

Voting on the Environment: Price or Ideology? Evidence from Swiss Referendums*

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This version: February 2008

Abstract

Studies on preferences for environmental quality usually posit that price and income explain most of the observed choices. Incorporating recent advances in the economics of non-selfish behavior into the traditional public choice approach, we argue that the willingness to contribute to public goods as well as social norms need to be taken into account when analyzing environmental voting outcomes. We study aggregate results of three ballot proposals in Switzerland put to vote in the year 2000 which foresaw different tax schemes on fossil energy. Our main results show that the aggregate level choice pattern is to be explained by income as well as structural attributes that make costs and benefits of the projects vary. More importantly, our results underline the importance of including variables pertaining to the notion of ideology, both in terms of statistical fit and obtaining unbiased estimates for price and income determinants.

Keywords: environmental preferences, market-based instruments, direct democracy

*The first author gratefully acknowledges support by the Swiss National Science Foundation, grant no. 100012-103517. A previous version of this paper was presented at the Swiss Society of Economics and Statistics Annual Meeting 2005: Resource Economics, Technology, and Sustainable Development, Zurich, Switzerland, March 17-18, 2005. We would like to thank Ece Ozdemiroglu, Philippe Thalmann, Pascal Sciarini and workshop participants for their helpful comments; Jos Anson for supplying invaluable data, and Laurent Vigui er for providing us with the GEMINI-E3 simulations.

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1 Introduction

Empirical investigations of the demand for environmental goods usually focus on price and income effects. Following this approach, individual's contribution to an environmental good has been consistently found to be related to the subjective benefits and costs expected, while a robust income effect shapes the willingness to contribute. These findings are well established, especially in a binding revealed preference contexts such as votes on environmental projects (Deacon and Shapiro, 1975; Kahn and Matsusaka, 1997; Kahn, 2002; Sciarini et al., in press).

While informative, this approach typically neglects two salient aspects of the problem. First, numerous environmental regulations deliver benefits that are, to a large extent, non-excludable and non-rival. In turn, a narrowly defined self-interested voter, taking into account only personal costs and benefits, will not consider the full amount of benefits and would have an incentive to free-ride on other's provision. This view is, however, at odds with numerous real-life observations of contribution to public goods (Vatn, 2005; Meier, 2006), in particular concerning the acceptance rate of environmental ballots. Hence, voters' willingness to contribute to a public good at ballots will bear an important part in both the acceptance level and its variation across the population.

Second, environmental goods themselves can be the subject of an ideological dimension. This view, often found outside the economics profession, conjectures that individuals might also follow a 'logic of appropriateness' and make a choice consistent with roles of identities, rules, and institutions which shape human behavior (March and Olsen, 1998). Hence the acceptance of a particular project could be shaped by socially accepted rules or norms, regardless of the costs imposed and the recipients of the benefits of the improvements. In other words, respecting a certain set of rules could provide a benefit in itself, while deviating from these rules could be felt as a cost.

The traditional public choice approach states that the median voter will cast his vote so as to receive highest attainable utility (Downs, 1957). However, as these 'ideological' or 'pro-social' aspects of a narrowly defined self-interested choice have been incorporated into microeconomic theory (see for example Elster, 1989; Andreoni and Miller, in press), it is a logical extension to

account for these factors when analyzing vote choices. Thus, while price and income determinants remain a central component of the voting choice, it is crucial to control for ideological factors contributing to the respondent's utility for both the understanding of voting outcomes and for obtaining correct estimates of price and income effects.

Direct democracy in Switzerland provides for a setting which allows us observing directly binding choices towards the provision of environmental goods. We study the voting outcome on three different taxes on fossil energy put to vote in September 2000 with aggregate, municipal-level data.¹ The price increase for this type of energy source would have entailed financial repercussions on households but would have improved the state of air quality and reduced CO_2 emissions. While two of the three projects were to subsidize renewable energy sources and thus to promote 'green energy', the third bill foresaw revenue recycling via social security contributions. However, all three bills were rejected by the electorate.

Our empirical results highlight the importance of price and income effects on the choice pattern and they perform very well explaining the variation in the acceptance rate across regions. More importantly, we obtain quantified evidence on the importance of the variables pertaining to the notion of ideology, showing that these significantly improve the statistical fit of our model. In addition, we find that the impact of the price variables generally reduces in magnitude when ideological variables are included, suggesting that the traditional approach might overestimate the importance of price effects.

While a better understanding of the demand for environmental public goods is the primary objective of this study, a second aspect is to highlight the public acceptability of climate policy. Indeed, science acknowledges that anthropogenic climate change has become one of the most salient environmental issues in the past decades (Kolstad and Toman, 2005; IPCC, 2007). Thus, by studying voting outcomes of the three energy bills we contribute to the growing but still scarce literature on the public acceptance of climate change policies.

Following the introduction, we will explain the three ballot proposals in Section 2. Thereafter, we present the theoretical framework and provide for measures of price and income ef-

¹Thalmann (2004) analyzed the same bills with individual-level survey data.

fects in Section 3, and ideology effects in Section 4. Section 5 is concerned with the econometric specification of our analysis and we discuss the estimation results in Section 6. The last Section concludes.

2 The three tax proposals

During the second half of the 1990s environmental interest groups and organizations gathered enough signatures for two popular initiatives to be submitted to the Swiss population.² The two popular initiatives, the ‘solar initiative’ and the ‘energy-environment initiative’, both aimed at taxing fossil energy and promoting renewable energy. After parliament had drafted two more modest and balanced counterproposals, the second of the two initiatives was withdrawn by its organizers leaving the total number of bills to be voted on at three. The following information stems from the official ‘Voting Brochure’ distributed to the population before every referendum (Conseil Fédéral, 2000).

