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ANALYSIS

Norms and economic motivation in the Swedish green electricity market ☆

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ABSTRACT

The purpose of this paper is to provide an econometric analysis of the most important determinants of Swedish households' choice to pay a price premium for "green" electricity. We draw on recent developments in the literature on integrating norm-motivated behavior into neoclassical consumer theory, and assume that individuals have a preference for keeping a self-image as a morally responsible person. Consumer behavior in the "green market place" will then be heavily determined by how purchases of different goods affect this self-image. The analysis is based on postal survey responses from 655 Swedish households, which are analyzed within a binary choice econometric framework. The results indicate that the impact of choosing "green" on the household budget largely influences the choice between "green" and "brown" electricity, as does the degree of perceived personal responsibility for the issue and the felt ability to affect the outcome in a positive way. We find limited support for the notion that perceptions about others' behavior in general affect individual moral norms and ultimately expressed behavior, but this is also complemented by the influence of explicit social influence. The difficulty in observing others' purchases makes it however difficult to distinguish between social and moral norms in the case of "green" electricity.

1. Introduction

The concept of 'sustainable consumption' has gained increased popularity in national and international agendas (e.g., Heap and Kent, 2000; OECD, 2002). While environmental policies in the past have focused on the production side, mainly through pollution control, there has for long existed a lack of understanding of "green" consumerism and the driving forces behind it, not the least within the economics discipline. Such knowledge is essential for the identification and the implementation of appropriate policy instruments designed to promote sustainable consumption behavior. From an economic-theoretical standpoint the modeling of green consumer behavior is a challenge, especially in those cases where the environmental benefits arise at the production rather than at the consumption stage. According to the welfare economics

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literature public goods, i.e., goods characterized by non-rivalry and non-excludability in consumption, are typically under-provided in the market place (e.g., Bergstrom et al., 1986). Since many environmental goods are (wholly or partially) public, markets, such as "green" electricity markets, will not, it is argued, promote enough of environmentally benign products and technologies. Still, in some cases concerns for the environment have had a profound impact on consumer behavior (e.g., Bjorner et al., 2004; Teisl et al., 2002), and this appears to be inconsistent with the type of utility-maximizing behavior assumed in standard economic models of consumer decision-making in households.

In order to increase our empirical understanding of "green" consumer behavior among households, we draw on recent developments in the literature on integrating norm-motivated behavior into neoclassical consumer theory (see, in particular, Nyborg et al., 2006; Brekke et al., 2003). The main purpose of the paper is to provide an econometric analysis of the most important determinants of households' (stated) choice to pay a price premium for electricity labeled as "green". The analysis is based on postal survey responses from 655 Swedish households, and the econometric (binary choice) models employed include variables that address, among others, the households' cost of purchasing "green" electricity as well as the impact of moral and social norms.

As a result of the deregulation of electricity markets in a large number of countries, a significant share of household customers can choose to sign contract with any of the electricity suppliers that are connected to the grid. In this way the deregulation of the market has made product differentiation a potentially important strategy to attract consumers. Nevertheless, "green" electricity demand represents a case of green consumerism where households in general have failed to contribute much to the public good. In 1996, the Swedish Society for Nature Conservation initiated a system for the labeling of "green" electricity. A survey investigation conducted by Swedenergy (1999) showed that 75% of the Swedish households surveyed could seriously consider buying "green" electricity, and about 40% of them could also consider paying more for "green" electricity than for conventional electricity products. In spite of these positive responses and the fairly modest price premiums (0.1–0.8 US cents) in the Swedish market only 1% of the households stated in 1999 that they actually did purchase "green" electricity. Since then the participation rate has only increased slightly. The above begs the question why households' purchases of "green" electricity have been so modest in the past, and what measures that can be taken to promote increased household participation in "green" electricity schemes.

Previous economic studies in the field of "green" electricity consumption typically focus on the overall market potential for "green" electricity, and therefore often aim at estimating the average willingness-to-pay (*WTP*) for "green" electricity (e.g., Eikeland, 1998; Fouquet, 1998; Goett et al., 2000; Roe et al., 2001). Overall these studies illustrate that there exists a non-negligible market potential for "green" electricity. This literature has also been extended to explicitly address the impact of different types of participation mechanisms (e.g., Rose et al., 2002; Kotchen and Moore, 2007; Wiser, 2007), and to draw on the distinction between pure and impure altruism in the private provision of public goods as outlined by Andreoni (1990) (Menges et al., 2005). In the case of pure altruism consumer utility is affected only by private consumption and everyone's contribution to the public good, and there exists an incentive to free-ride on others' contributions. In such situations government provision of the public good will crowd out voluntary contributions (Bergstrom et al., 1986). However, under impure altruism "green" consumers benefit both from the actual contribution to the public good (the warm-glow effect) and its current level, and Andreoni (1990) shows that then the crowding-out effect may only be partial. Menges et al. (2005) investigate the willingness-to-donate (*WTD*) for "green" electricity, that is the maximum amount a consumer is willing to pay for a public good if she can free-ride on others' contributions and where $WTD \leq WTP$ (see also Champ et al., 1997). The authors find evidence of impure altruism in the "green" electricity market, and report that crowding out effects are more likely in the case of electricity contracts involving large shares of "green" electricity.

In contrast to the above studies the primary aim of this paper is to analyze the main *determinants* of households' choice to pay a price premium for electricity labeled as "green" (see also Rowlands et al., 2003), and there is thus no attempt to focus on overall market potential and average *WTD*. Nevertheless, our approach relates to the literature on *WTD* for public goods under impure altruism and warm-glow in the sense that we explicitly address the influence of others' (perceived) contributions on the choice between "green" and "brown" electricity. However, by drawing on the lessons from the social psychology literature on moral and social norms (Nyborg et al., 2006) the analysis builds on an alternative interpretation of this influence, and an extension of the concept of warm-glow motives. The maintained hypothesis is that individuals have a preference for keeping a self-image as a morally responsible person, and behavior in the "green" market place will be heavily determined by how purchases of different goods affect this self-image. Moreover, others' behavior will represent one important determinant of self-image by providing a moral compass about the perceived personal responsibility of the individual consumer. In contrast to the above economic studies this permits an analysis of how different types of norms can be activated through public policy and influence "green" consumption. The results in this paper provide, for instance, lessons for the role and the design of information campaigns. We show that information about others' positive contributions may influence individuals to choose the "green" alternative, and this effect appears to be complemented by the presence of explicit social approval or disapproval. The empirical investigation also illustrates – partly in contradiction to other studies – the importance of convincing electricity consumers that "green" contracts do contribute to increased environmental quality.

