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Values, attitudes, and pro-environmental behaviours – is there a link? Results from a Norwegian survey.

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Abstract

We ask how the strength of the link from values and attitudes and to pro-environmental behaviour varies across different consumption domains. We base our analysis on a survey of the Norwegian population, focusing on values, attitudes, and pro-environmental behaviour relating to waste, food, transport and domestic energy. We show that that both values and environmental attitudes are most strongly correlated with the behaviours relating to waste and food and lesser so with behaviours related to energy and transport. The results have implications for when "soft" policy tools such as information provision are likely to be effective at inducing pro-environmental behaviours.

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1. Introduction

In this paper we address the question of how values and environmental attitudes link to pro-environmental behaviours.[1] Specifically we ask how the strength of this link varies across different consumption domains. Our study is based on a survey of the Norwegian population, focusing on values, attitudes, and pro-environmental behaviour in consumption domains of transport, energy investment, energy curtailments, food, and waste.

Standard economic theory dictates that external effects resulting from emissions of, for instance, greenhouse gases or nitrogen should be regulated by providing the right incentives to market agents. This is done through establishing price mechanisms that take external costs into account (for instance by putting a tax on emissions equal to the external effects). These policy recommendations work well if markets function well and the agents act rationally. However, this is not always the case, and there might be a role for other policy instruments or combinations of policy instruments in order to meet the environmental goals in a more effective way (see e.g. Imhof 2011, Kalbekken et al 2010), One such instrument is information measures used to motivate environmental friendly behaviour (see e.g Kallbekken et al 2010)

Stern (1999) points out that information is a policy tool that addresses the personal domain of individuals, or what is termed internal factors, whereas incentives address the contextual area or what is termed external factors.[2] Hence, to use this instrument effectively, there is a need for understanding which areas are most susceptible for the use of information measures in the sense that it has a higher chance of leading to behavioural changes. Following Stern's (op.cit.) arguments, this would imply that we need to know the areas where behaviour is most linked to internal factors like values and attitudes to be able to use information where it has the greatest chances for influencing behaviour. This is what we aim at investigating.

Several studies have analyzed the link between environmental attitudes or values and pro-environmental behaviour in specific consumption domains. For example, the link between psychological attributes, such as values and attitudes, and waste-related behaviour, has been investigated in a number of studies. A review of studies investigating the ability of general environmental concern to predict recycling behaviour has found significant, but relatively small, effects (Schultz et al., 1995). It appears that general environmental concern is related to recycling only when recycling requires a high degree of effort; however, attitudes more specific to recycling have consistently been found to correlate with recycling behaviour (Schultz et al., 1995; Cox et al., 2010)[3]. The same pattern can be found when considering the field of transport. Holden and Linnerud (2011) found in a survey of households that while general environmental attitudes were poor predictors of travel behaviour, specific transport

[1] Commonly, attitudes are understood as relatively stable organisations of beliefs, feelings, and behavioural tendencies towards socially important objects. Values, on the other hand, are seen to be guiding life principles, they transcend attitudes and are assumed to function as structures for organising them (Hogg & Vaughan, 2011).

[2] The internal factors are processes and characteristics which are conceived as being internal to the individual: attitudes, values, habits and personal norms, while external factors are processes and characteristics external to the individual: fiscal and regulatory incentives, institutional constraints and social practices." (Jackson, 2005).

[3] Empirical studies focusing on the prediction of behaviour from general environmental attitudes, typically have found weak relations. However, as pointed out for example by Fishbein and Ajzen (1975), measures of attitudes and behaviour should be at similar levels of specificity, and strong relations between general values or attitudes and individual behaviours cannot be expected.

environmental attitudes were significantly correlated with travel behaviour. An experiment by Hunecke et al. (2001) also found mobility-specific personal norms to be strong predictors of travel mode choice. Seyfang (2006) studied local organic food networks and tested the hypothesis that ecological citizenship is the driving force behind "alternative" sustainable consumption like buying local organic food. This empirical study found that both organizations and consumers in local organic food networks were expressing ecological citizenship values. In the field of household energy consumption, a study by Black et al. (1985) found that the strength of the influence by socio-psychological variables decreases as effort or cost increases. Hence they find that the influence is stronger for curtailment behaviours, such as lowering thermostat settings and shutting off heat in unused rooms, than investments in energy efficiency, such as adding insulation or storm windows.

