



UNIVERSITY OF GOTHENBURG
SCHOOL OF BUSINESS, ECONOMICS AND LAW

WORKING PAPERS IN ECONOMICS

No 505

Attitudes to Personal Carbon Allowances

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May 2011

ISSN 1403-2473 (print)
ISSN 1403-2465 (online)

Attitudes to Personal Carbon Allowances*

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Abstract

A personal carbon allowance (PCA) scheme targets emissions from individual consumption and allocates allowances directly to individuals by dividing the carbon budget on a per capita basis. In this study we analyse the results of a survey sent out to a representative sample of the Swedish population regarding attitudes to a potential PCA scheme. The distinctive design of a PCA scheme is likely to give rise to specific factors affecting individuals' attitudes, such as the perceived fairness of the allocation of allowances and corresponding redistribution of wealth, as well as the perceived complexity of the scheme. We perform an ordered probit analysis with attitude to PCAs as the dependent variable, controlling for a number of variables potentially affecting such attitudes. Interestingly, our findings indicate that the most important variable explaining attitudes to the scheme is the perception of respondents that this type of policy instrument seems very complex.

Keywords: Attitudes, Climate change, Environment, Fairness, Personal carbon allowances, Public opinion, Tradable energy quotas

JEL Classification: D12, D60, H23, Q48, Q58

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***Acknowledgments:** Financial support from Clipore (Mistra's Climate Policy Research Program) is gratefully acknowledged.

Introduction

Since the climate negotiations at the COP15 in Copenhagen in December 2009 stranded, the probability of a global carbon market in a near future has been low. A more likely scenario is one comprising a variety of policy instruments based on national and sub-national motives, policies, institutions and norms. An increasing number of politicians, environmental NGOs and scholars seem to agree that market-based policy instruments, such as emissions trading, are preferable as a means to reduce CO₂ emissions, based on their assumed cost-efficiency (see e.g. Fischer and Newell, 2008, for a recent contribution on this topic). Personal carbon allowances (PCAs) can be seen as a logical extension of emissions trading schemes from industry to individuals. A PCA scheme would target emissions from individual consumption and allocate allowances directly to individuals. The carbon allowances that originate from the carbon budget of the area (usually thought of as a nation) are allocated to individuals on a per capita basis. The individuals can then buy or sell any available surplus allowances in the carbon market. The market for carbon allowances may functionally operate like any commodity market: supply and demand determine the price, and excessive use raises the price accordingly. Of course, a series of technical issues must be settled before any such system can be implemented, e.g. rules for allowance allocation and trading and boundaries of the system (i.e. types of emissions that should be included and excluded, who should participate, and the geographical scope).

David Fleming explored the original idea in the UK context (Fleming, 1997) and Mayer Hillman, a well-known campaigner, popularized the idea further and also argued that the only serious and fair way to deal with climate change is to ration carbon emissions. Fleming and Hillman's early ideas have been developed and refined in the UK, as "tradable energy quotas", "domestic tradable quotas" or "personal carbon allowances" (Dresner and Ekins, 2004; Fawcett, 2005; Fleming, 2005; Starkey and Anderson, 2005). Recently the issue were raised again in the UK when the All Party Parliamentary Group on Peak Oil commissioned a report (Fleming and Chamberlin, 2011) investigating both how tradable energy quotas can contribute to ensure fair access of energy at time of shortages of oil and gas and how a PCA scheme would work alongside international carbon reduction policies. Although no nation or state has yet seriously developed proposals for a PCA scheme, the debate has been present within academia, NGOs and policy-making circles.

In 2010, *Climate Policy* published a special issue on personal carbon trading. The issue includes 10 articles on personal carbon trading, with a variety of perspectives and scales of investigation. Parag and Eyre (2010) study the politics of the PCA scheme and Fawcett (2010) studies the PCA scheme and the salience of various national energy- and carbon-related characteristics outside the UK. Lockwood (2010) compares a PCA scheme and a policy of upstream cap-and-trade, and Eyre (2010) tackles the previously neglected topic of enforcement of a PCA scheme. Brohé (2010) considers the interaction of PCAs with the EU ETS, while Sorrell (2010) assumes that PCAs cannot fit well with the EU ETS and instead proposes an upstream trading scheme (where the fossil fuel producers surrender allowances for the carbon contained in their fuel sales) operating together with the EU ETS. Matthews (2010) studies the influences of the psychological framing of carbon emission reduction policies on the public and political debate. More relevant for our study are the studies by Capstick and Lewis (2010), Wallace et al. (2010) and Jagers et al. (2010). Capstick and Lewis (2010) perform a computer-based simulation experiment and find evidence of energy-conserving tendencies under restricted and diminishing PCAs. Wallace et al.