Given the sometimes wide reported disparity between stated and actual behavior in the private provisions of public goods, the problem of hypothetical bias needs to be addressed (Mitchell and Carson, 1989). For this reason some studies (e.g., Menges et al., 2005) use a so-called "cheap-talk" design in which this bias is reduced by making it an integral part of the valuation experiment (Cummings and Taylor, 1999). Since the present analysis relies on a simple hypothetical choice

experiment, one should be careful in using the obtained results as projections of future real market outcomes. Nevertheless, as was noted above, our analysis does not attempt to estimate the overall economic value of the "green" component of electricity production. Thus, although there may be a large (absolute) discrepancy between stated and actual behavior in the "green" electricity market, a basic assumption of our analysis is that there exists a direct *correlation* between *expressed* and *actual* individual choice of "green" electricity. Specifically, individuals who express support for "green" electricity are also expected to be more likely to purchase such products in practice, and the same type of factors that determine self-reported willingness to act are assumed to be influential also in determining actual behavior. Moreover, the model of consumer choice that we present is also consistent with the presence of equilibria in which very few actually contribute to green electricity programs, but where policies affecting (directly or indirectly) beliefs about others' behavior may significantly increase participation rates (Nyborg et al., 2006). This means that one important empirical strategy of this paper is to integrate different perceptions about others' actual behavior in the choice experiment.

In the next section we develop a simple model of norm-based consumer choice, which is useful for identifying potentially important factors determining households' choice between "green" and "brown" products. Section 3 discusses survey design and variable definition issues, as well as the econometric specification of the binary choice model used in the empirical analysis. In section 4 the empirical results of the paper are presented and discussed, and, finally, section 5 provides some concluding remarks and implications.

2. A simple model of norm-motivated green consumer choice

The "green" consumer choice model employed in this paper builds heavily on a model outlined by Nyborg et al. (2006) (see also Brekke et al., 2003). This model addresses the complex interdependencies between norms – informal rules requiring that one should act in a given way in a given situation – and economic motivation. The analysis focuses on the presence of internalized moral norms among individuals, and they assume that each individual's perceived responsibility to buy "green" is affected by the beliefs about others' behavior in the sense that this provides a "moral compass" as to whether she should take personal responsibility for the issue. The presence of a moral norm implies that individuals sanction themselves. Nevertheless, the impact of others' behavior on individual willingness to purchase "green" may equally well be interpreted as stemming from the presence of social norm, which is enforced by approval and/or disapproval from others.

In practice it may be hard to make a distinction between moral norms and social norms, especially since it can be asserted that any influence of social norms is mediated through internalized norms (e.g., Schwartz, 1977). Still, as will be stressed below, the distinction between social and moral norms could have important policy implications. The model below builds on the assumption that only internalized moral norms are present, but in the empirical section of the paper we also challenge this assumption by explicitly testing for the presence of a prescriptive social norm. We assume that society consists of n identical individuals, and in the electricity market each individual can allocate her expenditures between a "brown" and a "green" good. The "green" alternative incurs an incremental cost, C, but it also generates two types of benefits.

First, by choosing "green" the individual contributes to an environmental public good and thus confers a non-market benefit b both on herself and on the other n-1 individuals in society. In the case of electricity consumption it is reasonable to assume that the personal environmental benefits of the individual's own choice are more or less negligible, thus the value of b is likely to be low and $b<C$. Still, it is important to note that what matters for the individual's choice are her *beliefs* about the positive environmental effects benefiting herself, and whether such beliefs exist remains ultimately an empirical question. Moreover, the presence of positive spillovers on other individuals means that it is reasonable to assume that $nb>C$ (Nyborg et al., 2006), implying thus that society as a whole would be better off if everyone purchased the "green" alternative.

Second, we assume that individuals have preferences for a positive self-image as a morally responsible person, S, defined here as a person who conforms to certain norms of responsible behavior (Brekke et al., 2003). The analysis builds on the assertion that the "green" alternative is morally superior, and that therefore choosing "green" will yield a self-image improvement. The above implies that the individual's payoff, p_i, of choosing "green" rather than the "brown" alternative can be expressed as:

$$p_i = (S + b - C)x_i \tag{1}$$

where $x_i=1$ if the individual chooses the "green" alternative and $x_i=0$ if she does not. As was noted above, it is reasonable to expect that b is very low (although not zero). Moreover, at the consumption stage electricity is a perfectly homogenous good and the choice of "green" versus "brown" electricity will result in the same amount of kilowatt hours reaching the individual's home.[1] Thus, we assume that the individual chooses "green" not for traditional consumption purposes but primarily for moral reasons since the choice of "green" over "brown" electricity can affect total environmental outcomes at the generation stage.

For the above reasons it is important to discuss the determinants of self-image, S. Following Nyborg et al. (2006), the change in self-image from choosing "green" is reflected in the personal responsibility the individual feels for the issue. The more willing the individual is to acknowledge his/her own *personal* responsibility to choose "green", the higher is S. However, some individuals may be genuinely uncertain about whether they ought to take the responsibility to buy "green", especially if there does not exist any formal sharing of responsibility through, for instance, laws and regulations. In addition, there are many good causes to support and no one

[1] Clearly, in the case of, say, ecologically labeled food products the "brown" and the "green" alternative would probably not be perfect substitutes as they could be differentiated due to, for instance, taste and health reasons.

can be expected to contribute to all of these; in a specific case thus the individual has to decide if she should take responsibility or if she instead should contribute to some other good cause. Following Schultz (2002), among others, Nyborg et al. (2006) suggest that:

"A natural thing to do, then, is to look around to see who carries this responsibility in practice. If she observes that it is common for people like her to take responsibility (in our case, purchase the green good), it is more likely that she will conclude that she does have some responsibility." (p. 354).

We assume that beliefs about others' behavior have a positive impact on S.[2] Specifically, α is defined as the share of the total population choosing green (i.e., $\alpha=(\Sigma x_i/n)$. As was noted above, however, it is very difficult to determine whether beliefs about what other people are doing reflect a moral or a social norm. This, we argue, is particularly apparent in a case such as "green" electricity where others' purchases are difficult to observe. If buying "green" is not easily observed the influence of people who are close may be important; these may directly express strong preferences for the desired behavior (i.e., prescriptive social norms) or in the individual's assessment of others' behavior, family members and close friends may influence the individual's perception of the frequency with which others purchase "green".

Social psychology research shows that individuals tend to overestimate the frequency of events that they encounter frequently (e.g., Ajzen, 1996); thus, if people close to the individual often stress the importance of purchasing "green" electricity the individual may overestimate the importance that others assign to this task. In the empirical part of the paper we test for the presence of a prescriptive social norm by asking respondents about whether people who are close to them express a desire that she should purchase "green" electricity. The impact of this variable can then be compared to the impact following from the perception of others' behavior in general.

