consumption-environment diagram becomes flatter. Thus,

[6]To simplify the presentation, we interpret utility differences in monetary terms here. Expressing the ideas in a framework with purely ordinal utility is slightly more complicated.

[7]Thus, for differentiable functions $\frac{\partial^2 U_i}{\partial \theta_i \partial E} \geq 0$, $\frac{\partial^2 U_i}{\partial \theta_i \partial C_i} \leq 0$.

consumers are less willing to give up environmental quality in return for more consumption. (A3) reflects the idea that the willingness to pay for environmental quality increases with income.

The following result can be derived.[8]

Proposition 1 *(a) Voter i will be more likely to vote for a proposal if c_i^t increases.*[9]
(b) Voter i will be more likely to vote for a proposal if e^t increases.
(c) Voter i will be more likely to vote for a proposal with $e^t > 0$ and $c_i^t < 0$ if θ_i^t increases.

Thus, measures that have less negative effects on individual consumption, and stronger positive effects on the environment have higher chances of acceptance. In addition, stronger environmental preferences also increase acceptance chances.

Without discussing the formalism, we shall loosely state some obvious implications of proposition 1. Essentially, the following three statements follow from part (a) of the proposition. First, the greater the change in income y_i^t, the greater are the acceptance chances of proposal t: Usually, a greater value of y_i^t means that income losses resulting from environmental policy are smaller. Other things being equal, smaller income losses amount to smaller reductions in consumption. Second, the less severe the additional restrictions r^t on consumer choice resulting from a proposal, the higher are its acceptance chances. Again, other things being equal, lower absolute values of r^t imply smaller decreases of the consumption index, and (a) implies the result. Third, the higher any tax payments which a proposal requires from each consumer, the lower the chances of acceptance. Even though taxes have not been formally introduced to the model, their inclusion would correspond to lower disposable income and thus to lower values of the consumption index.

[8] Here and in the remainder of the section, the analysis is imprecise at this stage!

[9] Usually, an increase in c_i^t will mean that the negative effect of a proposal on consumption becomes smaller.

Finally, under mild additional conditions, the following final statement holds: The higher the initial income of the population, the greater the acceptance chances of a project. Intuitively, with higher initial income the benefits from additional environmental quality (expressed in terms of units of consumption) increases by (A3).

3 Data

Our analysis uses data from 49 Swiss referendums on environmental issues that took place between September 1977 and March 2001. 27 of these referendums that are directly concerned with transportation have been dealt with in the study of Vatter et al (2000). In these cases, we relied on their data. In all other cases, we used various reliable sources, including the archives of the major Swiss newspapers (Neue Zürcher Zeitung, Tagesanzeiger) and the official homepages of the Swiss Federal Republic and the Swiss Statistical Office. For data concerning the recommendations of the industry associations *economie-suisse* and *Vorort*, we used direct information from these sources. A full list of the referendums, including a brief description of their contents, is available on request from the authors.

4 The Econometric Model

The goal of the model is to understand what determines the percentage of voters who are in favor of some environmental proposal. For the moment, we use a simple OLS approach, even though a logit or probit approach would be desirable in principle. Though we consider only national referendums, we have data on votes at the cantonal level for each referendum. Using these data, we ran one regression for each of the 26 Swiss cantons. Thus, the dependant variable is the percentage of votes in favor of environmental referendums in a particular canton. Comparing the results for different cantons is useful because it allows us to check the robustness of our main insights

across cantons. Beyond that, investigating regional differences is interesting in its own right. In addition, we ran one regression with federal data for the same set of referendums.

The independent variables are mostly motivated by our theoretical approach. We distinguish betweeen consumption-related variables, parameters concerning the economic environment and technical variables.

(i) **Consumption-related Variables**

(i.1) *Consumer Sovereignty Dummies.*

Our first two dummy variables capture the effect of a proposal on consumer sovereignty. We distinguish between three types of proposals. First, there are proposals that restrict consumer freedom (for instance, by prohibiting to drive on certain days or by stopping particular highway projects). Second, there are proposals that have no immediate effect on any particular consumption activity (such as a moratorium on nuclear power or a general program to support energy efficiency). Finally, there are proposals that involve an extension of certain consumption activities (such as plans to build new public transport facilities).