The first of the three proposals, named *solar initiative*, would have levied a tax during twenty-five years on fossil and nuclear energy, starting at Swiss Francs (CHF) 0.001/kWh and increasing to 0.005/kWh (1 CHF \approx 0.82 US\$). The estimated revenues of CHF 750m per year would have been equally distributed for the promotion of solar energy and for energy efficiency solutions. Parliament and government rejected the initiative on the grounds that it favored solar energy disproportionately and neglected the promotion and further empowerment of hydrological power.

The counterproposal, the so called *energy conservation package*, envisaged a tax of CHF 0.003/kWh during ten to fifteen years on non-renewable energy, starting in 2001. Revenues were to be used for four purposes where they would have been split equally for the promotion of renewable energy, for energy efficient solutions, for maintenance works on hydroelectric plants, and for energy-efficiency programs. The counterproposal was prepared by the Commit-

²The Swiss political system allows anyone to require a referendum on a bill passed in parliamentary, provided one manages to gather 50,000 signatures within 100 days from citizens who have the right to vote. To launch a popular initiative in order to devise or amend a federal law or the constitution, 100,000 signatures must be collected within 18 months. If the required number of signatures is obtained, Parliament and Government may issue a voting recommendation and/or a counterproposal to the bill.

tee for the Environment, Spatial Planning and Energy (CESPE) of the Council of States, i.e. the higher chamber of parliament, and received majority support by both chambers in parliament and by the Federal Council (Government).

The third project put to vote, the so called *green tax reform*, was the counterproposal designed by the CESPE to the energy-environment-initiative. Of the three proposals it would have provided for the highest tax, gradually increasing to a maximum of CHF 0.02/kWh on non-renewable energy, with no temporal limitation. Revenues p.a. were expected to be around CHF 3 billion which would have been used to lower social security contributions for employers and employees (up to 0.65 percentage points).

In the voting brochure (Conseil Fédéral, 2000), the Federal Council highlighted the incentive nature of the bills and in turn the positive impact they would have had in terms of environmental quality, reducing the probability of natural catastrophes as well as improving health of our and future generations. Other arguments given in favor of the bills were the comparative advantage for the existing hydraulic energy sector and the promotion of energy-efficient technologies. The Federal Council underlined that the competitiveness of the Swiss economy would be preserved as all three proposals provided for full or partial exemption from the taxes for industries heavily dependent on non-renewable energy. Furthermore, the bills foresaw that parliament would be able to fix lower tax levels for energy sources already heavily touched by other taxes, such as gasoline or diesel.

No accumulation of taxes was possible: a subsidiary question asked citizens to indicate which of the two bills, the *solar initiative* or its parliamentary counterproposal, the *energy conservation package* they preferred if both were to be accepted. Had the *green tax reform* been accepted, then it would have been the only one to become effective. However, this mechanism was not used since all three proposals were rejected by the population. Indeed, the solar initiative was rejected strongly with only 31.3% of yes-votes whereas the counterproposal received 45.3% of yes-votes. The approval rate for the green tax reform was at 44.5%.

For the sake of completeness it must be noted that the participation rate of the vote was relatively high at 44.8%. This might to a great extent be due to the presence of yet another

initiative, which demanded for a cap on the foreign population in Switzerland of 18%. The ‘18-percent-initiative’ was not only able to mobilize a big portion of voters but also gathered most of the media’s attention. It is therefore impossible to disentangle the participation effects for the other votes on the same day from participation rates concerning our objects of interest.

3 Measuring income and price effects

As the sections above make clear, Swiss nationals were asked to state their preferences towards three bills that would have reduced the adverse environmental impact of Switzerland’s fossil energy consumption by increasing its price in favor of other sources of energy. In this context, the environmental good to be decided upon would have been created by the potential reduction of fossil energy consumption and the change towards more environmentally friendly energy sources. Since a large proportion of the benefits are non-rival and non-excludable, notably in terms of air pollution and CO_2 emission reduction, the environmental good is close to a pure public good. The only exception is perhaps the comparative advantage that would have been granted to the sector of renewable energy, in particular to producers of electricity by hydraulic means.

The individual cost attached to the environmental public good, on the other hand, would have been highly heterogeneous. It is therefore essential to proxy the regional price in order to proxy for the cost-benefit analysis undertaken individually among the population. Resistance to environmental policy is generally shown to be higher in regions with a larger share of producer interests since enforcement could lead to lower profits, wages and employment (Schneider and Volkert, 1999; Babiker and Eckaus, 2007). Therefore, voters working or living in regions whose activity depends on vulnerable industrial sectors may have triggered higher refusal rates because of the probability of increased costs.

In order to have a clearer picture of the economic costs engendered by the three proposals, we simulated their respective impacts on the Swiss economy. Table 1 displays the results of simulations undertaken with a Computable General Equilibrium (CGE) model developed by Bernard et al. (2005). The simulation will enable us to compare the sectoral employment compositions

with the respective voting outcomes.

Table 1 is a scenario where one of the three proposals has been accepted and implemented without any other constraints in any other country. Figures reported in the table are percentage variations in economic production by sectors relative to the ‘business as usual’ scenario, estimated for the year 2010. We applied a uniform tax rate for all sectors although the proposals would have exempted the energy-intensive industries partially or completely. Note that we are interested in the relative impacts on the different sectors of economic activity rather than with absolute impacts on production.