Only a handful of studies – however - have addressed the issue of how the link between values or attitudes and pro-environmental behaviours varies across consumption domains. Olli et al. (2001) compare the strength of the link across different groups of behaviours. But while they derive the categorization empirically—from a factor analysis of which individual behaviours are correlated—we are interested in comparing domains that are defined *ex ante*, namely behaviours relating respectively to transport, household energy, food, and waste. Diekmann and Preisendörfer (1998) compare the strength of the link between attitudes (they use the term "environmental consciousness") and behaviour across categories that are more similar to ours, finding that the degree of correlation produces the following ranking: 1) shopping behaviour, 2) recycling, 3) household energy, and 4) transportation. They limit the focus to a total of sixteen pro-environmental actions. In our analysis, we will include a richer set of pro-environmental behaviours, and also put this into a policy context of instrument choice

2. Method

In this study we employ quantitative data collected through an online survey. The survey data are analyzed by running regressions and Analysis of Variance (ANOVA).

2.1. Survey data collection

The quantitative data were collected through electronic surveys conducted by the professional survey company Synovate. The survey was conducted twice, between September 8th and 23rd 2008 and between March 5th and 22nd 2010. This is not a panel data set, and the time dimension will not be analyzed in this study, instead we are treating all responses as one large sample. In total we have a sample of 4670 respondents. These were recruited from a Synovate database consisting of around 60 000 people. Sampling weights are used to ensure that the sample is representative of the Norwegian population above the age of 15 that have access to the internet, with respect to age, gender, and area of residence. The response rates were respectively 24% and 27%.

2.2. Behavioural variables

The dependent variables are pro-environmental actions taken within five separate consumption domains. The domains are transport, food, waste, domestic energy investment actions, and domestic energy curtailment actions (behavioural changes not requiring capital investments). Respondents are presented with a list of actions and asked which ones they/their household have taken or are considering taking. The list is replicated in Table II below which reports the results. The six Likert-type response alternatives were: have taken/is taking today, will for sure take, will maybe take, will not take, not relevant for me/my household, and don't

know.[4] If not otherwise stated, we aggregate the actions within each consumption domain and include only the actions that respondents report they have taken/are taking. We furthermore exclude the actions where the response is 'not relevant to my household' and 'don't know'. Hence for each of the five domains, we create a variable giving the ratio of the number of measures taken over the number of relevant measures. These are the dependent variables used in most of the analyses.
Respondents below the age of 18 and respondents living with their parents were excluded from the analyses.

2.3. Quantitative analysis 1: attitudes and behaviour
Responses to a series of attitudinal questions serve as explanatory variables in two different sets of regressions where the dependent variables are some measure of pro-environmental behaviour. In the first set, there is one regression for each of the five consumption domains. In the second set, there is one regression for each single action. The different regression models are compared in terms of the goodness of fit between attitudes and behaviour, in order to investigate in which consumption domains and for which specific actions the association between environmental attitudes and pro-environmental behaviour is strongest.
Environmental attitudes were investigated through a series of nine statements to which respondents were asked to indicate their level of agreement on a four-point Likert scale. The responses to the attitudinal questions are treated as categorical variables. For each question *j*, three dummy variables ($\theta_{i,j}$) were created (one category has to be omitted to avoid perfect colinearity) indicating which of the response options the respondent chose. Hence there are in total 27 explanatory variables, plus the intercept β_0, as shown in equation 1. There is one such equation for each of the five behavioural domains.

$$\frac{actions\ taken}{relevant\ actions} = \beta_0 + \sum_{j=1}^{9}\sum_{i=1}^{3}\theta_{i,j} \times Attitude_j Response_i \quad (1)$$

For the analysis where behaviour is aggregated within the four domains, the dependent variable is the ratio of the number of measures taken over the number of relevant measures. Because these variables' range is limited to between zero and unity and the variables take one of the limit values in a substantial number of cases, ordinary least squares regression would produce biased estimates. We therefore employed the Tobit (Tobin, 1958) regression model, which uses maximum likelihood estimation.