To distinguish between these three possibilities, we introduce two dummies. $CSN = 1$ if the proposal is neutral with respect to consumption possibilities, $CSE = 1$ if the proposal extends consumption possibilities. We realize that it would be desirable to distinguish proposals according to the extent to which they restrict or extend consumption possibilities. At this stage, however, we do not see a transparent way of doing this.

(i.2) *The Tax Dummy*

Proposals can lead to tax changes in two ways. Some proposals directly contain a tax that consumers have to pay. Other proposals involve public projects which obviously have to be financed in some fashion, for instance via tax increases. Some environmental proposals would seem to lead to lower

taxes, however. If the proposal is: "Do not build a motorway from A to B", tax payers' money is saved. Accordingly, we introduce two dummy variables: $TAXN = 1$ if a proposal is neutral with respect to taxation, $TAXL = 1$ if a proposal leads to lower taxes. Again, a more sophisticated analysis would include measures of the tax burden rather than just a dummy, but obtaining adequate data is beyond the scope of this paper.

(i.3) *The General Economic Impact Variable*

To measure the general economic impact of a proposal, we use the recommendation given by the relevant industry association as an indicator.[10] If the association supports a proposal, we take this as a sign of a positive economic impact.[11] Thus, we include a dummy IS to indicate industry support.

(ii) **Parameters of the Economic Environment**

From our model, it is clear that not only properties of the proposal itself are relevant for its acceptance chances, but also characteristics of the economy, including preferences for the environment.

(iia) *Environmental Preferences*

To account for exogenous changes in environmental preferences, we include a variable that describes how important environmental problems are considered to be, compared with other problems of society. This variable ($RANK$) relies on a ranking of major problems that is published annualy by the research institute GfS. Note that the variable is constructed in such a fashion that a high value of $RANK$ corresponds to low preferences for the environment.

(iib) *National Income*

[10] Today, the relevant association is *economiesuisse*, which is the result of a merger of *Vorort* and *wf*. For the early referendums, we use the recommendation of *Vorort*.

[11] We shall discuss this interpretation below.

Gross National Income in the canton under consideration at the time of the referendum is included as a dependent variable (INC).

(iic) *Unemployment*

Similarly, the cantonal unemployment rate ($UNEMP$) is included.

There is potentially a collinearity issue here: National Income and Unemployment tend to be correlated, and it is not entirely implausible that $RANK$ is correlated with the other two variables, as higher unemployment and lower national income would seem to imply smaller relative concern for the environment. Bivariate correlation coefficients confirm this suspicion to some extent. We thus also ran a second set of regressions (model 2) where we only included the $RANK$ variable.

(iii) *A Technical Issue: The Simultaneity Dummy*

Our last variable is included to account for one peculiarity of the Swiss system. In principle, a proposal and a counterproposal can be voted on in referendums on the same day. Usually, the counterproposals are more moderate, with correspondingly higher acceptance chances. In the four cases with a proposal and a counterproposal, a simultaneity dummy SIM was set equal to 1.

5 Results

As outlined above, we analyzed voter behavior in 26 cantonal regressions and one regression on the federal level. For reasons of space, we only give details for Zürich, Bern, Luzern and Vaud in this paper, and one regression for all of Switzerland. The remaining cantons are broadly similar, as the overview in Figure 2 in Appendix B shows. Before reporting our regression results, a remark on descriptive statistics is in order. One might expect a clear time trend in voter behavior. Figure 1 in Appendix A uses the results from Zürich to show that this is not the case: Except for a notable concentration of

low-acceptance referendums in very recent years, acceptance rates fluctuate wildly over time.[12] The low acceptance rates for some of the last referendums appear to be partly due to environmental preferences, but they also seem to reflect the fact that the contents of the proposals are relatively "extreme" in the sense of restricting consumer sovereignty.

We now turn to the regression results for model 1, which includes all the variables introduced in the last section. Figure 3 gives the results for Switzerland; Figures 4-7 contains the cantonal results.