Table 1: Simulated output change in 2010

	Solar Init.	Energy Cons.	Green Tax
Fossil energy	-1.07%	-1.75%	-6.92%
Electricity	-0.01%	-0.02%	-0.09%
Paper production	-0.03%	-0.05%	-0.20%
Chemicals	-0.04%	-0.06%	-0.23%
Mining industry	-0.08%	-0.12%	-0.47%
Transport	-0.17%	-0.28%	-1.18%
Total	-0.03%	-0.04%	-0.17%

In order to proxy for this price effect, we use a measure of the distribution of the active population in the industrial sectors whose output were the most sensitive in the CGE simulations. The data refers to 1998 and is adjusted for commuters to reflect the employment of each commune’s inhabitants rather than the communal production (see Anson and Cadot, 2004). Despite the exemption accorded to these industries, workers in these sectors can be expected to oppose the bills more strongly as they might fear stricter legislation in the future.

Another salient price effect is the direct impact of the bills on the gasoline price. Hence, households relying heavily on private transport should react negatively towards the proposals. We therefore include the proportion of the population that reported to be using a car as their main means of work-related commuting (Swiss National Census 2000). This is crucial as commuting with a private car accounts for around half of total daily mobility in Switzerland (Kaufmann et al., 2001).

The classification of some additional measures of the structural composition of each com-

is less clear. Especially for education the concern is apparent. Indeed, despite a recurring strong positive influence on the contribution to environmental goods (e.g. Deacon and Shapiro, 1975; Kahn and Matsusaka, 1997; Kahn, 2002; Thalmann, 2004; Sciarini et al., in press), there is no clear consensus on the interpretation of the variable. First, Kahn (2002) notes that more patient voters will give more weight on long-run environmental quality and be more willing to accept short-term costs. This argument effectively accounts for individual variations in the discount rate, and better educated citizens can be seen as revealing a lower discount rate when delaying their entry into the labor market (Becker and Mulligan, 1997). On the other hand highly educated voters, once on the labor market, belong to the highly qualified and thus better paid wage earners. Consequently, in many studies education proxies for unobserved job characteristics. In turn, less educated workers will oppose environmental proposals most notably because they might experience a decline in earnings, for example through intersectoral redistribution (Felder and Schleiniger, 2002). We include the proportion of the population with a relatively high level of education (high school degree, higher professional degree, university degree).

Finally, an essential economic component of the environmental demand is the regional income level, since it conditions to a certain extent the ability to support the costs. We therefore include the average disposable income per tax-payer in thousands of Swiss Francs (CHF) and allow for non-linearities by adding higher order terms.

4 Measuring ideology effects

Since the vote decision regards a public good, narrowly defined self-interested utility maximization should hardly lead voters to cast a ‘yes’ vote. As for any public good, a purely self-interested individual would rather free-ride on the provisions of others than contribute to emissions abatement.

Hence, while we maintain that voters accounted for their individual costs and benefits, economic calculus cannot explain alone the large variations in approval rates. Rather, recent economic literature corroborates that pro-social behavior is crucial when contributing to a public

good (for a survey see Meier, 2006). Sen (1977) also claims that individuals would make choices at odds with cost and benefit calculus, especially on a public good, since a choice may reflect a compromise among several considerations where the pursuit of personal welfare might not be the only one. Scholars from other disciplines have argued that human actions can be conceived to be rule- or norms-based where these rules associate particular identities to particular situations and comprise a specific conception of self (Elster, 1989; March and Olsen, 1998).

However, measuring pro-social behavior is problematic since its quantification alongside price effects is less than obvious. In order to shed some light on the importance of notions such as altruism or social norms, we include data on past choices that may reveal behavioral trends in the electorate. Two different variables are used.

Firstly, we include the proportion of households who voted for left and green parties in the national elections of 1999. This ideological variable captures the support for state intervention and confidence in public action (Thalmann, 2004), hence the general stance toward contributing to public goods. Traditionally, in Western Europe the Social Democrats and the Green Party advocate state intervention and redistribution for the sake of greater equality and social welfare. Furthermore, consider that the Old Left adopted essential claims by grassroots environmental movements during the 1980s - most notably the green agenda - and incorporated them into their party programs (Kitschelt, 1989; Sciarini and Finger, 1991; Neumayer, 2004). Thus, the New Left's vision of society where markets and allocation of resources are not the central premises but where protection of natural resources, feminism, and anti-nuclear politics are equally important in democratic deliberation (Kitschelt, 1994) is supported by roughly 30% of the Swiss electorate.

Secondly, we employ a measure for what we call 'habitual green behavior', measuring a general inclination of each commune towards environmental bills. It is measured as the average communal acceptance rate of the last five environmental ballots voted on at the national level. Thus it provides us with an approximation of what the 'environmental conscience' could be comprised of and serves as our second 'ideological' variable. Table 2 recapitulates the five ballot propositions, the date of vote and the respective acceptance rates.

Although all five ballot propositions were concerned with questions relating to traffic in

Table 2: Five ballot propositions used in the composite variable

Date	Title	Approval
20.02.1994	Referendum on the increase and prolongation of a highway tax	68.5%
20.02.1994	Popular Initiative to protect the Alps from transit traffic	51.9%
27.09.1998	Referendum concerning an incentive tax on trucks	57.2%
29.11.1998	Referendum concerning the financing of public transport	63.5%
12.03.2000	Popular Initiative to cut motorized traffic in half to improve living space	21.3%

the broadest sense, there are nevertheless remarkable differences between the bills. The two referendums with the highest approval rates (nos. 1 & 4) were contested only minimally by the main political actors. The first dealt with a prolongation of the highway tax charge, whereas the second provided for an infrastructure fund to finance large public transport projects.