The impact on S of choosing "green" is also assumed to be affected by the positive environmental externalities arising from the individual's choice (and thus affecting the $n-1$ other individuals in society). We define $B=b(n-1)$ as the individual's *beliefs* about the total positive *external* effects her purchasing choice gives rise to. The moral – self-image – relevance of purchasing "green" depends positively on B. It should be clear that the size of B will largely reflect the individual's perception of her ability to affect the outcome in a positive way; in the literature on environmentally benign consumer behavior this is often summarized in the concept *perceived consumer effectiveness* (PCE) (e.g., Ellen et al., 1991; Laroche et al., 2001). For instance, the extent to which the individual perceives that "green" electricity is actually more environmentally benign than other power sources and/or that her choice to purchase the "green" alternative will in fact increase investments in "green" electric power capacity, will both affect B. Implicit in B is also some valuation of the environmental benefits following the individual's choice; even if individuals believe that their choices imply greater environmental quality various people may perceive the *importance* of this improvement differently. Thus, we assume that the more environmentally concerned an individual is, the higher B will be.[3] In sum, the self-image from choosing "green" can be expressed as:

$$S = s(B, \alpha) \tag{2}$$

where s is a concave and continuously differentiable function, which (in the presence of "green" purchases) is increasing in both α and B. This simple representation of self-image is inspired by the way in which moral-decision making is often modelled in the field of social psychology, and in which awareness of consequences and ascription of responsibility are identified as important factors determining moral decisions (e.g., Schwartz, 1970).

The above implies that an individual maximizes her payoff by choosing "green" ($x_i=1$) if and only if $b+s(B,\alpha)>c$. Given that b is deemed to be low in the case of "green" electricity it becomes particularly important empirically to focus on the determinants of S. Following the above we hypothesize that the self-image effect will be more pronounced the higher are the perceived positive environmental externalities and the more willing the individual is to take personal responsibility. Self-image is also expected to be an increasing function of the share of other households' choosing "green".

Nyborg et al. (2006) show that the above type of specification of preferences – in which self-image is determined by the perception of others' activities – can produce multiple equilibria and "herd behavior" can promote either a very high or a very low demand for "green" products. In practice individuals cannot observe α, but must make "an imperfect assessment $\hat{\alpha}$, for example by drawing inferences based on a limited number of observations of others' behavior," (p. 361). This provides room for the government and for companies to influence the beliefs about other people's behavior through information and advertising campaigns. Clearly this has policy implications, but it is equally important to note that in the presence of a prescriptive social (rather than a moral) norm, information campaigns influencing the perception of others' purchasing behavior will most likely have a more limited effect. "Social approval or disapproval come from real people, so real frequencies do matter, whereas a feeling of moral responsibility may be based only on beliefs," (Nyborg et al., 2006, p. 362). In the empirical part of this paper we address the question whether different information about the contribution of others' can affect the reported willingness to purchase "green" electricity, and we also discuss and analyze the difficult problem whether perceptions about others' behavior should be assumed to reflect a moral or a social norm (or perhaps both).

[2] This approach is also consistent with what other psychology scholars refer to as normative conformity, i.e., perceiving others' behavior as a guide to what is morally appropriate (e.g., Moscovici, 1985).

[3] Ellen at al. (1991) argue that PCE is distinct from pro-environmental attitudes (see also Thogersen, 1999). A person may agree that it is very important to solve a specific environmental problem but she may only perceive some solutions as effective. For this reason B encompasses both PCE (ability to contribute to solving the problem) *and* environmental concern (assessment of the importance of the problem).

3. Survey design, variable definitions and model specification

3.1. The survey

In early May 2004, 4000 questionnaires were sent out to randomly drawn household members, 20–75 years old, in four different Swedish municipalities. The response rate was 32%. This is quite low when compared to those presented in other Swedish studies on households' environmental activities, values and attitudes. One important reason for this is that the present survey focused on several household activities and included questions about a number of related policy instruments. While these characteristics make the survey rather unique, enabling, for instance, comparative analyses across different household activities as well as investigations of the links between household characteristics, values and attitudes on the one hand and specific policy instruments on the other, they also imply that the survey was quite demanding to complete for the respondents. Reactions from non-responding households indicate that the two main reasons for not participating were: (a) the time input needed to complete the questionnaire; and (b) a lack of interest in environmental issues. This deserves further elaboration as well as some kind of sensitivity analysis of the impact of possible self-selection bias.

In order to evaluate whether the results are reasonably representative we first analyzed to what extent the socio-economic characteristics of the respondents were similar to the four different populations from which they were drawn. When the socioeconomic characteristics of the respondents were compared with an average resident in each of the four municipalities, women proved to be overrepresented. We also found that people older than 45 are overrepresented in the sample for two of the municipalities, partly reflecting the fact that the opportunity cost of time for elderly people is lower than for the average resident. We did however not find similar deviations between the sample and the population with respect to the proportion of people with higher education.

Since we are using the so-called NEP scale (see Section 3.3) to assess differences in the strength of environmental attitudes across respondents, a significantly higher NEP score, on average, could be an indication of sample selection bias. However, since true average NEP scores for entire populations are not available such a test is difficult to perform. In this study we are, though, primarily interested in analyzing the differences across individuals that can explain the likelihood of choosing "green" over "brown" electricity. Thus, in our case sample selection bias would be a particularly problematic issue if the choice whether to support "green" or not is based on other foundations for individuals with a strong pro-environmental orientation than for others. To permit a test of this notion, we omitted the 25% of the respondents with the highest NEP score and investigated whether the overall results remained (roughly) the same. See Section 4 (and Appendix B) for results from this test.

Finally, only respondents that had the option to choose electricity supplier were asked to participate in the simple choice experiment (see Section 3.2). Although this "self-selection" was purposely built into the questionnaire it further reduced the number of observations to be used in the empirical investigation; 59% of the respondents did actually answer the questions about their willingness to accept a price premium for "green" electricity. It is likely that a few of the respondents (especially some of those living in apartments) thought that they do not have the option to renew their contract and choose supplier even though they do. While this specific self-selection may impose bias on the estimation results it is also likely to remove from the sample respondents with very limited past experience of assessing the cost impact of different electricity purchases on the household budget. In other words, there is a trade-off between including as many as possible in the sample on the one hand and minimizing the hypothetical nature of the choice experiment on the other. The above left us with a total of 655 questionnaires. Since each respondent were confronted with three choices, the total number of observations on which the empirical results are based equals 1965.

3.2. The choice scenario

The choice of electricity contract affects all members of a household, but our focus lies on individual choices and norms. Our approach to this dilemma has been to direct the relevant survey questions to that single person who normally takes the prime responsibility for the household's electricity purchases. We thus implicitly assume that norms and attitudes expressed by this person have a significant influence on the likelihood of choosing the "green" alternative.[4]

In the survey the respondents could choose between two alternatives of a perfectly homogenous electricity good (in terms of kWh supplied) although differentiated with respect to environmental labelling as well as cost. The choice scenario was formulated in a way so as to mimic the decision that the respondent faces when renewing her household's electricity supply contract. In each choice set, respondents were asked the following specific question:[5]

> Envisage now that at the time when you are to renew the contract with your electricity supply company, you will be able to choose between two options, A and B. A represents environmentally labelled electricity while B represents electricity without any environmental label. An average household who does not purchase environmentally labelled electricity today pays about 80 öre per kWh for its electricity. For environmentally labelled electricity, however, an extra cost is added.