In all four cantons, the consumer sovereignty variables CSN and CSE have the expected effects, and these effects are generally significant at the 5%-level.[13] The interpretation is straightforward. Voters (in their role as consumers) obviously resent proposals that involve a direct restriction in their freedom to choose. Beyond that, they support measures involving the provision of additional public goods, for instance railroads, bicycle paths, etc. Both effects are not only significant, but also very large. The tax variables $TAXN$ and $TAXL$ are generally insignificant. In cases where the proposal itself is a tax this may simply reflect the fact that the tax levels are typically not very high. In cases where the proposal is framed as support for some public project, consumers may simply not be aware of the relation between the project and possible tax increases.

The "general economic effect" IS is as predicted: When a proposal is supported by the Swiss Business Federation, it has significantly higher chances of being accepted. The interpretation is not quite as obvious as before. An interpretation along the lines of section 2 would work as follows: If a project has industry support, this is not necessarily only so because it caters to special interests: There should be at least a possible correlation between industry interests and general consumer interests. Put differently, if an environmental proposal is highly detrimental to industry profits, so that the industry association recommends voting against it, some consumers may follow this

[12] Pictures for other cantons are broadly similar.

[13] An exception is CSN for Bern. However, even there, the two consumer sovereignty variables together would clearly be significant.

recommendation for fear of negative effects on their own consumption, job situation, etc.

There is, however, another less satisfactory interpretation: The industry association represents the opinions of of a particular group of voters (in particular, managers and owners of firms). In this sense, saying that a project has industry support amounts to very much the same as saying that there is a subset of voters that is likely to vote for a measure. Nevertheless, this interpretation is not as convincing as it may seem. If it were true, it should also hold with respect to other important groups in society. We checked this by investigating the Socialist Party (SP) that usually obtains between 20 and 30% of the votes in parliamentary elections. It turns out that the SP supported virtually all environmental proposals: Therefore, the SP recommendation bears essentially no informational value about a proposal's chances of success. Thus, our alternative explanation of the impact of the industry recommendation may not be all that misleading.

The influence of the economic parameters is generally not highly significant. This is particularly striking for the income variable INC. This result does not change if we substitute growth for income.[14] Unemployment $UNEMP$ has an effect that is close to being significant at the 5%-level in some cases, but the sign is a mystery. Higher unemployment seems to coincide with higher support for environmental proposals. This problem may simply reflect the collinearity issues alluded to earlier.

The sign of the environmental preference variable is as expected. The t-values are broadly similar to those for $UNEMP$. However, they are considerably higher for the national regression: This makes sense, as $RANK$ is a national preference variable. Changes of preferences on a regional level may not correspond exactly to changes on a national level. Finally, the technical simultaneity variable SIM also has the expected effect: counterproposals have better chances of being accepted.

[14]The reason for doing so might be a psychological argument: When economic prosperity is improving, consumers may believe they can afford more environmental policy.

In model 2, we reestimated the model with those exogenous variables that are generally significant (including the slightly debatable variable $RANK$). The results are generally confirmed, the $RANK$-variable is now significant at the 5%-level, even in the cantonal regressions.

In all cantons, the constant term is highly significant with values that are typically in the range of 30-40%. This is informative because we choose our independent variables so that values of zero for these variables correspond to worst cases for the acceptance rate.[15] The numbers can thus be interpreted as percentages of voters who vote for environmental proposals even when their contents and the economic parameters at the time of the referendum are highly unfavorable to acceptance.

A final result is worth mentioning. In Figure **??**, we try to develop some ideas about the determinants of cantonal differences. We compile the correlations between the constant terms in the regression and other variables. It turns out that population density is positively correlated with the constant term, whereas motorization is negatively correlated, and population and motorization are negatively correlated with each other. Other potentially interesting variables reflecting education levels are not significantly correlated with the constant term. A reasonable interpretation would be the following. High population density increases pollution problems, resulting in higher willingness to vote for environmental problems. It also leads to less motorization; as a result, the local lobby for environmentalist proposals in the transportation sector is relatively strong.