The acceptance of the initiative to protect the Alps from transit traffic (no. 2) came very unexpectedly. Moderate and conservative parties, and private and freight traffic associations opposed the bill, which was launched by the ecology movement and only gained partisan support from the Social Democratic Party, the Greens and the Far Left (representing ca. 30% of the electorate). The vote on the referendum on the incentive tax on trucks (no. 3) remained very contested. Freight transportation interest groups launched a heavy political campaign in the run-up to the vote, claiming that consumer prices would soar upon introduction of the tax. They were backed up by the moderate and conservative right. Nevertheless, the referendum passed. Finally, the initiative to cut traffic in half (no. 5) had not the slightest chance of approval as its implementation was deemed unrealistic.

We argue that the choice on these five bills was differentiated enough to reflect orthogonal economic interests from the taxes under study. In other words, following the logic of the median voter theorem, we see the costs and benefits of each proposal as differentiated enough to avoid measuring the same choice. Hence the *averaged* variations between the communes

provide valuable information on the general stance towards the willingness to contribute to an environmental good. The timing of the votes and the fact that the projects were not altogether accepted or rejected prevents the composite variable from being endogenous in the analyzed choice (for a similar application see Weck-Hannemann, 1990; Anson and Cadot, 2004). Finally, note also that the covariance between the averaged voting behavior and the share of left and green voters is 0.27 ($p = 0.000$).

5 Econometric specification

As already mentioned, we use aggregate cross-section data to control for household characteristics on municipal level. The large number of communes (nearly 3,000) allows us obtaining precise estimates, even in the presence of some degree of multicollinearity among variables.

We model the participation and choice on each project as a joint decision by voters. Indeed, the present configuration suggests viewing the three propositions as a simultaneous choice made with the same amount of information. However, as other projects were presented to voters on the same day at the federal, cantonal and communal level, the choice to participate in the three ballots under review is only indirectly linked with the voting decision. In other words, observed outcomes cannot be seen as endogenous, even though the decision is simultaneous.

In order to account for this indirect link, we use a Seemingly Unrelated Regression Estimation (SURE) (Zellner, 1962), where each of the three projects is modeled by separate equations and the participation as a fourth. Within this model, the four choices are linked through unobserved heterogeneity by allowing for a non-diagonal variance-covariance matrix.

The dependent variables are the logistic transformed share of favorable answers for each ballot and the mean participation rate in each commune.³ As the residuals of such a model are heteroskedastic by construction, we use a two step procedure in order to obtain efficient estimates and correct expressions for their standard deviations. The endogenous weights can be

³We assume that voters decided to participate in the three ballots or did not participate at all. As there was no substantial variation in the participation rates between ballots, this simplification does not influence our estimation. This assumption is supported by the results of the post-referendum VOX-study (Ballmer-Cao et al., 2000).

defined as

$$w_i = [n_i \hat{y}_i (1 - \hat{y}_i)]^{0.5} \quad (1)$$

where n_i is the population of commune i and \hat{y}_i is the OLS estimated proportion (Greene, 1999).

The estimated relations are summarized by the following equations.

$$y_{ij} = \alpha_j + C_i \delta_j + E_i \gamma_j + I_i \lambda_j + u_{ij} \quad (2)$$

$$y_{iP} = \alpha_P + X_i \beta_P + u_{iP} \quad (3)$$

Equation 2 stands for the three voting decisions. The dependent variables are noted y_{ij} , where i and j index the communes and projects respectively. The control variables, i.e. the proportion of female, young (18-30 years), elderly (60+), French-speaking, a dummy for communes with more than 20,000 inhabitants as an indicator of urbanity, and a dummy variable for the canton of 'Graubunden', which was found to have many outliers among its communes, are denoted by C_i . E_i stands for the vector of economic determinants reviewed in Section 3 and I_i denotes the ideological variables of Section 4. α_j , δ_j , γ_j and λ_j are the parameters to be estimated and u_{ij} is the error term.

The participation decision is represented by equation 3, where we use a different set of explanatory variables, noted X_i . This vector contains a set of control variables together with a dummy for observations in the canton of Schaffhausen (where voting is compulsory) and the average participation for the five preceding referendum days.⁴ The remaining notation follows the same canvas as for the choice equations.

⁴Specification for the participation equation is taken from Weck-Hannemann (1990).

6 Empirical results

In order to assess the respective impacts of the determinants of the choice we first present results of the model including control variables and those pertaining to price and income effects, before presenting the model including ideology-related variables.

Generally, we find a very similar pattern for the three different tax schemes. This corresponds to the fact that a large fraction of the voters either accepted or rejected the projects. Note that for all models estimated, the variance-covariance matrix is statistically different from a diagonal matrix (Breusch-Pagan test, $p = 0.000$), which confirms the implicit link between the equations. We also found the specification of the equation controlling for the participation to perform very well, with an explanatory power of nearly 70%.

Environmental demand with price and income effect

The results for our first econometric specification are presented in Table 3. Socio-demographic and economic variables explain a large portion of the variance. The R^2 is the lowest for the energy conservation package at 42%, whereas the covariates explain 55% of the variance for the green tax reform.

The impact of the proportion of women voters on the three bills is positive and highly significant, and the impact on the voting outcome is large when compared to other coefficients. While we are unable to account for the effect in its entire scope, we are led to believe that rather traditional role-sharing in the Swiss society's make-up, which exposes women less to the labor market, might contribute to this result (van Liere and Dunlap, 1980; Husermann, 2006). However, empirical and experimental research has demonstrated the role of gender in pro-social behavior (Meier, 2006), and we could expect this result to be sensitive to the inclusion of ideological variables.