For the analysis of the individual action level, we treat the responses as ordinal. We include all responses where one of the following alternatives was chosen: have taken/is taking today, will for sure take, will maybe take, and will not take. Again, the linear regression model fails because the dependent variable is not continuous. We specify a model with the latent variable *Propensity to act* as a function of the same explanatory variables as above:

$$Propensity\ to\ act = \beta_0 + \sum_{j=1}^{9}\sum_{i=1}^{3}\theta_{i,j} \times Attitude_j Response_i \quad (2)$$

The function is estimated using an Ordered Probit model based on the observed choices respondents made. There are 35 such equations, one for each of the individual actions included in the survey.

[4] For transport-related behaviours the question and response alternatives are worded differently but the structure is the same. Here we ask how often the actions are taken (*always, often, sometimes, seldom, not relevant, don't know).* We calculate the ratio of the number of measures always taken over the number of relevant measures.

To investigate in which consumption domain and for which specific actions we find the strongest link between environmental attitudes and pro-environmental behaviour, we compare the regression models in terms of the likelihood ratio index obtained. It is defined as:

$$1 - \frac{\text{LL(b)}}{\text{LL(0)}} \tag{3}$$

where LL(b) is the log likelihood functions value at the estimated parameters, and LL(0) its value when all parameters are set equal to zero.[5]

In relation to the regression models, a note on endogeneity is in order. We are implicitly assuming that the casual direction goes from attitude to behaviour. Contrary to this, Bem (1972) argues that individuals come to know their own attitudes, emotions, and other internal states by inferring them from their own overt behaviour. To the extent that this is the case, it introduces simultaneity—a type of endogeneity—into the equation, and the error terms will be correlated with the explanatory variables. This can result in biased estimates of the coefficients in our models. We circumvent this potential problem by not focusing on the individual coefficients estimated or trying to predict behaviour from attitudes. The statistic we are interested in is the overall explanatory power of the model within each behavioural domain. This provides a measure of the strength of the association between attitudes and behaviour, and hence less susceptible to simultaneity.

2.4. Quantitative analysis 2: values and behaviour

The registration of values is based on a categorization scheme that has been used to track values in the Norwegian population for 25 years through a biennial survey called Norsk Monitor (Hellevik, 2008). This survey uses 61 questions to measure 25 pairs of opposing values. An example of a value pair is individualism versus conformatism. Then, factor analysis is used to map the values onto a limited number of dimensions (or 'super values'). The two most important dimensions are labelled traditional vs. modern and materialistic vs. idealistic.

Our survey uses a condensed version of Norsk Monitor, with 10 questions. Based on responses to these questions, respondents are grouped into different areas of the plane defined by the two dimensions traditional vs. modern and materialistic vs. idealistic. We divide respondents into three groups based on their level of traditionality/modernity and three groups based on their level of materialism/idealism. We then compare the mean number of pro-environmental measures taken within each of these groups. We use ANOVA to test the null hypothesis that there is no difference in the mean number of measures taken in the different groups. The degree of difference between the groups is measured by the F-statistic.

3. Results

3.1. Quantitative analysis 1: attitudes and behaviour

A Tobit regression is run for each of the five consumption domains. Table I reports the likelihood ratio indexes obtained from each of the runs. It indicates substantial variation

[5] It is also known as McFaddens pseudo-R^2, but unlike the R^2 used in linear regressions, it has no intuitively interpretable meaning between the limit values of 0 (where the estimated parameters are no better than zero parameters) and 1 (when the estimated parameters perfectly predict the choices in the sample). When comparing two models estimated on the same data and the same set of alternatives, it is usually valid to say that the model with the highest log likelihood ratio fits the data better (Train, 2003).

across the domains in the extent to which environmental attitudes are correlated with pro-environmental behaviour. The correlation is strongest for food and waste, while weakest for energy and transport.