6 Conclusions

This paper has identified determinants of success for environmental policy, using referendum data for Swiss cantons. More than half of the referendums concerned transportation issues, the others mainly dealt with energy and

[15] Strictly speaking, this is only true for model 2; the macroeconomic variables in model 1 never take on zero values.

landscape conservation. With respect to the contents of the proposal, two elements appear to increase acceptance chances particularly: The absence of restrictions on consumer sovereignty and a positive "general economic impact". The fact that a proposal contains a tax has no significant effects on voter behavior. Among the parameters describing the situation at the time of the referendum, the environmental preference parameter has the expected effect. The income variable is insignificant. Finally, cantonal differences are highly correlated with population density and motorization.

There are several caveats to our analysis.

Clearly, some potentially important variables have not been included. Most notably, there is no direct measure of the environmental impact of a proposal. In a similar vein, the excessive use of dummy variables in cases where cardinal variables would be desirable also means that influence factors that are relevant from an economic point of view are not analyzed in full detail. In some sense, the fact that we obtain some explanatory value despite our crude independent variables is promising.

Also, the use of the industry recommendation for the "general economic impact" is worth mentioning: Though we believe that our interpretation of the variable is not entirely off the mark, we realize that this point is debatable.

A final problem concerns the use of a linear model for a problem that obviously calls for non-linear approaches. A quick glance at our regression results shows that our model predicts acceptance rates of more than 100% for referendums with very favorable properties. This might happen if a referendum extends consumer sovereignty, reduces tax payments, takes place in times when environmental problems are considered very important, etc. However, it seems that no single referendum comes close to having all the properties required to generate such a prediction. Extensions of the present paper will include a more thorough analysis of these issues.

Given the limitations of our approach, we hesitate to draw to far-reaching conclusions. One important aspect seems to transpire, however. The widely held belief that market instruments find acceptance less easily than command-

and-control instruments must be taken with a grain of salt. At least when consumers decide about proposals to restrict emissions from consumptions, they are clearly reluctant to accept a command-and-control policy. Taxes seem to meet with less resistance.

Strictly speaking, this is not in contradiction with standard political economy arguments: These arguments usually refer to pollution by firms, whereas many of the investigated proposals deal with consumption emissions (mostly by motorists). Our analysis suggests that the political economy of consumption emissions may differ substantially from the political economy of production emissions. An alternative interpretation is also plausible: Casual observations suggest that, whereas some of the proposed command-and-control measures were massive interventions, the proposed taxes tended to be fairly low. Had voters been confronted with the typical text book exercise of comparing a command-and-control measure with a tax with equivalent emission effects, they might have preferred command-and-control measures.

Finally, we would like to emphasize that this is not a normative analysis. In particular, the fact that certain types of command-and-control instruments seem to meet with more resistance than other instruments does not in itself imply that they are bad. In cases where alternative policy options are limited, it may well be a wise move to put such instruments on the political agenda, even at the risk of failure. Nevertheless, our results remind us that it may be worth thinking very hard about the way in which environmental goals are targeted, not only for efficiency reasons: To sell environmental policy, it is important not to destroy the goodwill of the buyers.

7 References (incomplete)

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8 Appendix

8.1 Appendix A: Percentage of Environmental Votes

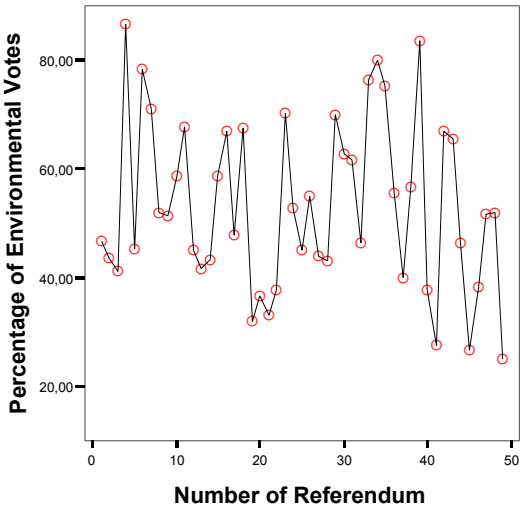

Figure 1: Percentage of Environmental Votes (Zürich)