(2010) investigate the public support for a PCA scheme using questionnaires and semi-structured interviews in the English Midlands. They find a notable level of support for a PCA scheme, both in the questionnaires and the interviews. Jagers et al. (2010) discuss the Swedish perspective and investigate the public acceptance of PCAs, with particular focus on the relations between attitudes to a PCA scheme and trust in politicians, perceived fairness and ideology. In the present study we extend the analysis of Jagers et al. (2010) using the same data, with an aim to contribute to the discussion on the public perception of an implementation of a PCA scheme. Our study differs from Jagers et al. (2010) mainly by analyzing the determinants of attitudes to a potential PCA scheme in an econometric model, controlling for a number of variables potentially affecting attitudes. Interestingly, our findings indicate that the most important variable explaining attitudes to the scheme is the perception of respondents that this type of policy instrument seems very complex.

In the following section, the variables explaining attitudes to a PCA scheme are discussed, followed by a description of the data and the survey. The results and conclusion are presented in the last sections of the paper.

Variables explaining attitudes to Personal Carbon Allowances

A PCA scheme and a carbon tax have major resemblances. They both use market mechanisms, internalizing externalities by putting a price on carbon. For a PCA scheme, *total emissions* are determined and then demand and supply determine the market price of carbon permits. In contrast, for a carbon tax, the *price* is determined, which affects the demand for carbon (and hence affect production and consumption that utilizes carbon). While both are in theory cost-efficient, the PCA scheme has the advantage that the level of emissions can be precisely determined in advance (provided full observance of and participation in the tradable quota system), whereas for a carbon tax the government has to rely on elasticity calculations when setting the proper level. While the public's attitudes to these two policy instruments may differ, all their similarities imply that we can expect that more or less the same factors will explain why they are popular or unpopular among the citizens. Thus, although only few studies have specifically investigated the public's opinion about a PCA scheme, we argue that we can draw from similar studies focusing on attitudes to carbon taxes. Below we discuss the variables that have proved significant for explaining attitudes to the Swedish carbon dioxide tax as well as to environmental attitudes in general.

Torgler and Garcia-Valinas (2007) provide a review of variables that have been shown to determine environmental attitudes in previous studies. These are mainly socio-demographic variables such as age and gender and variables such as education, income, environmental interest and residence. They also propose a number of "new" variables that have been frequently used in political science studies to explain attitudes to policies in general, e.g. political interest, political awareness, trust and ideology.

The effect of age on environmental attitudes has been shown to be negative, i.e. the higher the age the lower the environmental concern. However, having children or grandchildren might affect how concerned you are about the future, having a positive effect on environmental attitudes. Women have been shown to be more environmentally aware than men (Loureiro and Lotade, 2005; Zelezny, 2000) and education seem to be positively correlated to environmental concern (Carlsson et al., 2010; Tjernström and Tietenberg, 2008; Demoskop, 2007). Earlier research has shown that income and having a less pressing financial situation each have a positive effect on pro-environmental attitudes (Torgler and Garcia-Valinas, 2007, Carlsson et al., 2010). However, the evidence is mixed as both Tjernström and Tietenberg (2008) and Demoskop (2007) report that income is negatively related to concern about climate change. Also, Torgler and Garcia-Valinas (2007) show ambiguous results indicating a Kuznets-type relationship between income and environmental attitudes. As for political affiliation, several studies have shown a positive relationship between left-wing voters and environmental concern (Torgler and Garcia-Valinas, 2007; Tjernström and Tietenberg, 2008). Also, individuals with an environmental interest tend to be more concerned with the environment.

It has been shown that trust affects people's attitudes to more and higher environmental taxes (Torgler and Garcia-Valinas, 2007), and this in two different ways. Typically, people tend to be more supportive of an environmental tax if they trust their co-citizens and/or if they trust their politicians (Hammar and Jagers, 2006).