The respondents then faced three different choices between alternatives A and B; the choices differed only with respect to the price premiums (i.e., extra cost) paid for "green" electricity. In the experiment we opted for simple discrete "yes" or "no" questions and thus no open-ended willingness-

[4] Previous research also supports the notion that individual norms tend to converge in a family due to the social interactions taking place at the household level (e.g., Silverstone et al., 1992).

[5] This scenario was preceded by a brief paragraph introducing the Swedish system for the labeling of "green" electricity.

to-pay question. The main reason for this choice of design was to confront the respondent with the same type of situation that they confront in the real-life market, i.e., specific price premiums for "green" electricity contracts. The price premiums included in the three choice sets were 2, 4, and 10 öre per kWh, corresponding at the time to approximately 2.5, 5, and 14% increases in the average household electricity price. The choice of these price bids was based on an early pre-test directed to a smaller number of individuals; generally the premiums are fairly low (set in relation to the then prevailing electricity price of about 80 öre (or 10 US cents) per kWh) but this can be motivated by the fact that in the past households have been reluctant to accept even low price bids in the "green" electricity market. In order to facilitate comparisons between the economic impacts of the different price scenarios, the choice sets were also preceded by a simple calculation translating the different price bids into an annual total cost in SEK for the household. The calculations were based on the electricity consumption levels of an average house with and without electric heating.

Following Nyborg et al. (2006) we hypothesize that the self-image benefits from choosing "green" are positively related to the perceived contribution of others. In order to test this hypothesis empirically we divided the entire sample into two sub-samples and introduced two scenarios. The scenarios differed only to the extent that they provided the two responding groups different information about other households' activity in the "green" electricity market. The exact wordings of the scenarios (translated from Swedish), were as follows:

Scenario #1:.
"Others contribute little"

A few Swedish households buy "green" electricity. In 2002, 8% of total Swedish electricity consumption was labelled "green", but the major share of the total demand for "green-labelled" electricity stem from private companies and state enterprises (e.g., Swedish Railways). The households' share was thus smaller than that. We are now interested in the extent to which your household would be willing to purchase electricity labelled as "green".

Scenario #2:.
"Others contribute much"

Investigations show that about 75% of all Swedish households can consider buying "green-labelled" electricity, and about 40% of all households can also consider paying more for "green-labelled" electricity than for electricity that is not "green-labelled". We are now interested in the extent to which your household would be willing to purchase electricity labelled as "green".

We hypothesize that a respondent who faces the "exaggerated" scenario #2 will (ceteris paribus) be more likely to choose the "green" alternative than a respondent who is confronted with scenario #1. In order to permit an empirical evaluation of this test, a dummy "framing" variable was constructed; this variable equals 1 in the case of scenario #2 and 0 otherwise.

3.3. *Variable definitions and model specification*

The binary choice between "green" and "brown" electricity represents the dependent variable in the empirical investigation. The independent variables to be included in the model can be divided into five different categories: (a) variables affecting the cost of purchasing "green" electricity; (b) factors influencing the extent to which purchases of "green" electricity give rise to self-image improvements; (c) the perception of personal environmental benefits from choosing to purchase "green" electricity; (d) socio-economic characteristics; and (e) the explicit presence of a prescriptive social norm.

We hypothesize that the improvement in self-image from choosing "green" is determined by the perceptions of the personal responsibility to purchase "green" electricity as well as of the positive environmental externalities following the individual choice. The respondents were therefore confronted with the statement "I feel a personal responsibility to purchase electricity labelled as "green" in order to contribute to a better environment." A clear majority of the respondents express that the government and the electricity companies together have the main responsibility for securing an environmentally sound electricity production portfolio, but as much as one third of the respondents also explicitly acknowledge some personal responsibility. Specifically, about 34% of the respondents entirely or partly agreed with the above statement while the corresponding share for those who disagreed (partly or entirely) was 37%. The remainder (29%) expressed that they were uncertain about their personal responsibility.

The individuals receiving the questionnaire were also asked about to what extent they *believe* that other households in the same municipality purchase "green" electricity. The respondents were confronted with a five-point scale ranging from 1 to 5, where 5 reflects the perception of extensive "green" electricity consumption on the part of other households. The average score on this question was 1.56 reflecting that people *in general* do not think that other households are very active consumers of "green" electricity. Still, also in this case important differences across individual responses exist. Since no respondent marked higher than 4 on this statement, the responses are only spread among four levels. This is not considered a sufficient number of response categories for treating Likert-scale responses as interval data in econometric analysis (e.g., Weng, 2004; Preston and Coleman, 2000). For this reason the responses were coded as a binary dummy variable taking the value of one (1) for respondents who marked 4 and zero (0) for the remaining options 1, 2 and 3.

The improvement in self-image of choosing "green" is assumed to increase in the positive environmental external effects associated with this choice. The individuals' perceptions of the size of these effects are in turn determined by both PCE and the strength of her pro-environmental attitudes. In the questionnaire, respondents were asked to what extent they agreed or disagreed to four statements included to capture different aspects of PCE. These statements and the percentage distributions of the answers are presented in Table 1. The table indicates that quite a few individuals express uncertainty about the environmental benefits of "green" electricity. It is perhaps even more noteworthy that about 48% (29.6+18.3) of the respondents express a lack of trust in the "green" power scheme in the sense that they question whether a decision to purchase

Table 1 – Perceived consumer effectiveness (PCE) for "green" electricity purchases

Statements	Disagree entirely	Partly disagree	Uncertain	Partly agree	Agree entirely
In reality "green" electricity is not more environmentally benign than electricity that is not labelled "green".	9.3	14.2	49.3	18.0	9.2
It is difficult to know what environmental quality standards "green" electricity comply with.	3.1	3.8	27.6	36.3	29.1
If I choose to purchase "green" electricity this does not necessarily imply increased production from "green" electricity sources.	2.6	4.6	44.6	29.6	18.3
I'm not interested in "green" electricity because I cannot be sure that "green" electricity will be delivered to my household.	11.0	12.4	34.8	23.5	18.4

"green" electricity would actually imply increased production from "green" electric power sources. This can be explained by the fact that the product "green" electricity tends to be more abstract than many other green-labeled products such as laundry detergents (Kåberger, 2003). There exists, for instance, no direct relationship between consumer choice and what is delivered in the sockets. The producer of "green" electricity has simply committed itself to balance the purchased "green" consumption by production from "green" sources. The scores for the four different statements presented in Table 1 were added to construct a (reversed) "PCE index", and by calculating the first principal components. This means that when the scores on each item is added, items that show a stronger correlation with each other are given a higher weight than items that are less correlated.[6] The index thus ranges between 4 and 20 where low values reflect a situation in which the respondent is confident that she can affect the outcome in a positive way.

Moreover, we hypothesize that the individual's perception of the size of the external environmental effects also are positively related to the degree of pro-environmental orientation. In order to identify differences in environmental concern between the respondents, they were asked to indicate to what extent they agreed or disagreed to 15 statements known as the modified New Ecological Paradigm (NEP) scale (Dunlap et al., 1992; Dunlap and Van Liere, 1978). The modified NEP-scale is commonly used in the psychology literature and aims at capturing the following five facets of environmental concern: limits to growth, anti-anthropocentrism, the fragility of the balance of nature, rejection of the idea that humans are exempt from the constraints of nature, and the possibility of an eco-crisis or ecological catastrophe (Ibid.). The response categories range between 1 and 5 so that high scores correspond to a stronger pro-environmental attitude than low scores (with the ordering reversed for the statements that reject the NEP-paradigm). The percentage distributions of the responses are provided in Appendix A. As with the PCE-index, the total NEP-index used in the empirical investigation represents the correlation-weighted sum of its 15 dimensions (using principal component analysis). Overall respondents seem to be relatively inclined to support the pro-environmental statements, and the mean NEP-score is 54.5 (out of a maximum of 75).

It is reasonable to expect that individuals who are, or perceive that they are, personally adversely affected by the generation of "brown" electricity are more inclined to support the promotion of "green" electricity simply on the basis of "selfish" reasons. Even though the environmental impacts of one individual's choice (*b*) – and indeed those following many others' choices – may be considered too small to be observed by the same individual, it is important to investigate whether the individual respondent perceives that she will *personally* benefit from increased production of "green" electricity. In order to evaluate this issue empirically, respondents were asked to mark on a scale ranging between 1 (disagree entirely) and 5 (agree entirely) to what extent they supported the statement: "The generation of electricity that is *not* "green" is a threat towards *my* health and *my* well-being" (emphasis in original). Our results suggest that 26% of the respondents perceive a personal threat from the production of "brown" electric power generation (i.e., they marked 4 or 5). As much as 39% are uncertain.

The different socio-economic variables included in the questionnaire (and ultimately used in the econometric model estimated) were gender, age and the education level of the respondent. We also tested for whether households with children (dummy 1/0 variable) and total household income influenced the decision to purchase "green", but our initial model estimations showed that these variables had no statistically significant impact on this choice. Finally, in order to test for the presence of a social norm the questionnaire included the following statement: "Important persons, who are close to me, expect me to purchase electricity labeled "green"". These responses were measured on a five-point scale with the end points "disagree entirely" (1) and "agree entirely" (5). Overall few people agreed to this statement, and as much as 48% marked "1". Still, the responses are spread over the entire scale permitting a test of whether social norms are important determinants of "green" purchasing behavior. Table 2 summarizes the variables used in the empirical investigation, including definitions, coding and some descriptive statistics.[7]

As was noted above, each respondent was asked to choose between the two binary alternatives "green" and "brown", the former being associated with a given price premium. The probability that an individual *i* will opt for the higher electricity price for "green" electricity is assumed to be equivalent to the probability that she by doing this experiences a higher payoff,

[6] Cronbach's alpha, a coefficient of reliability used to test whether items are sufficiently inter-related to justify their combination in an index, is estimated at 0.72.

[7] The two indices used in the empirical investigation have varied ranges, and we did not normalize them to have a common range (e.g., 0–1). In the case of the NEP scale this facilitates comparisons with other studies using the same index in econometric analyses.

Table 2 – Variables included in the analysis: definitions and descriptive statistics

Variables	Coding/definitions	Mean	Std. Dev.	Min	Max
Dependent variable					
Green choice	1 if "green" alternative is selected, 0 otherwise	0.28	0.45	0	1
Cost of "green" electricity					
Electricity Price	Price increases of 2, 4 and 10 öre per kWh	5.33	3.40	2	10
Electric heating	1 for electric heating, 0 otherwise	0.55	0.50	0	1
Self-image determinants					
PCE (reversed, principal component)	Index based on responses presented in Table 2	10.03	2.27	4	20
Personal responsibility	1 for disagree entirely, 3 for uncertain and 5 for agree entirely	2.84	1.16	1	5
Framing (others)	1 for scenario #2, 0 for scenario #1	0.52	0.50	0	1
Perception of others' contributions	1 for high contribution (4), 0 otherwise (1-3)	0.12	0.10	0	1
NEP-score (principal component)	Index based on responses presented in Appendix A	54.49	7.63	18	75
Personal "green" benefits					
Perceived own benefits	1 for disagree entirely, 3 for uncertain and 5 for agree entirely	2.94	1.11	1	5
Socio-economic variables					
Gender	1 for female, 0 otherwise	0.49	0.50	0	1
Age	Age in years	49	13	22	75
Education	1 for university degree, 0 otherwise	0.38	0.49	0	1
Presence of a social norm					
Persons close expect "green"	1 for disagree entirely, 3 for uncertain and 5 for agree entirely	1.88	0.99	1	5

p_i, in the proposed scenario. The payoff function for individual i consists of a deterministic component and a random component. Since respondents were asked to make three repeated choices each associated with three different price premiums, the assumption of statistical independence between observations may be violated and the random component would then be correlated with the individual choices. Following Butler and Moffit (1982) we therefore employed the random effects probit model. This model is less restrictive than the ordinary binary probit model, which ignores the correlation altogether but our model is still restrictive in the sense that it assumes equal correlation between the different choices of each individual. Still, since each respondent in our study faces only three relatively simple choices we expect this assumption to be plausible. The null hypothesis of no cross-period correlation is tested empirically by evaluating the statistical significance of the estimated ρ (rho) (Greene, 2000).

Moreover, if the two alternatives "green" and "brown" had implied equal prices, we would not expect the probability of choosing one alternative over the other to differ, and for this reason there is no constant included in the estimated model. This assumption also appeared to be consistent with the data. When a constant was added to the model it proved to be statistically insignificant (detailed results are available from the authors on request).

4. Empirical results

As was noted above, a total of 1965 observations were included in the sample. 347 respondents, 53%, chose the "brown" alternative throughout all three choices while 51 respondents, 8%, chose the "green" alternative in all three choices. The remaining 39% accepted some of the price premium bids for "green" electricity but rejected some of the (often higher) bids.[8] The empirical findings discussed in this section are based on three different model estimations, I-III. The estimation results from these models are presented in Tables 3 and 4, where the former shows the coefficient estimates and the latter the corresponding marginal effects.[9] In interpreting the marginal effects it is important to acknowledge the fact that the value ranges differ across some of the independent variables.

The main differences between three models relate mainly to our interest in the influence of others' behavior, and the distinction between moral and social norms. Model I excludes the variables "perception of others' contributions" and "people close expect "green"". Model II then adds the former to the estimation, while model III also includes the latter variable. In all three models the chi-square estimates is just below 300, indicating that the hypothesis of all coefficients being equal to zero can be rejected at the one percent significance level (the critical value lies between 25 and 28 for the three specifications). The estimated correlation between the error terms (within individuals), ρ (rho), is around 0.83 in all three models. In all cases ρ is highly statistically significant, indicating that we cannot reject the random effects model in favor of a more restrictive model that assumes no correlation between the error terms.

In the following we discuss the estimates generated by Model I in detail, and thereafter we comment on how the results are affected and altered when considering models II

[8] Six respondents behaved "irrationally" in the sense that they rejected to pay the lowest price premium (2 öre per kWh) but accepted a higher premium (4 or 8 öre per kWh).

[9] Different model specifications (with various independent variables included) were tested, but overall the main results that are highlighted in the paper proved to be stable across different specifications. Moreover, in general the problem of multicollinearity was limited (see Appendix C for a correlation matrix).

Table 3 – Parameter estimates in the random effects binary probit model

Variables	Model I		Model II		Model III	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant	−2.733**	2.131	−2.642***	−2.601	−3.127**	−2.448
Cost of "green" electricity						
Electricity price	−0.460***	−13.803	−0.460***	−13.831	−0.458***	−13.826
Electric heating	−0.759***	−3.248	−0.750***	−3.212	−0.732***	−3.162
Self-image determinants						
PCE (reversed)	−0.144**	−2.543	−0.148***	−2.607	−0.144**	−2.578
Personal responsibility	1.047***	7.465	1.047***	7.464	0.956***	6.842
Framing (others)	0.429*	1.806	0.423*	1.781	0.423*	1.804
NEP-score	0.085***	2.709	0.084***	2.653	0.091***	2.901
Perception of others' contributions			0.917	0.811	0.621	0.496
Personal "green" benefits						
Perceived own benefits	0.226*	1.865	0.224*	1.843	0.198	1.623
Socio-economic variables						
Gender	0.283	1.175	0.265	1.100	0.293	1.223
Age	−0.038***	−3.789	−0.034***	−3.799	−0.035***	−3.868
Education	0.338	1.336	0.344	1.353	0.416*	1.639
Presence of a social norm						
People close expect "green"					0.302**	2.451
Rho (ρ)	0.831***	30.422	0.831***	30.367	0.827***	29.977
	Log-likelihood: −693 Restricted log-likelihood: −842 Chi-squared: 299		Log-likelihood: −692 Restricted log-likelihood: −842 Chi-squared: 299		Log-likelihood: −689 Restricted log-likelihood: −837 Chi-squared: 294	

*, **, ***Coefficients statistically significant at the ten, five and one percent levels, respectively.

and III. The results first of all indicate that the cost for the household of choosing "green" electricity has an important impact on the choice probability. The "electricity price" coefficient is (as expected) negative and highly statistically significant. The negative sign of the "electric heating" coefficient suggests that people who live in houses with electric heating are less likely to choose "green" than people who do not. Clearly, this is also as would be expected since

Table 4 – Marginal effects estimates in the random effects binary probit model

Variables	Model I		Model II		Model III	
	Marginal effect	*t*-statistic	Marginal effect	*t*-statistic	Marginal effect	*t*-statistic
Cost of "green" electricity						
Electricity price	−0.046***	−4.205	−0.046***	−4.204	−0.046***	−4.236
Electric heating	−0.075***	−2.622	−0.074***	−2.598	−0.074**	−2.574
Self-image determinants						
PCE (reversed)	−0.014**	−2.118	−0.015**	−2.153	−0.015**	−2.144
Personal responsibility	0.104***	3.681	1.104***	3.683	0.097***	3.635
Framing (others)	0.043*	1.678	0.042*	1.654	0.043*	1.679
NEP-score	0.008**	2.289	0.008**	2.253	0.009**	2.427
Perception of others' contributions			0.091	0.795	0.623	0.492
Personal "green" benefits						
Perceived own benefits	0.022***	2.840	0.022***	2.793	0.020**	2.327
Socio-economic variables						
Gender	0.028	1.107	0.026	1.042	0.030	1.143
Age	−0.003***	−2.800	−0.003***	−2.796	−0.003***	−2.847
Education	0.033	1.271	0.034	1.286	0.042	0.639
Presence of a social norm						
People close expect "green"					0.030**	2.091

*, **, ***Coefficients statistically significant at the ten, five and one percent levels, respectively.

electricity costs in households with electric heating constitute a relatively large share of the household budget.

The self-image determinants appear overall to be important for explaining households' choices between "green" and "brown" electricity. The negative sign of the estimated coefficient for "PCE (reversed)" is expected, and the coefficient is statistically significant at the one percent level. Our results also suggest that individuals that are more inclined to express pro-environmental attitudes are more likely to express a willingness to choose "green" electricity; the estimated coefficient for the "NEP-score" variable is highly statistically significant. Moreover, the results support the notion that the more an individual acknowledges a personal responsibility for contributing to "green" electricity, the more likely she is to voluntarily participate in "green" electricity schemes. Also in this case the estimated coefficient is highly significant from a statistical point of view. Finally, the hypothesis that the beliefs about others' behavior affect the individual's willingness to purchase "green" is here tested empirically by comparing whether there is any statistically significant difference between the two sub-samples that received different scenarios, A and B. The results for the "framing" variable indicate that the sign of the estimated coefficient is (as expected) positive, and it is statistically significant at the 10 percent level. This result provides thus at least some limited support for the idea that other households' behavior will affect the individual's own judgment of her responsibility, and ultimately also the choice between "green" and "brown" electricity. One reason why we do not find a stronger result here may be that "green" electricity consumption is an area in which it is difficult to observe (at least directly) others' behavior. We however return to this question below when discussing the results from models II and III.

The coefficient representing the variable "perceived own benefits" is positive and statistically significant at the ten percent level; this indicates that individuals who see a personal threat from electricity production that is not "green" are more likely to choose the "green" electricity option. Finally, with respect to the socio-economic characteristics of the respondents we note that the probability of finding an individual that is willing to support "green" electricity decreases with age. This impact is statistically significant at the one percent level. Our results do not, however, display that the choice of "green" electricity is affected by gender and the education level.

In the estimation of model II we extend the analysis of the empirical importance of others' behavior by adding the dummy variable "perception of others' contributions" to the estimations. The results in Tables 3 and 4 indicate first of all that this inclusion has a minor impact on the coefficients of the other variables. The coefficient for the new variable is positive but statistically insignificant, and the original framing variable remains statistically significant at the ten percent level. These results provide thus no support for the idea that the perceptions about others' purchases of "green" electricity *in the same municipality* add any new insights to the influence of others' participation. It is however useful to ask the question whether a further narrowing of the scope of social interaction could alter the results. In model III we therefore introduce the variable "people close expect "green"", and the results from this estimation are presented in the last columns of Tables 3 and 4.

Again it is first worth noting that the overall results for the variables included in models I and II are only marginally affected by this introduction. The results display however support for the notion that respondents who report that "people who are close expect them to purchase "green" electricity", are also more willing to accept a given premium for "green" electricity. The coefficient for the variable representing the presence of a prescriptive social norm is statistically significant at the five percent level, but the results for the original framing variable is more or less entirely unaffected by this inclusion. This finding rejects the notion that some of the variation in the "people close expect "green"" variable is explicable by the variation in "perception of others' contributions".

This suggests to us that others' behavior does have an impact on "green" consumption patterns, and this impact could stem from two sources. *First*, overall household behavior in the "green" electricity market may influence people's view on the ascription of personal responsibility. Specifically, if others participate in "green" electricity schemes, the individual may experience a loss in her self-image as a morally responsible person in the case she does not choose to participate. This interpretation differs from that employed in many other economic studies on "green" electricity consumption in which people are assumed to be primarily concerned about the production of the public good *per se*. It also differs from the warm-glow approach to private provision of public goods, since it is not the purchase in itself that provides utility but rather the self-image from being a morally responsible person. *Second*, there is also the presence of explicit prescriptive social norms stemming from, for instance, family members and close friends. This influence may well constitute a complement to the above perceptions of others' contributions. If people close stress the importance of purchasing "green" the individual may interpret this as an indication that others also believe it is important.

In order to test for the possible impact of self-selection bias in the survey investigation, we removed the 25% of the total sample with the highest reported NEP-scores. The results from these alternative estimations are reported in Appendix B. One interesting finding is that when we remove respondents with a strong environmental orientation the impacts of the framing and the "perception of others' contributions" variables are reduced and the corresponding coefficients become statistically insignificant. This may suggest that those with a stronger environmental orientation tend to be more sensitive to information about others' behavior. A potentially important policy implication of this is that it can be difficult to use information campaigns about others' positive contributions to induce non-environmentalists to choose "green" electricity contracts.[10] Finally, our sensitivity analysis also reveals that when removing the highest NEP-scores from the sample, the perceived consumer effectiveness expressed by individuals matter less for "green" electricity choices. This finding partly supports the results of Goett et al. (2000), who suggest that often consumers may be more concerned about the concept of "green" electricity than its actual environmental impacts.

[10] Furthermore, as suggested by the reviewers, the limited impact of prescriptive social norms for the sample with a weaker environmental orientation compared to the full sample may suggest that people with green preferences simply choose friends who hold the same type of preferences. This may make it potentially difficult to interpret the influence of this variable. However, our data set does not at all reveal a close correlation with the NEP-score and prescriptive social norms (see Appendix C).

However, in this study we also find that for people with a strong environmental orientation the consequences of the purchase for the environment appear to be of greater importance.

5. Concluding remarks and implications

The results in this paper show that quite a few of the respondents in our choice experiment opt for the "green" electricity alternative. However, as stressed before this should not necessarily be interpreted as a support for the conclusion that there exists a large actual market potential for "green" electricity among Swedish households. Instead, our results should primarily be used to increase our understanding of the driving forces behind the choice to sign "green" electricity contracts. The paper therefore also adds to the existing economic literature on "green" electricity markets, which has tended to focus primarily on average willingness-to-pay assessments and overall market potential and has thus paid less attention to different motivating factors (e.g., Eikeland, 1998; Fouquet, 1998; Roe et al., 2001).

The empirical results provide support for the notion that the choice between "green" and "brown" electricity is determined by both economic factors as well as by the presence of norms. The impact of choosing "green" on the household budget largely influences the willingness to contribute to "green" electricity schemes (a result well in line with most other studies), but so do also the degree of perceived personal responsibility for the issue and the felt ability to affect the outcome in a positive way. We also find evidence of a general lack of trust in the "green" electricity scheme and a view of the sharing of responsibility emphasizing the government's and the energy companies' rather than the households' role, and this probably explains the (so far) modest amount of "green" electricity purchases among Swedish households. Put bluntly, even though the possibility to purchase "green" electricity for a relatively small amount of money exists, many households are unwilling to "give away" money to something that does not achieve any good purpose and for which others have the main responsibility. These results are very strong for the sample as a whole and they partly contradict other studies (e.g., Wiser, 2007; Goett et al., 2000) but are more in line with others (e.g., Rowlands et al., 2003). Our investigation also shows that perceived consumer effectiveness appears to be more important for individuals who rank high on the strength of environmental orientation.

A number of other studies have investigated the role of others' behavior on individual "green" electricity choice (e.g., Rowlands et al., 2003), and some of these frame this interaction in terms of potential free-riding behavior (Menges et al., 2005). The present paper has spent a lot of space on analyzing the impact of others' behavior in the "green" electricity market on the individual's willingness to contribute, and in contrast to the above studies we draw heavily on the social psychology literature on moral and social norm activation. This approach involves therefore an alternative interpretation of the impact of others' behavior, and permits a more in-depth understanding of the underlying causes of this impact. We find some support for the idea that perception about others' behavior *in general* affects individual moral norms and ultimately expressed behavior, but this is also complemented by the influence of explicit social influence. This suggests that a felt obligation to purchase "green" electricity may stem from compliance with perceived other-expectations, in our case expectations from family members, neighbors and friends. For the above reasons information campaigns (e.g., based on country-wide surveys) influencing beliefs about others' behavior in general may have some impacts on "green" consumer behavior in the electricity market. Still, these results should be interpreted with care. Since "green" purchasing behavior in the electricity market cannot be easily observed, individuals must in various ways make an assessment of others' behavior, and in this assessment family members and friends may profoundly influence the individual's perception of others behavior. If this is the case it becomes very difficult to make a clear distinction between social and moral norms, and the impact of information campaigns will be ambiguous. This differs notably from the case of household recycling (not the least curbside recycling) where others' behavior is much more easily observed (Nyborg et al., 2006), and where overall household participation in Sweden (and elsewhere) is much more common.

While this paper has focused on voluntary contributions to a public good in a (largely) non-cooperative setting, it is likely – following the results from other economic and psychological studies on reciprocity and fairness (e.g., Fehr and Falk, 2002) – that individuals are much more likely to contribute if the contributions of others are conditional. This approach differs from that employed here where we assume that others' behavior provide a compass to the morally appropriate behavior. One could expect that the willingness to accept a given price premium for supporting environmentally benign electricity is higher within the institutional setting of a tradable green certificate system – in which all consumers are obliged to contribute – compared to a voluntary setting, and also that other factors explain the degree of support (see also Wiser, 2007).

Appendix A. Responses to the NEP-scale statements (percentage distributions)

Statement		Strongly disagree	Partly disagree	Unsure	Partly agree	Strongly agree	r_{i-t}^*
1	The balance of nature is strong enough to cope with the impacts of modern industrial nations	32.4	32.0	26.1	7.9	1.7	0.50
2	Humans have right to modify the natural environment to suit their needs	33.7	41.9	11.6	12.8	1.0	0.49
3	Plants and animals have as much right as humans to exist	3.2	10.3	8.3	33.7	44.5	0.38
4	Despite our special abilities, humans are still subject to the laws of nature	1.7	3.0	11.8	38.5	45.2	0.21

(continued on next page)

Appendix A (*continued*)

Statement		Strongly disagree	Partly disagree	Unsure	Partly agree	Strongly agree	r_{i-t}*
5	Humans were meant to rule over the rest of nature	36.2	29.1	19.7	11.9	3.2	0.44
6	The earth is like a spaceship with very limited room and resources	5.2	8.9	24.4	35.1	26.4	0.36
7	When humans interfere with nature it often produces disastrous consequences	1.8	9.8	17.7	44.6	26.1	0.49
8	We are approaching the limit of the number of people the earth support	3.2	11.7	41.5	26.3	17.4	0.31
9	The earth has plenty of natural resources if we just learn how to develop them	2.6	7.4	20.1	47.0	22.9	0.12
10	Humans are severely abusing the environment	1.6	5.4	11.6	46.0	35.6	0.55
11	Humans ingenuity will insure that we do not make the earth unliveable	8.9	19.7	46.0	21.1	4.6	0.38
12	If things continue on their present course, we will soon experience a major ecological catastrophe	3.0	9.1	31.6	37.7	18.8	0.47
13	Humans will eventually learn enough about how nature works to be able to control it	12.2	19.1	47.0	19.2	2.9	0.38
14	The so-called "ecological crisis" facing human kind has been greatly exaggerated	15.9	28.7	38.9	14.1	2.4	0.50
15	The balance of nature is very delicate and easily upset	1.0	5.2	16.3	38.8	38.8	0.50

*The item-total correlation (r_{i-t}) shows the correlation coefficient between the score on each individual statement and the sum of the scores on the remaining statements. Ideally this correlation should be reasonably strong since the different statements all are designed to measure environmental attitudes. The item-total coefficients vary between 0.12 for statement No. 9 (indicating that the score for this statement is fairly uncorrelated with the other statements) and 0.55 (for statement No. 10). Cronbach's alpha, a coefficient of reliability used to test whether items are sufficiently inter-related to justify their combination in an index, is 0.79. This is slightly lower than those reported in Clark et al. (2003) and Kotchen and Reiling (2000), respectively, but significantly higher than the results of Cooper et al. (2004). Thus, overall our results are roughly similar to the results of previous studies, and the internal consistency of the NEP-scale appears reasonably adequate.

Appendix B. Random effects binary probit model results with the 25% highest NEP-scores removed

Table B1 – Parameter estimates

	Model I		Model II		Model III	
Variables	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant	−3.246*	−1.918	−3.223*	−1.890	−3.416**	−1.995
Cost of "green" electricity						
Electricity price	−0.438***	−12.624	−0.439***	12.666	−0.439***	−12.615
Electric heating	−0.685**	−2.608	−0.665**	−2.530	−0.655**	−2.484
Self-image determinants						
PCE (reversed)	−0.096	−1.530	−0.102*	−1.690	−0.104*	−1.672
Personal responsibility (reversed)	1.128***	6.903	1.150***	6.966	1.116***	6.484
Framing	0.305	1.161	0.304	1.159	0.307	1.169
NEP-score	0.096**	2.066	0.096**	2.055	0.100**	2.141
Perception of others' contributions			2.427	1.352	2.265	1.226
Personal "green" benefits						
Perceived own benefits	0.126	0.942	0. 111	0.827	0.103	0.751
Socio-economic variables						
Gender	0.459*	1.690	0.422	1.552	0.439	1.603
Age	−0.038**	−3.778	−0.038***	−3.816	−0.039***	−3.803
Education	0.409	1.372	0.412	1.364	0.442	1.456
Presence of a social norm						
People close expect "green"					0.107	0.703
Rho (ρ)	0.811***	23.855	0.810***	23.630	0.810***	23.585
	Log-likelihood: −496 Restricted log-likelihood: −601 Chi-squared: 210		Log-likelihood: −494 Restricted log-likelihood: −599 Chi-squared: 210		Log-likelihood: −494 Restricted log-likelihood: −598 Chi-squared: 210	

**, ***Coefficients statistically significant at the five and one percent levels, respectively.

Table B2 – Estimated marginal effects

Variables	Model I		Model II		Model III	
	Coefficient	*t*-statistic	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Cost of "green" electricity						
Electricity price	−0.042***	−2.751	−0.042***	−2.762	−0.046***	−7.315
Electric heating	−0.066*	−1.918	−0.064*	−1.877	−0.064**	−2.204
Self-image determinants						
PCE (reversed)	−0.009	−1.317	−0.010	−1.360	−0.010*	−1.933
Personal responsibility (reversed)	0.108**	2.498	0.111**	2.511	−0.034***	−3.787
Framing	0.029	1.100	0.030	1.098	0.017	0.601
NEP-score	0.009*	1.754	0.009*	1.752	0.016***	4.119
Perception of others' contributions			0.236	1.218	0.023*	1.211
Personal "green" benefits						
Perceived own benefits	0.012	1.338	0.011	1.118	0.042***	2.962
Socio-economic variables						
Gender	0.044	1.427	0.041	1.334	0.068**	2.287
Age	−0.003**	−2.186	−0.004**	−2.197	−0.003***	−2.953
Education	0.039	1.220	0.040	1.214	0.031	1.103
Presence of a social norm						
People close expect "green"					0.045***	2.979

*, **, ***Coefficients statistically significant at the ten, five and one percent levels, respectively.

Appendix C. Correlation matrix for the independent variables

	Electricity price	Electric heating	PCE	Personal responsibility	Framing	NEP-score	Perception of others' contribution	Perceived own benefits	Gender	Age	Education	People close expect "green"
Electricity price	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electric heating	0.00	1.00	0.12	−0.07	−0.05	0.01	−0.04	−0.07	−0.04	0.12	−0.06	−0.04
PCE	0.00	0.12	1.00	0.40	−0.01	−0.13	0.04	−0.29	−0.17	0.19	−0.07	−0.16
Personal responsibility	0.00	−0.07	0.40	1.00	0.04	0.23	0.02	0.47	−0.17	0.11	−0.03	0.39
Framing	0.00	−0.05	−0.01	0.04	1.00	0.05	0.02	−0.03	−0.02	0.14	−0.06	0.02
NEP-score	0.00	0.01	−0.13	0.23	0.05	1.00	0.06	0.30	0.11	−0.13	0.08	0.04
Perception others' contribution	0.00	−004	0.04	0.02	0.02	0.06	1.00	0.12	0.06	0.05	−0.00	0.09
Perceived own benefits	0.00	−0.07	−0.30	0.47	−0.03	0.32	0.04	1.00	0.20	−0.12	0.03	0.23
Gender	0.00	−0.04	−0.17	0.17	−0.02	0.11	0.06	0.20	1.00	−0.10	0.10	0.02
Age	0.00	0.12	0.20	−0.03	0.14	−0.14	0.03	−0.12	−0.10	1.00	−0.21	0.02
Education	0.00	−0.06	−0.07	0.03	−0.06	0.08	−0.00	0.03	0.10	−0.21	1.00	−0.08
People close expect "green"	0.00	−0.04	−0.16	0.39	0.02	0.04	0.09	0.23	0.02	0.02	−0.08	1.00

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