8.2 Appendix B: Regression Results for all Cantons: Summary

	ZH	t	BE	t	LU	t	UR	t	SZ	t	OW	t	NW	t	GL	t	ZG	t
const	41,31	5,17	35,26	3,64	30,36	3,58	34,77	2,91	30,72	3,71	28,60	2,83	29,05	2,72	40,79	3,89	30,39	4,03
CSN	12,58	3,30	11,74	2,79	15,87	3,87	12,75	2,13	16,03	3,94	19,18	4,16	16,78	3,28	9,94	2,08	15,84	3,81
CSE	14,89	2,88	10,63	1,89	14,42	2,63	16,35	2,07	11,26	2,06	12,72	2,04	16,70	2,44	8,46	1,34	16,83	3,00
TAXN	-0,23	-0,08	0,94	0,28	0,22	0,07	-2,41	-0,50	2,00	0,61	-0,91	-0,24	1,05	0,26	1,45	0,38	0,12	0,04
TAXL	-0,28	-0,05	6,02	1,05	4,50	0,81	3,94	0,49	5,78	1,05	5,23	0,82	4,67	0,67	5,38	0,84	-0,94	-0,16
SIM	21,89	4,58	24,86	4,76	21,94	4,31	11,36	1,55	13,66	2,72	13,56	2,34	20,27	3,21	16,41	2,81	20,86	4,00
IS	18,97	4,49	18,04	3,91	18,08	3,93	13,50	1,97	13,55	2,96	18,63	3,51	21,55	3,70	17,42	3,20	21,25	4,63
RANK	-1,52	-1,38	-1,54	-1,57	-2,49	-2,29	-4,58	-2,53	-1,86	-1,65	-1,79	-1,46	-1,85	-1,44	-3,14	-2,10	-2,00	-1,91
UNE	1,94	1,32	2,76	1,66	3,81	2,01	12,35	2,08	5,48	1,94	3,21	0,94	2,85	1,13	6,69	1,79	2,65	1,38
INC	-0,12	-0,64	-0,09	-0,26	-0,04	-0,16	0,21	0,51	-0,21	-0,86	-0,14	-0,39	-0,11	-0,36	-0,10	-0,35	-0,03	-0,24

	FR	t	SO	t	BS	t	BL	t	SH	t	AR	t	AI	t	SG	t	GR	t
const	29,89	3,11	34,09	3,60	44,14	3,82	36,41	3,72	33,14	3,83	42,39	4,24	30,01	2,53	38,16	4,51	31,89	2,92
CSN	19,68	4,15	11,31	2,60	16,49	3,21	18,98	4,03	14,99	3,56	10,13	2,31	13,05	2,42	12,53	3,19	15,25	3,33
CSE	18,07	2,82	9,99	1,72	21,15	3,11	20,69	3,32	14,27	2,57	6,70	1,14	6,79	0,94	11,50	2,19	15,01	2,35
TAXN	2,27	0,59	4,34	1,28	-3,18	-0,80	-0,56	-0,15	1,90	0,58	2,55	0,73	3,38	0,79	1,01	0,33	-2,97	-0,80
TAXL	4,31	0,66	12,42	2,10	8,92	1,33	11,27	1,81	3,50	0,63	5,36	0,88	4,95	0,67	3,72	0,70	-1,34	-0,21
SIM	20,47	3,46	20,54	3,84	16,96	2,73	18,19	3,16	17,75	3,47	21,40	3,92	22,44	3,36	24,16	4,99	20,37	3,59
IS	17,78	3,35	16,00	3,38	13,56	2,41	16,85	3,23	17,40	3,73	16,64	3,42	16,88	2,82	19,05	4,36	22,36	4,45
RANK	-1,26	-1,08	-1,43	-1,19	-1,30	-0,93	-1,27	-1,01	-1,53	-1,30	-1,27	-1,18	-2,18	-1,50	-2,06	-1,89	-2,19	-1,48
UNE	0,00	0,00	2,57	1,68	2,02	1,31	3,66	1,54	2,13	1,22	4,94	2,05	10,05	1,90	4,02	1,97	3,70	0,83
INC	-0,27	-0,89	-0,17	-0,55	-0,09	-0,34	-0,22	-0,77	-0,11	-0,42	-0,35	-1,02	-0,14	-0,30	-0,22	-0,79	0,09	0,27