The distinctive design of a PCA scheme is also likely to give rise to specific factors affecting individuals' attitudes. We believe that the most important characteristics distinguishing PCAs from taxes are the perceived fairness of allocation and redistribution issues, as well as the complexity of the scheme. Another specific feature of a PCA scheme is that the redistribution is determined through trade. As discussed above, the basis for a PCA scheme is that individuals have an equal right to pollute and to be protected from pollution. Hence, the most likely allocation mechanism for a PCA scheme is equal distribution of carbon allowances.¹ The likely distributional effect can be shown by using data from the Swedish Energy Agency (2007). This data shows that the use of energy is higher for people living in the countryside compared to people living in cities, for men compared to women, and for house owners compared to persons living in apartments, and it is therefore likely that wealth will be distributed from these groups. Even if this allocation mechanism at first glance seems fair in general, the explicitness of the allocation and redistribution generated by the scheme is likely to result in criticism among affected groups and engage moral intuitions on the fairness of the scheme.

¹ However, exceptions and additions to this general rule are often discussed for children (e.g. giving parents additional permits corresponding to the additional emissions caused by having children) and countryside residents (where public transportation cannot be justified from a cost/benefit perspective).

The survey

The Climate Barometer 2007 questionnaire was sent out to a random sample of 2,000 persons, age 18 to 75, drawn from the Swedish population in the national register. The net response rate was 46.8 percent.² Respondents were asked to answer a total of 45 questions with two thirds of them being general questions concerning background characteristics, environmental values and attitudes to present climate policies. The remaining 14 questions were directly devoted to the PCA scheme. Some of the questions are presented in Appendix II.³

Comparing respondent characteristics in terms of gender, education, income, and political affiliation with census data from Statistics Sweden shows that our sample is representative of the Swedish population in terms of gender and income, but not political affiliation and especially not education. A significantly larger share of our respondents is well educated compared with the population as a whole: 37% of the total Swedish population have post-secondary education versus 50% in our sample. As for the political affiliation, all the smaller parties are over-represented (except for the Left Party and the Christian Democrats) compared with the population as a whole, since the two largest parties (the Moderates and the Social Democrats) are under-represented among our respondents.

The scenario related to the PCA scheme was presented as straightforward as possible (see Appendix II), but two important aspects of the scheme were clearly stipulated in order to simplify the description of the scheme. First, in order to make the measurement of attitudes to the scheme as fair as possible, respondents were given the information that the CO₂ tax would be alleviated once the scheme was introduced but that other taxes would be increased in order to compensate for this loss. Although this need not necessarily be the case, conducting a comparison between a free allocation scheme and a tax scheme runs the risk of tilting respondents' preferences to PCAs. Second, the presentation of the scheme in the questionnaire assumes that all adults are to be allocated an equal amount of allowances, although this need not necessarily be decided in an actual policy formulation. Table 1 presents the variables used to explain the attitude to a PCA scheme, based on what we have learnt from earlier attitude studies.

² The survey was followed up with two reminders.

³ Since the survey was explicitly presented in an environmental context, there is a risk of framing bias, meaning that respondents could express stronger support for climate policies because they assume that this is expected of them. This bias may have been further affected by the exceptional media coverage of the climate change issue that took place during the autumn and winter of 2007. One additional issue relates to the fact that we asked about a hypothetical scheme. While it is generally shown that people overstate their willingness to pay in hypothetical studies (List and Gallet, 2001), it is not clear whether the difference is large (see e.g. Bertrand and Mullainathan, 2001) or small (see e.g. Hanemann, 1994). This tendency to overstate implies that people are generally more positive to a PCA scheme than to a policy instrument, such as the carbon tax, that has already been implemented, meaning that there is a bias favouring PCAs. On the other hand, we also know that people prefer the state they are currently in (Shogren et al., 1994; Kahneman and Knetsch, 1992; Slovic, Fischhoff and Lichtenstein, 1982), (the current policy in Sweden is a carbon tax), and hence we potentially have two opposing effects, and it is hard to judge which one is stronger.

Table 1: Descriptive statistics.

| Variables | Variable explanation | Mean (std. dev) | Min | Max |
|-----------------------|--|---------------------|-----|-----|
| PCA attitude | 1=very negative, 2=negative, 3=positive, 4=very positive | 2.094 (0.867) | 1 | 4 |
| Male | 1=male, 0=female | 0.487 (0.500) | 0 | 1 |
| Age | age of the respondent | 48.878 (15.745) | 18 | 75 |
| Children | number of children | 0.720 (0.449) | 0 | 1 |
| University | 1=university studies, 0=others | 0.384 (0.487) | 0 | 1 |
| Income | Stated income from a list of 12 categories ^a | - | 1 | 12 |
| Left-wing voter | 1=prefer a left-wing government, 0=prefer a right-wing government ^b | 0.466 (0.499) | 0 | 1 |
| Above average emitter | 1=above average emitter, 0=at or below average emitter ^c | 0.095 (0.294) | 0 | 1 |
| Trust in politicians | 1=trust in politicians, 0=low trust in politicians ^d | 0.085 (0.279) | 0 | 1 |
| Environmental concern | 1=not worried at all, 2=not very worried, 3=neither worried nor not worried, 4=worried, 5=very worried | 3.997 (1.077) | 1 | 5 |
| Redistribution rural | 1=very unfair, 2=basically unfair, 3=basically fair, 4=very fair | 1.832207(.8128054) | 1 | 4 |
| Redistribution income | 1=very unfair, 2=basically unfair, 3=basically fair, 4=very fair | 2.5963511(0.007454) | 1 | 4 |
| Complexity | 1= not at all complex, 2= not very complex, 3= complex, 4=very complex | 3.264 (0.819) | 1 | 4 |
| Number of respondents | | 785 | | |

^a The exact income cannot be determined since respondents indicated their income using a list of 12 categories.

^b Left wing = the Swedish Social Democratic Party, the Swedish Green Party and the Left party. Right wing = The Alliance = the Moderate Party, the Centre Party, the Liberal Party and the Christian Democrats.

^c In the questionnaire the response alternatives ranged from 1 to 5, where 1 = far below the average emitter and 5 = far above the average emitter. The variables were re-coded so that alternatives (4, 5) = 1 and (1, 2, 3) = 0.

^d In the questionnaire the response alternatives ranged from 1 to 5, where alternative 3 is understood to be neutral. The variables were re-coded so that alternatives (4, 5) = 1 and (1, 2, 3) = 0.

Regarding the overall opinions about PCAs, 64 percent of the respondents oppose the PCA scheme (very negative or negative). However, this means that 36 percent are supportive of the PCA scheme (see Jagers et al., 2010, for a discussion on the relationship between attitudes towards the PCA scheme and the Swedish carbon tax). This result is similar to the findings in Wallace et al. (2010) that 40 percent are supportive. Furthermore, 81 percent of the respondents think that the PCA scheme is complex or very complex, and only 2 percent (!) think that the scheme does not seem complex at all. The future global environment seems to be of great concern to the respondents: 75 percent states that they are worried to some extent about the future global environmental and only 10 percent are not very worried or not worried. When it comes to their own emissions levels, only 10 percent of the respondents place themselves above the average CO₂ emissions per person in Sweden, while 40 percent see themselves as average emitters. A report from Statistics Sweden (Wadeskog and Larsson, 2003) analyzes the distribution of household CO₂ emissions, and states that individuals in rural areas emit more than individuals in urban areas and that high disposable incomes go hand in hand with high CO₂ emissions. We include two redistributive variables to capture the perceived fairness of the PCA scheme. The redistributive variables show that 80 percent of the respondents feel that redistribution from people in rural areas to people in urban areas is unfair (very or basically unfair), while 41 percent feel that redistribution from high-income earners to low-income earners is unfair (very or basically unfair). Thus, redistribution based on geographic location is considered as more unfair than redistribution based on income.

Results

We perform an ordered probit estimation with attitude to PCAs as the dependent variable. The results are presented in Table 2. The full set of marginal effects is presented in Table A1 in Appendix I.

Table 2: Ordered probit regression. Dependent variable: Attitude to a PCA scheme (1-4, where 4 is very positive)

| | Coefficient | Standard error |
|--|-------------|----------------|
| Male | -0.081 | 0.088 |
| Age | 0.002 | 0.003 |
| Children | 0.048 | 0.111 |
| University | -0.064 | 0.093 |
| Income | -0.055*** | 0.018 |
| Left-wing voter | -0.167* | 0.086 |
| Above average emitter | 0.033 | 0.146 |
| Trust in politicians | 0.183 | 0.148 |
| Environmental concern, not worried | 0.103 | 0.282 |
| Environmental concern, neither worried nor not worried | 0.257 | 0.238 |
| Environmental concern, worried | 0.482** | 0.226 |
| Environmental concern, very worried | 0.532** | 0.227 |
| Redistribution rural, basically unfair | 0.374*** | 0.102 |
| Redistribution rural, basically fair | 0.719*** | 0.134 |
| Redistribution rural, very fair | 0.442* | 0.248 |
| Redistribution income, basically unfair | 0.594*** | 0.147 |
| Redistribution income, basically fair | 0.894*** | 0.138 |
| Redistribution income, very fair | 1.299*** | 0.156 |
| PCA, not very complex | -0.755*** | 0.288 |
| PCA, complex | -1.040*** | 0.285 |
| PCA, very complex | -2.044*** | 0.288 |
| (Pseudo) R ² | 0.2387 | |
| Prob>chi ² | 0.0000 | |
| Number of observations | 790 | |

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

As shown in Table 2, few of the socioeconomic variables are significant. One exception is income, which is negative and significant: having a higher income decreases the probability of being positive to the PCA scheme. As noted earlier, a significantly larger share of our respondents are well-educated compared to in the population as a whole, yet there is no statistical

difference in attitude to a PCA scheme between those with and without a university degree. Regarding political trust and political affiliation, we do not find any effect of political trust on attitude to the PCA scheme, yet an individual who votes for the left-wing block (the Swedish Social Democratic Party, the Swedish Green Party or the Left party) is less likely to have a positive attitude to the PCA scheme compared to those who vote for a right-wing party.

Notably, respondents who claimed to be “above average emitters” did not think worse of the PCA scheme even though this group would by definition lose from the scheme. This contradicts the standard assumption in economic theory that individuals’ attitudes are mainly explained by self-interest. The lack of correlation could be due to the small size of this group (only 10 percent of the sample), but the fact that the coefficient points at a positive relationship is still puzzling. A bold interpretation of the lack of negative significance might hence be that respondents, who actually realize their relatively large greenhouse gas emissions, also feel more responsible for reducing them and hence become more prone to appreciate a relatively strict climate policy like the PCA scheme. We can of course only speculate on the above relationship, and suggest future research to analyze how detailed estimations of own-emissions affect individual behaviour.

Further, the more worried you are about the future global environment, the stronger your support of the PCA scheme. For example, an individual who is very worried about the future global environment as opposed to not being worried at all has an 18 percentage point higher probability of having a positive attitude (see marginal effects in Table A1 in Appendix I).

As discussed earlier we included two variables to control for the perceived fairness of the PCA scheme: redistribution from individuals living in rural areas to individuals living in urban areas (Redistribution rural) and redistribution from high-income earners to low-income earners (Redistribution income). These variables are significant and positive. Hence, the more fair an individual believes these redistributions to be, the more likely it is that he or she is positive to the PCA scheme. Our results indicate that the perceived fairness of the redistribution outcomes of the PCA scheme is an important determinant of somebody’s attitude to it. For example, if an individual perceives the “Redistribution rural” as basically fair as opposed to very unfair, he or she has a 25 percentage point higher probability of having a positive attitude to the PCA scheme (see marginal effects in Table A1 in Appendix I). The corresponding figure for “Redistribution income” is 30 percentage points, i.e. an individual who perceives the “Redistribution income” as basically fair as opposed to very unfair has a 30 percentage point higher probability of having a positive attitude to the PCA scheme.

However, the largest impact on attitude to the PCA scheme is the perceived complexity of the scheme. The effect of this variable is negative and significant, and for example, an individual who perceives the PCA scheme as very complex as opposed to not at all complex has a 58 percentage point higher probability of having a very negative attitude to the PCA scheme. This is interesting from a policy perspective since the perception of complexity to a large extent can be mitigated by information and by the design of the scheme.

Discussion and conclusions

This study analyzes one of the first large surveys on attitudes to a PCA scheme, and serves as a starting point to identify critical aspects that policy makers, in any country, will most likely encounter when considering the implementation of a PCA scheme.

We find that the most important factor explaining people's attitudes to a PCA scheme is its perceived complexity. This is an aspect of the scheme that policy makers can affect, and probably even to a large degree, by providing information about the scheme before implementation. A British interview study concluded that the attitudes to PCAs became more positive when participants were given the opportunity to ask questions about the scheme (Bottrill, 2006). However, more research on how the scheme could make use of information and communication technology (ICT) solutions to minimize private management costs is necessary in order to work out how the scheme would actually operate. A number of other issues also need to be thoroughly thought through when designing a PCA scheme, such as whether children should be eligible to receive allowances, whether banking should be allowed etc. These questions may very well affect individuals' attitudes to the scheme and should hence be carefully analyzed.

The fairness aspects of the scheme are also shown to be important. We found this by exploring how fair individuals perceived two different types of redistributions to be, i.e. redistribution from individuals living in rural areas to individuals living in urban areas and redistribution from high-income earners to low-income earners. Our results indicate that the more fair an individual believe these redistributions to be, the more likely it is that he or she is positive towards PCAs. Since about 60 percent of the respondents approve of the implied redistribution from high to low income earners in a PCA scheme – the most comprehensive distributional consequence of the scheme – it seems likely that the fairness aspects of the scheme would affect people's attitudes to the scheme in a positive direction. We conclude that the perceived complexity of the PCA scheme obstructs this policy from being a feasible alternative for implementation at present, but that the relatively strong support for the scheme⁴ and the potentially strong behavioural effects of the scheme make further analysis interesting.

⁴ 36 percent of the respondents are positive to the PCA scheme which can be compared to the result presented in Jagers et. al., 2010 where 50% of the respondents (using the same sample) were positive to an increase in the current carbon tax.

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Appendix I

Table A1: Marginal effects for the ordered probit model

| | PCA attitude : "very negative" | | PCA attitude : "negative" | | PCA attitude : "positive" | | PCA attitude : "very positive" | |
|--|-----------------------------------|----------------|------------------------------|----------------|------------------------------|----------------|-----------------------------------|----------------|
| | Marginal effect | Standard error | Marginal effect | Standard error | Marginal effect | Standard error | Marginal effect | Standard error |
| Male | 0.023 | 0.025 | 0.005 | 0.006 | -0.027 | 0.029 | -0.001 | 0.002 |
| Age (18-75) | -0.001 | 0.001 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.000 |
| Children | -0.014 | 0.033 | -0.003 | 0.006 | 0.016 | 0.037 | 0.001 | 0.002 |
| University | 0.019 | 0.027 | 0.004 | 0.005 | -0.021 | 0.031 | -0.001 | 0.002 |
| Income (1-12) | 0.016*** | 0.005 | 0.003** | 0.001 | -0.018*** | 0.006 | -0.001** | 0.000 |
| Left-wing voter | 0.049* | 0.025 | 0.010* | 0.006 | -0.056* | 0.028 | -0.003* | 0.002 |
| Above average emitter | -0.009 | 0.042 | -0.002 | 0.010 | 0.011 | 0.049 | 0.001 | 0.003 |
| Trust in politicians | -0.050 | 0.038 | -0.017 | 0.018 | 0.063 | 0.052 | 0.004 | 0.004 |
| Environmental concern, not worried | -0.029 | 0.076 | -0.008 | 0.027 | 0.035 | 0.097 | 0.002 | 0.006 |
| Environmental concern, neither worried nor not worried | -0.069 | 0.059 | -0.024 | 0.031 | 0.088 | 0.083 | 0.005 | 0.006 |
| Environmental concern, worried | -0.132** | 0.058 | -0.041 | 0.026 | 0.163** | 0.077 | 0.010 | 0.006 |
| Environmental concern, very worried | -0.146** | 0.059 | -0.044* | 0.025 | 0.179** | 0.076 | 0.011* | 0.007 |
| Redistribution rural, basically unfair | -0.105** | 0.028 | -0.027** | 0.011 | 0.126*** | 0.034 | 0.007** | 0.003 |
| Redistribution rural, basically fair | -0.167*** | 0.025 | -0.105*** | 0.031 | 0.248*** | 0.045 | 0.024*** | 0.009 |
| Redistribution rural, very fair | -0.107** | 0.048 | -0.061 | 0.051 | 0.154* | 0.088 | 0.013 | 0.011 |
| Redistribution income, basically unfair | -0.149*** | 0.032 | -0.071*** | 0.026 | 0.204*** | 0.050 | 0.016** | 0.007 |
| Redistribution income, basically fair | -0.237*** | 0.035 | -0.082*** | 0.021 | 0.297*** | 0.044 | 0.022*** | 0.007 |
| Redistribution income, very fair | -0.261*** | 0.024 | -0.220*** | 0.037 | 0.413*** | 0.040 | 0.068*** | 0.020 |
| PCA, not very complex | 0.255** | 0.107 | -0.030 | 0.039 | -0.217*** | 0.068 | -0.008*** | 0.003 |
| PCA, complex | 0.332*** | 0.095 | -0.010 | 0.026 | -0.307*** | 0.073 | -0.015*** | 0.005 |
| PCA, very complex | 0.578*** | 0.071 | 0.036 | 0.024 | -0.557*** | 0.055 | -0.058*** | 0.018 |

^a marginal effect is for discrete change in dummy variable from 0 to 1

^b compared to "Future concern, not worried at all"

^c compared to "PCA, not complex at all"

^d compared to "Fairness, don't agree at all"

^e compared to "PCA buy additional, very unfair"

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Appendix II: Extraction of questions from the survey “The 2007 Climate Barometer”

| | Very little confidence | | Very strong confidence | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Question 22. In general, to what extent do you trust Swedish politicians? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| | Not worried at all | | | Very worried | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | 1 | 2 | 3 | 4 | 5 |
| Question 24. Do you feel worried about what will happen to the global environment in the future?..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Information about personal carbon allowances

A new environmental policy instrument involving personal carbon allowances is currently being discussed in the UK, and we would like to investigate how the Swedish public feels about a similar system. The system of personal carbon allowances is based on the Swedish Parliament determining a ceiling for the total yearly carbon dioxide emissions due to private car transports, air travel and residential heating. This total amount would be converted to allowances, which would then be distributed to all adult citizens. The emission allowances would be handed out for free and deposited into each person’s ”carbon dioxide account” at the end of every month.

Each person would receive the same number of allowances. As a person causes carbon dioxide emissions, a corresponding number of allowances would be deducted from his or her carbon dioxide account. Individuals who make an effort to reduce their emissions or who already cause very little emissions will be able to sell their unused allowances to people who need more allowances. In practise, the system would work as follows:

Imagine that you have just put petrol in your car and then gone inside to pay. First you use your carbon dioxide card to ’pay’ for the emissions, and then you pay for the petrol. If you have already used up the allotted allowances that month, you can easily buy extra allowances at the petrol station. The same procedure would be used when buying airline tickets or paying the electricity bill.

If this system of personal carbon allowances would be introduced, it would take the place of the current carbon dioxide tax, which means that the petrol price would be reduced by a little over 2 SEK per litre. However, it is important to remember that an abolished tax would mean less public revenue, which in turn would mean that other taxes would have to be increased. The total tax burden would therefore not be changed following an implementation of personal carbon allowance scheme.

As mentioned, the system of personal carbon allowances implies that people who cause high amounts of emissions would have to buy allowances from people who cause less carbon dioxide emissions. This would lead to an economic redistribution among different groups. We will now present a few examples of possible redistributions, and would like to know how you feel about them.

Question 33. People in rural areas commonly need to use a car more than people in urban areas, which means that people in rural areas would need to buy emission allowances from people in urban areas. This means that there would be a redistribution of money from people in rural areas to people in urban areas. Do you feel this would be fair?

Very fair Basically fair Basically unfair Very unfair

Question 36. Low-income earners generally cause less carbon dioxide emissions than high-income earners, which means that high-income earners would have to buy emission allowances from low-income earners. This implies a redistribution of money from high-income earners to low-income earners. Do you feel this would be fair?

Very fair Basically fair Basically unfair Very unfair

Question 39. Do you think that you cause more or less carbon dioxide emissions per person than the average in Sweden?

Far below average Below average At average Above average Far above average

Question 41. Do you think that the personal carbon allowances scheme seems complex?

Very complex Complex Not very complex Not complex at all

Question 42. From what you have learned so far about the system of personal emission allowances, do you think it seems like an overall good or bad suggestion?

Very good Fairly good Fairly bad Very bad