Table I: Predictive power of environmental attitudes on pro-environmental behaviour within the different domains.

Consumption domain	Likelihood ratio index (LRI)
Waste	0.1941
Food	0.1201
Domestic energy – curtailment	0.1091
Domestic energy – investment	0.0625
Transport	0.0375

We also include the results from regressing the responses to each individual action on environmental attitudes. Table II lists the actions, again in the order of the size of the likelihood ratio index. Note that the absolute levels obtained here using ordered Probit models are not directly compared to those obtained using the Tobit models in the previous section. As can be seen, there is some variation within each domain, but the overall pattern is similar to the previous results.

Table II: Predictive power of environmental attitudes on individual pro-environmental actions.

Field	Action	LRI
Food	Choose organic products more often	0.1439
Waste	Avoid disposable products	0.1001
Waste	Deliver waste for recycling	0.0806
Food	Eat less meat	0.0740
Transport	Choose the most environmentally friendly transport on leisure travels	0.0706
Transport	Choose the most environmentally friendly transport on work travels	0.0616
Waste	Sort waste	0.0556
Food	Eat more local food	0.0554
Energy - curtailment	Use less hot water than before	0.0493
Energy - curtailment	Lower the indoor temperature by one centigrade	0.0479
Energy - investment	Install solar panels	0.0463
Energy - curtailment	Reduce the duration of showers	0.0433
Transport	Offset carbon emissions from private flights	0.0386
Energy - curtailment	Turn off stand-by switches	0.0378
Transport	Walk distances that are less than 1 km	0.0361
Waste	Compost	0.0349
Food	Eat more fruit and vegetables	0.0343
Waste	Stop mail advertisements	0.0329

3.3. Quantitative analysis 2: values and behaviour

For the dimension of traditionality/modernity, the hypothesis that there are differences in the number of pro-environmental measures taken could not be rejected at the 5% confidence level when looking at behaviour aggregated across all the consumption domains. We therefore

focus on the dimension from materialism to idealism. Along this dimension there were significant differences between the three groups of respondents for each of the five consumption domains. To investigate for which domain the differences were most clear, we have ranked the domains in terms of the value of the F-statistic. Table III reveals that this gives exactly the same ranking of the consumption domains as regressing behaviour on attitude. This result is not so surprising given that the two different types of explanatory variables are highly correlated with each other. Hellevik (2008) observes that pro-environmental attitudes are strongly correlated with an idealistic value orientation. Nevertheless, the result suggests that our main findings are robust to methodological specifications.

Table III: Cross-tabulation between value orientation and pro-environmental activity

	Average proportion of relevant actions **taken**			
	Materialists	Intermediate	Idealists	F-value
Waste	46 %	56 %	62 %	101.44
Food	25 %	32 %	39 %	80.50
Domestic energy – curtailment	47 %	55 %	61 %	65.47
Domestic energy – investment	34 %	41 %	45 %	32.76
Transport	37 %	40 %	44 %	19.82

4. Concluding remarks

Our results suggest that values and environmental attitudes are most strongly correlated with behaviour related to waste and the domain of food while the correlation is weakest for behaviour relating to domestic energy and transport. As argued by Stern (1999), information measures works at best when internal factors are most important for behaviour. Thus, information provision appears to have the largest potential in the behavioural domains of waste and food because it is here that changes in attitudes are most likely to result in behavioural change.

Further, as pointed out by for instance Gneezy and Rustichini (2000) and Mellström and Johannesson (2008), economic incentives might have undesired effects by crowding out moral motivations where those play a role. Our results suggest that intrinsic motivation may play a relatively larger role for behaviours in the domains of food and waste, since these are most closely correlated with values and environmental attitudes. There may therefore be a greater risk that economic instruments crowd out intrinsic motivation for behaviours relating to waste and food than for behaviours relating to energy and transport.

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