	AG	t	TG	t	TI	t	VD	t	VS	t	NE	t	GE	t	JU	t
const	37,91	4,19	34,89	3,90	30,89	2,91	34,68	3,16	27,71	2,32	37,85	3,40	33,11	2,23	-6,94	-0,309
CSN	9,87	2,36	11,61	2,96	17,87	3,42	22,01	4,46	19,20	3,82	24,15	4,47	23,67	3,68	35,26	4,18
CSE	10,15	1,81	9,48	1,77	25,08	3,60	24,58	3,69	22,57	3,32	23,89	3,37	27,04	3,07	31,97	3,201
TAXN	0,99	0,30	0,96	0,30	0,90	0,22	-0,84	-0,21	-3,86	-0,94	2,43	0,59	1,63	0,32	9,20	1,642
TAXL	0,99	0,17	0,52	0,10	2,10	0,30	2,21	0,33	3,46	0,50	1,65	0,23	5,55	0,62	11,55	1,185
SIM	24,36	4,69	23,30	4,75	15,78	2,51	15,73	2,57	14,51	2,31	18,84	2,91	17,38	2,17	11,28	1,339
IS	18,66	4,03	19,42	4,41	19,08	3,29	15,71	2,82	20,21	3,57	20,61	3,55	20,12	2,85	19,36	2,592
RANK	-1,28	-1,08	-2,77	-2,37	-2,57	-1,76	0,42	0,31	0,71	0,59	-0,09	-0,07	0,13	0,08	-2,38	-1,444
UNE	3,37	1,60	4,33	1,91	2,10	1,32	-0,87	-0,78	-0,47	-0,43	-1,57	-1,14	-1,91	-1,21	-0,23	-0,14
INC	-0,282	-1,079	-0,107	-0,374	-0,062	-0,172	-0,419	-1,318	-0,495	-1,113	-0,519	-1,422	-0,119	-0,341	0,55	0,784

Figure 2: Summary of Regession Results

8.3 Appendix C: Details of Regression Results for Switzerland

Switzerland	Model 1		Model 2	
Variable	Coef.	t	Coef	t
const	30,06	5,23	32,65	10,91
CSN	15,72	4,34	15,64	4,97
CSE	15,32	3,04	15,07	3,42
TAXN	0,49	0,16		
TAXL	2,25	0,45		
SIM	20,07	4,36	19,19	4,39
IS	19,16	4,78	20,50	5,81
RANK	-2,12	-2,26	-1,44	-2,80
UNEMP	1,54	0,26		
INC	1,41	1,21		
Number of obs.	45		45	
F	10,884		20,223	
Prob > F	0,000		0,000	
R-squared	0,737		0,722	
Adj R-squared	0,669		0,686	
Root MSE	8,210		7,997	
DW	2,346		2,263	

Figure 3: Regression Results with National Data

8.4 Appendix D: Details of Regression Results for Zürich, Bern, Luzern, Vaud

Zürich	Model 1		Model 2	
Variable	Coef.	t	Coef	t
const	41,31	5,17	36,07	11,63
CSN	12,58	3,30	14,26	4,38
CSE	14,89	2,88	15,78	3,46
TAXN	-0,23	-0,08		
TAXL	-0,28	-0,05		
SIM	21,89	4,58	20,70	4,57
IS	18,97	4,49	21,57	5,91
RANK	-1,52	-1,38	-1,18	-2,21
UNEMP	1,94	1,32		
INC	-0,12	-0,64		
Number of obs.	45		45	
F	11,037		20,458	
Prob > F	0,000		0,000	
R-squared	0,739		0,724	
Adj R-squared	0,672		0,689	
Root MSE	8,495		8,283	
DW	2,426		2,376	