The coefficient for young voters has a negative impact and is highly significant for all three proposals. We thus refute the assumption of younger birth cohorts supporting post-materialist values such as the protection of the environment (Inglehart, 1995). However, in the light of a participation rate of only 30% for young voters (Ballmer-Cao et al., 2000) the risk of putting

Table 3: Regression coefficients (SURE), logistic WLS, price and income effects only

	Weighted mean	Solar Initiative	s.e.	Energy Conservation	s.e.	Green tax	s.e.	Participation	s.e.
Constant	-	-2.062***	0.218	-0.805***	0.189	-0.913***	0.194	-1.852***	0.116
Gender	0.51	2.555***	0.401	1.826***	0.348	2.015***	0.357	-0.183	0.225
Young	0.188	-1.39***	0.263	-0.816***	0.229	-1.089***	0.234	0.244*	0.139
Elderly	0.253	-0.086	0.168	-0.392***	0.146	-0.431***	0.15	-0.478***	0.086
French	0.204	-0.279***	0.021	-0.149***	0.019	-0.531***	0.019	-0.296***	0.012
Graubnden	0.026	0.291***	0.032	0.447***	0.027	0.433***	0.028	-	-
Urbanity	0.251	0.157***	0.030	0.052**	0.026	0.103***	0.027	0.057***	0.0158
Education	0.179	2.402***	0.140	2.274***	0.122	2.277***	0.125	-0.1	0.074
Car commuter	0.431	-1.213***	0.074	-1.067***	0.064	-1.205***	0.066	-	-
Fossil fuels	1.18e-4	-1.052	2.321	-3.272	2.018	-3.023	2.065	-	-
Electricity	0.007	-2.181***	0.466	-0.618	0.406	-1.092***	0.415	-	-
Paper	0.005	-1.476**	0.680	-1.401**	0.591	-0.307	0.605	-	-
Chemicals	0.024	0.971***	0.207	0.218	0.180	0.275	0.184	-	-
Mining	0.036	0.629***	0.192	-0.388**	0.167	-0.015	0.170	-	-
Transport	0.026	1.718***	0.383	0.865***	0.333	0.428	0.341	-	-
Income	23.459	0.028***	0.006	0.007	0.005	0.016***	0.005	0.01***	0.001
Income ²	573.968	-7e-4***	1e-4	-3e-4***	0.9e-4	-4e-4***	0.9e-4	-	-
Left-green	0.283	-	-	-	-	-	-	-	-
Schaffhausen	0.010	-	-	-	-	-	-	0.284***	0.036
N		2826		2826		2826		2826	
Adjusted R ²		0.422		0.421		0.552		0.692	

*p≤.1 **p≤.05 ***p≤.01

too big an emphasis on this measure is evident. For older voters the picture looks similar: our results seem to imply that older households did not want to carry costs for future generations as the coefficients are all negative (for the solar initiative the coefficient does not attain statistical significance).

The coefficient for the French-speaking proportion variable is negative and highly significant. Taking into account societal factors influencing the environmental consciousness in Switzerland we could imagine this variable to be influenced more strongly by informational considerations. Indeed, environmentalism in Germany has traditionally been very strong having emerged out of a powerful anti-nuclear movement (Kitschelt, 1986), whereas no relevant ecological party has formed at the national level in France. Hence we could conjecture that language groups in Switzerland would orientate themselves according to their neighboring language homologues (for a related argument, see Maddison, 2006). This might to some extent account for the reasons why French-speaking voters' demand for green policy is smaller than the Swiss-Germans' demand (see Kriesi, 1996).

Additionally, we notice a second regional effect: the coefficient for the dummy variable for the canton of Graübunden is statistically significant and positive for all three bills. *Ceteris paribus*, communes in this canton were on average between 6-11% more favorable to the proposals (see marginal effects in Table 4). This might capture some private benefits provided by the environmental good. Indeed, Graübunden is a mountainous canton, heavily dependent on tourism and one of the largest producer of hydroelectric power. Furthermore, the canton possesses 46% of shares of Graübunden's largest electricity producer, 'Rätia Energie' which is one of the biggest providers and promoters of green electricity in Switzerland.

The coefficients for urbanity are all positive and statistically significant, although with a small effect. It comes as no surprise that urban households are more inclined to vote in favor of green policy as they are less dependent on private mobility (Hammar and Jagers, 2007) and value open leisure space higher than people living in rural areas, which are often dependent on the exploitation of natural resources to make a living. But as we will see in the following section, this effect will disappear when we include the measures of 'ideology'.

Table 4: Marginal effects estimated at the weighted sample mean

	<i>Price model</i>			<i>Full model</i>		
	Solar Initiative	Energy conservation	Green tax	Solar Initiative	Energy Conservation	Green tax
Gender	0.54%***	0.45%***	0.5%***	0.12%*	0.06%	0.07%
Young	-0.29%***	-0.20%***	-0.27%***	-0.30%***	-0.28%***	-0.32%***
Elderly	-0.02%	-0.10%***	-0.11%***	-0.17%***	-0.28%***	-0.29%***
French	-0.06%***	-0.04%***	-0.13%***	0.03%***	0.07%***	-0.02%***
Graübunden	6.12%***	11.06%***	10.64%***	3.59%***	8.34%***	7.84%***
Urbanity	3.31%***	1.29%**	2.53%***	0.82%	-0.80%	0.12%
Education	0.51%***	0.56%***	0.56%***	0.08%***	0.12%***	0.1%***
Car commuter	-0.26%***	-0.26%***	-0.30%***	-0.15%***	-0.18%***	-0.2%***
Fossil fuels	-0.22%	-0.81%	-0.74%	-0.31%	-0.66%	-0.70%***
Electricity	-0.46%***	-0.15%	-0.27%***	-0.51%***	-0.19%**	-0.32%***
Paper	-0.31%**	-0.35%**	-0.08%	-0.54%***	-0.43%***	-0.23%*
Chemicals	0.20%***	0.05%	0.07%	0.14%***	-0.01%	0.001%
Mining	0.13%***	-0.10%**	-0.004%	-0.03%	-0.21%***	-0.15%***
Transport	0.36%***	0.21%***	0.11%	0.09%	-0.10%	-0.21%***
Income	0.60%***	0.18%	0.40%***	-0.0002%	-0.31%***	-0.17%
Income ²	-0.02%***	-0.01%***	-0.01%***	-0.01%	0.003%	0.003%
Left-green	-	-	-	0.14%***	0.04%***	0.09%***
Env. behavior	-	-	-	0.58%***	0.66%***	0.66%***

*p<.1 **p<.05 ***p<.01

As expected, the proportion of the population with a higher education is confirmed to have a strong impact on the decision. We mentioned above that education often proxies for unobserved job characteristics (Kahn and Matsusaka, 1997; Kahn, 2002). But because our model controls for regional employment distribution and the income level, this result seems to indicate the genuine importance of the education level in the willingness to contribute to the provision of environmental goods. Although this finding suggests that more investigation is needed to understand the underlying motivation, we favor the explanation that posits an inherent link between higher education and the discount rate, giving less weight to short term financial arguments raised during the campaign. Note that more higher educated citizens are to be found in urban areas, where income at an aggregate level is also higher. As we will see, our predictors prove to be quite robust even in the light of these close relationships.

Turning to the variables related to price and income, we observe that the use of a personal car as main means to commute has a strong negative impact on approval rates (Hammar and Jagers, 2007). Households who rely on their car to go to work demonstrated their unwillingness to pay more for commuting by rejecting the proposals more heavily. So long as public transport does not pose a cheaper or equal alternative to private commuting, these citizens will presumably not alter their stance (Kaufmann et al., 2001).

The six economic sectors we included are all traditionally energy-intensive and generally fulfill their role of price proxies well. Notably regions with a larger proportion of workers in the sectors of fossil energy, electricity, paper production and the mining industry opposed the three proposals more strongly. These variables generally display a negative and highly statistically significant coefficient, which can be interpreted as a fear for a general economic degradation in regions where industries depend more heavily on energy production and use. Note that these effects are detected even with the small proportion and variations of the labor force in the respective sectors.

Interestingly, these price effects are observed despite exemption schemes set up in the bills. This could be the sign of a will to manifest a general opposition to policies implying a higher energy price, as workers in these sectors probably felt threatened by the bills - be it a real or subjective threat. This point remains speculative as we are not able to control for the voting motivation. Nevertheless, employment considerations appear to be crucial for the approval of policy regulating relative prices of energy (Schneider and Volkert, 1999; Bornstein and Thalmann, 2007).

Two sectors display rather surprising results. First, communes with workforce in the chemical sectors seemed to favor the three projects, although the effect is significant for the solar initiative only. Second, the transport sector variable has a positive impact on the voting outcome and is statistically significant at the one percent level for two of the three projects. A possible explanation lies in the fact that a significant proportion of people working in the transport sector actually work for public transport. Consequently, this variable sends a mixed signal, as a part of the measured proportion has no work-related incentive to refuse the taxes since they

could eventually gain from an increased demand for public transportation.

The final economic determinant, also seen as one of the fundamental determinants of the environmental demand, is the voters' disposable income (Buchanan and Tullock, 1975; Fischel, 1979; Kahn, 2002). In line with the literature, Figure 1 shows that our specification for the income variable suggests an inverted u-shaped relationship between the average communal taxable income and the acceptance of the projects.⁵ Hence the marginal effect of income is positive for small income levels but becomes negative for communes with the highest income level. It is often argued that the environment is a normal good, but that the richest households do not necessarily show greater acceptance of environmental regulation either because they must bear a larger share of the burden of environmental protection (Thalmann, 2004) or because wealthier people can afford to live in areas of higher environmental quality (Kahn, 2002).

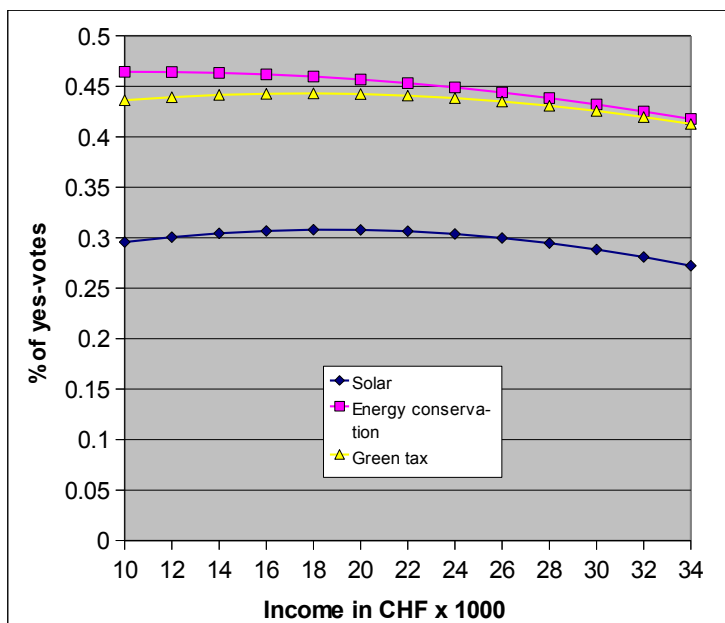


Figure 1: Acceptance rates of the bills conditional on income, weighted sample mean

When plotting acceptance rates against income we observe that the turning point for approval is situated at a yearly disposable income of CHF 18,000 to 20,000 for the solar initia-

⁵Higher order income terms were also used but revealed to be statistically highly insignificant and were not used in the final specification.

tive and green tax reform, and between CHF 10,000 and 12,000 for the energy conservation package.⁶ Hence, while there were few indications of an income effect at the individual level (Thalmann, 2004), in the present setting we detect a statistically significant effect, albeit very small. At the (weighted) sample mean, an increase of CHF 1,000 increases the probability of acceptance of the green tax reform by 0.2% if the income variable is set at CHF 9,000 whereas it decreases by 0.5% for an income of CHF 40,000 (Table 4).

Introducing ideology into environmental demand

The second model includes our two variables which control for ideological effects. Hence, in this specification we can interpret the coefficients as if every commune had the same political affinity and residual environmental behavior. In other words, the price and income effects are isolated from the ideological effects. The results are reported in Table 5

We first note that the proportion of explained variance is relatively high, as we explain between 58% and 68% of the variance of the three outcomes. The adjusted R^2 increases by 17.9% for the solar initiative, by 15.8% for the energy conservation package and by 13.6% for the green tax reform.

As expected, the coefficient for the main political-ideological variable, the percentage of votes gained by left and green parties in national elections, is strongly positive and highly statistically significant. Furthermore, the average result of the last five nation-wide environmental ballots, proxying for the electorate's green behavior, displays encouraging results. The effect of the predictor is positive and the marginal effect is relatively strong for all three bills. This last point illustrates that there is an environmental awareness inherent to all communes which is not directly measurable in terms of price effects.

Most of the socio-demographic coefficients are robust; however, some noteworthy exceptions apply. Remark that the difference between men and women vanishes once ideological variables are introduced. Because the votes included in the composite variable would have had only a

⁶Note that our income measure has a weighted average of CHF 23,460 and a weighted median of CHF 22,900 (interquartile range CHF 5,740).

Table 5: Regression coefficients (SURE), logistic WLS, full model

	Weighted mean	Solar Init.	s.e.	Energy Cons.	s.e.	Green tax	s.e.	Part.	s.e.
Constant	-	-1.984***	0.181	-0.802***	0.162	-0.878***	0.162	-1.85***	0.116
Gender	0.51	0.57*	0.338	0.261	0.301	0.284	0.302	-0.183	0.225
Young	0.188	-1.427***	0.222	-1.123***	0.198	-1.282***	0.199	0.244*	0.139
Elderly	0.253	-0.816***	0.143	-1.134***	0.128	-1.163***	0.128	-0.478***	0.086
French	0.204	0.164***	0.025	0.293***	0.022	-0.091***	0.022	0.295***	0.012
Graubunden	0.026	0.17***	0.027	0.337***	0.024	0.318***	0.024	-	-
Urbanity	0.251	0.039	0.025	-0.032	0.022	0.005	0.022	0.057***	0.016
Education	0.179	0.385***	0.132	0.469***	0.118	0.394***	0.118	-0.1	0.074
Car commuter	0.431	-0.73***	0.063	-0.734***	0.057	-0.812***	0.057	-	-
Fossil fuels	1.18e-4	-1.473	1.932	-2.665	1.724	-2.851***	1.728	-	-
Electricity	0.007	-2.41***	0.387	-0.783**	0.346	-1.283***	0.346	-	-
Paper	0.005	-2.562***	0.57	-1.726***	0.509	-0.948*	0.51	-	-
Chemicals	0.024	0.674***	0.172	-0.06	0.154	-0.01	0.154	-	-
Mining	0.036	-0.163	0.162	-0.842***	0.145	-0.607***	0.145	-	-
Transport	0.026	0.428	0.322	-0.405	0.288	-0.843***	0.288	-	-
Income	23.459	-1.086e-4	0.005	-0.013***	0.005	-0.007	0.005	0.01***	0.001
Income ²	573.968	-1.33e-4	0.9e-4	1.07e-4	0.8e-4	0.57e-4	0.8e-4	-	-
Left-green	0.283	0.675***	0.051	0.170***	0.046	0.381***	0.046	-	-
Env. behavior	0.521	2.743***	0.001	2.647***	0.001	2.67***	0.001	-	-
Average part.	0.401	-	-	-	-	-	-	3.653***	0.057
Schaffhausen	0.010	-	-	-	-	-	-	0.286***	0.036
N		2826		2826		2826		2826	
Adjusted R ²		0.601		0.579		0.687		0.692	

*p≤.1 **p≤.05 ***p≤.01

limited impact on the employment market, our result seems to indicate that the gender effect of the price model can be attributed to ideological effects (van Liere and Dunlap, 1980). This result also corroborates previous experimental research on the relation between gender and altruism (Eckel and Grossman, 1997; Andreoni and Vesterlund, 2001).

In line with a study by Salka (2001), we find that urbanity effects get canceled out upon the introduction of ideological variables. Thus, we are able to confirm that differences between urban and rural regions are rooted in more general ideological characteristics rather than differences in costs and benefits (for similar findings see Kriesi, 1999).

Concerning the price proxies, we also find that the estimated coefficients are robust across specifications. Interestingly however, the general pattern is a reduction of the price effects, indicating that these might be overestimated in models excluding ideological effects, notably altruism and social norms. In addition, we observe that the price proxies have effects that are more consistent with prior expectations once ideology is introduced. Indeed, almost all industrial sectors show a negative sign or are not statistically different from zero.⁷ Nevertheless, these results seem to confirm the strong price effect associated with employment considerations.

Although all the price variables have the expected impact, the income effect virtually disappears from this specification. This result points at a weakness of our approach, since the income effect might be captured by our composite variables containing the outcomes of past votes. Indeed, the inverted u-shaped relationship between income and the acceptance of environmental ballots has been shown to be quite robust, and Kahn and Matsusaka (1997) find that pattern in 12 out of 13 of the ballots they analyze. This intuition was confirmed by running a regression of our composite variable on a quadratic income function and control variables, as we found the usual concave relationship between income and environmental voting to hold equally well. Rather than mitigating the effect of income, our result therefore confirms the inverted-u choice pattern between environmental voting and income.

On the whole, our results seem to point into a different direction than those obtained by Kahn and Matsusaka (1997) who state that ‘... while price and income can explain most of

⁷The only exception is the coefficient of the chemical industry in the solar initiative equation.

the variation, it seems that party preferences can be useful in explaining some of the *residual* variation' (p. 161, emphasis added). On the contrary, following our estimations, non-economic variables seem to explain an important part of the choice. Moreover, the coefficients of the socio-demographic and price variables in this full specification are more consistent with *a priori* cost benefit arguments, suggesting that not controlling for ideological factors can induce a bias or at least overestimate the effect of relative prices in voting behavior.

7 Conclusion

The objective of this study was to show that it is crucial to account for citizens' adherence to socially accepted norms and ideology alongside price and income effects when analyzing the demand for environmental quality. We base our theoretical framework in a strand of microeconomic theory, which goes beyond narrowly defined self-interest to include pro-social behavior which can deviate from the utility maximizing calculus (Sen, 1977). Thus '... people base their preferences less on what they believe will benefit them than on what they judge is good in itself, meets certain standards or norms, suits the identity or character of their community, or conforms with principles appropriate to the circumstances' (Sagoff, 2003, p. 590). This is to be understood as complementary to a view in which preferences are guided solely by narrowly defined self-interest (Deacon and Shapiro, 1975; Becker, 1976). However, the inclusion of ideological concepts in an empirical study remains difficult. We tried to overcome this obstacle by including information on past voting choices observed during recent elections and environmental ballots hence controlling for political affinity and ideology, respectively, as well as for a general stance toward pro-environmental projects.

While controlling for these effects is fundamental in obtaining unbiased estimates for the other variables, we are aware of two main caveats that future research may address. First, the observed trend, as measured by our ideological variable, does not explain behavior. Directly speaking, one choice does not explain the other. More research would be needed to explain the heterogeneity underlying these variables. A second deficit of our study must be found in the fact that we are not able to identify factors crucial to the formation of attitudes and the shaping of

preferences for socially accepted norms. Indeed, we treat ideological preferences as exogenous. This is related with the line of thought propagating a view in which individuals engage in social processes in order to arrive at a common judgment on the value of an environmental good (Sagoff, 1998; O'Hara, 2001) and refers to the endogeneity of social norms. However, while this question is of utmost importance in understanding the *formation* of attitudes, it lies outside the scope of the present empirical investigation

In summary, by stressing the importance of ideology we do not invalidate assumptions underlying neoclassical economic theory (Vatn, 2005). Our point is that following a logic of appropriateness and engaging in pro-social behavior, a person can make a choice consistent with his commitment towards contributing to a public good while foregoing greater personal economic welfare. Thus, we contend that this rationale constitutes a complementary source of utility when he is faced with making a choice; in our case this means making a choice which implies an increase in the relative price of fossil energy.

What are the broader implications of our results? In the light of ever-growing global environmental concern, the use of market-based instruments is growing but their level and implementation is far from being undisputed (Hammar and Jagers, 2007). Why did the three taxes on non-renewable energy in Switzerland in the year 2000 not gain a popular majority? Firstly, on the political side, the proposals did not receive unanimous support from major political actors inside and outside the parliamentary arena, especially not the major employers' organizations, which launched an information campaign in national media against the projects. However, their support during the political campaign is crucial to the acceptance of ballot proposals (Kriesi, 2005; Halbheer et al., 2006; Bornstein, 2007). Secondly, the introduction of the Swiss CO_2 -law and the vote on the three proposals in the same year made it impossible for the economic milieu to support the ballot proposals, as they argued that the CO_2 -law already fulfilled all the claims posited in the proposals. Thirdly, we recognize that the energy-intensive sectors, which would have been exempted from the tax, and the employers' representatives were hostile to the taxes, too - be it because they feared economic losses, stricter legislation in the future or because the design of the tax was not understood correctly. Finally, it appears that the time for incentive

taxes was not right: the introduction of an incentive tax as part of the CO_2 -law would have been possible in 2004, however, the industry managed to circumvent this legal provision by concluding voluntary agreements with the government (Thalmann and Baranzini, 2008). After lengthy obstruction, a rather modest incentive tax on combustibles will enter into force in 2008.

In the light of a vote which was not only very complex to the electorate (three thinly differentiated bills) but also encountered considerable politico-economic opposition, the refusal of the three bills comes as no surprise. This has little impact on our findings, though, since our goal was to analyze the variability of the responses and show which role price and ideology effects, respectively, have on aggregate voting choice. And to this question, we believe, we are able to provide a satisfactory answer: economic rationality matters in the light of a decision on a project which would have entailed costs to households in order to do something for the common good, but the role of social norms and altruism on vote choice is of great significance.

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