Figure 4: Regression Results for Zürich

8.5 Appendix E: Cantonal Differences in Constant Terms

Sorry: Wrong Language

Bern	Model 1		Model 2	
Variable	Coef.	t	Coef	t
const	35,26	3,64	36,45	10,49
CSN	11,74	2,79	12,08	3,31
CSE	10,63	1,89	9,33	1,82
TAXN	0,94	0,28		
TAXL	6,02	1,05		
SIM	24,86	4,76	22,81	4,50
IS	18,04	3,91	21,18	5,18
RANK	-1,54	-1,57	-1,20	-2,01
UNEMP	2,76	1,66		
INC	-0,09	-0,26		
Number of obs.	45		45	
F	8,091		13,725	
Prob > F	0,000		0,000	
R-squared	0,675		0,638	
Adj R-squared	0,592		0,591	
Root MSE	9,272		9,280	
DW	2,38		2,255	

Figure 5: Regression Results for Bern

Luzern	Model 1		Model 2	
Variable	Coef.	t	Coef	t
const	30,36	3,58	31,38	9,15
CSN	15,87	3,87	16,94	4,70
CSE	14,42	2,63	14,13	2,80
TAXN	0,22	0,07		
TAXL	4,50	0,81		
SIM	21,94	4,31	19,81	3,96
IS	18,08	3,93	21,89	5,42
RANK	-2,49	-2,29	-1,73	-2,94
UNEMP	3,81	2,01		
INC	-0,04	-0,16		
Number of obs.	45		45	
F	10,075		16,688	
Prob > F	0,000		0,000	
R-squared	0,722		0,681	
Adj R-squared	0,650		0,641	
Root MSE	9,041		9,160	
DW	2,183		2,136	

Figure 6: Regression Results for Luzern

Vaud	Model 1		Model 2	
Variable	Coef.	t	Coef	t
const	34,68	3,16	22,88	5,61
CSN	22,01	4,46	21,02	4,90
CSE	24,58	3,69	22,67	3,77
TAXN	-0,84	-0,21		
TAXL	2,21	0,33		
SIM	15,73	2,57	15,73	2,64
IS	15,71	2,82	15,70	3,27
RANK	0,42	0,31	-1,58	-2,26
UNEMP	-0,87	-0,78		
INC	-0,42	-1,32		
Number of obs.	45		45	
F	6,736		11,622	
Prob > F	0,000		0,000	
R-squared	0,634		0,598	
Adj R-squared	0,540		0,547	
Root MSE	10,982		10,898	
DW	2,288		2,189	

Figure 7: Regression Results for Vaud

Korrelationen

		Konstante	Bevölkerungs dichte	Personenwagen pro 1000 Einwohner	Hochschulab schlussquote (2000)	Maturitätsquote (2000)
Konstante	Korrelation nach Pearson	1,000	,492*	-,648**	-,211	-,192
	Signifikanz (2-seitig)	,	,011	,000	,300	,346
	N	26	26	26	26	26
Bevölkerungsdichte	Korrelation nach Pearson	,492*	1,000	-,590**	,133	,273
	Signifikanz (2-seitig)	,011	,	,002	,517	,177
	N	26	26	26	26	26
Personenwagen pro 1000 Einwohner	Korrelation nach Pearson	-,648**	-,590**	1,000	,370	,362
	Signifikanz (2-seitig)	,000	,002	,	,063	,069
	N	26	26	26	26	26
Hochschulabschluss quote (2000)	Korrelation nach Pearson	-,211	,133	,370	1,000	,776**
	Signifikanz (2-seitig)	,300	,517	,063	,	,000
	N	26	26	26	26	26
Maturitätsquote (2000)	Korrelation nach Pearson	-,192	,273	,362	,776**	1,000
	Signifikanz (2-seitig)	,346	,177	,069	,000	,
	N	26	26	26	26	26

*. Die Korrelation ist auf dem Niveau von 0,05 (2-seitig) signifikant.

**. Die Korrelation ist auf dem Niveau von 0,01 (2-seitig) signifikant.

Figure 8: