# Conscientious vs. ambivalent consumers: Do concerns about energy availability and climate change influence consumer behaviour?

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**Abstract**

Energy availability and climate change are interrelated concerns with economic components. They need to be addressed by policy makers and they require changes in energy consumption. This study examines whether concerns about energy availability and climate change influence consumer behaviour, policy perceptions, and beliefs about future energy consumption. This question is investigated by analysing data from the Eurobarometer 75.4, a comprehensive survey of citizens from all countries of the European Union that was conducted in June 2011 (*n*=26,840). The regression results show that people concerned about climate change were significantly more likely to take action to mitigate climate change, and to be more favourably disposed towards energy policies and future changes in energy consumption, than people who were not concerned about climate change. On the other hand, people who were concerned about energy availability undertook fewer actions and neither supported energy policies nor believed in future changes in energy consumption. This surprising finding raises questions regarding the adequate communication of energy availability and policies to the public in the European Union.

*Keywords*: Climate change; energy availability; economic situation; concern; consumer behaviour; policy perception

## 1. Introduction

The last five years have been turbulent for energy and climate policy, with three major challenges individually and in combination raising questions about the sustainability of current development paths, consumer behaviours and policy decisions. One challenge was that record high oil prices in 2008 and ongoing price volatility reinforced speculations about 'Peak Oil' and the future availability of conventional liquid fuels (Aleklett et al., 2010). A second challenge, the problem of climate change, was highlighted by the Fourth Assessment Report by the Intergovernmental Panel on Climate Change (IPCC; 2007), in combination with limited progress on international agreements to combat climate change. A third challenge, the Global Financial Crisis, which is widely considered to be the worst financial crisis since the Great Depression in the 1930s, sparked discussions about the future of capitalism, and the role of states in controlling markets (Shahrokhi, 2011).

These three global challenges are not unrelated and recent years have seen increasing interest in the relationships between energy availability and climate change (Bang, 2010; Friedrichs, 2011; Leggett & Ball, 2012). Under some circumstances, policies to address either energy issues or climate change will have a detrimental effect on the other problem, but there are clear synergies that make it possible to manage both risks simultaneously (Turton & Barreto, 2006). In fact, the potentially more immediate and politically salient risk of high oil prices and dependence on imported fuel (Bang, 2010), may lend additional urgency to the widely acknowledged need to reduce greenhouse gas emissions to avoid 'dangerous climate change'. Importantly, environmental and economic issues are highly interdependent (Tienhaara, 2010; Venkatachalam, 2007), with energy and climate change posing serious risks to the global economy. The Stern Report (Stern, 2006) stressed that a failure to combat climate change will result in significantly higher economic costs compared with proactive mitigation costs. A number of other approaches are being developed to study the economic

implications of a ‘supply-constrained’ scenario for oil as an input factor (Kerschner & Hubacek, 2009). The compounding risks of climate change and oil depletion are also believed to seriously threaten global trade, with supply chains predicted to become shorter, and production and consumption patterns predicted to become more localised (Curtis, 2009).

Importantly, constraints on energy availability, climate change, and the economic situation are all human-made problems, and their mitigation will therefore necessitate changes to current behaviours, policies and institutional arrangements. Consumers (especially in Western democracies) play a key role in this situation. The term ‘citizen-consumers’ (Clarke et al., 2007) has been coined in this context as it depicts the dual role of people in exercising both political and market power, and also explains an increasing interest in people’s attitudes and in their willingness to engage in pro-environmental behaviour (Barr et al., 2011).

The purpose of this research is to investigate the extent to which concerns about energy availability and climate change influence consumers to opt for energy efficient alternatives. People who are concerned about the global economic situation were analysed as a control group, as some measures could have been adopted for economic reasons. Thus, this paper advances the following main research question: Do concerns about energy availability and climate change influence consumer behaviour, policy perceptions, and beliefs about future energy consumption? This research contributes to knowledge in ecological economics by shedding more light on the complex interactions between human, economic and environmental systems and decision-making processes that explicitly assume bounded rationality (Venkatachalam, 2007) in a society characterised by high levels of household consumption (Tukker, 2010), free riding, and “pseudo-satisfaction” (Jackson, 2002, p. 296). The inclusion of energy policy questions in this research and the focus on policy

recommendations in the conclusion support the notion of ecological economics as a policy-driven science (Shi, 2004).

## 2. Public perceptions of energy and climate change

### 2. 1 Energy and climate change

Both energy availability and climate change are likely to have a fundamental impact on sustainable economic development for the future. However, while they are both escalating and global problems, they have been approached very differently by scientists and in the public arena (Friedrichs, 2011). The study of climate change has been an example *par excellence* of post-normal science, which means that scientific expertise has been integrated with the political process right from its inception at the 1992 Earth Summit. Ever since, climate scientists have been challenged to find a balance between maintaining scientific objectivity (Shi, 2004), and providing tangible policy advice, for example in the form of thresholds or confidence statements. In contrast, energy availability has received very limited public attention, with analyses being polarised between the official predictions by the International Energy Agency (IEA; 2008) and "mavericks at the fringes or outside mainstream scientific discourse" (Friedrichs, 2011, p. 475). The public and scientific debates on issues relating to energy availability and security[1] are therefore less advanced than the debate on climate change (e.g., Helm, 2011; Murray & King, 2012).

An additional challenge to the energy debate is that there is no agreed term to capture its many dimensions (Demski, 2011). Increasingly, the term 'energy security' is used by both politicians and scientists, but even though there is agreement that energy security implies an energy supply that is reliable, adequate, and affordable (Chester, 2010), the term still holds many meanings and this impedes clear policy discussions. This paper uses the term energy

[1] Energy security is a cognate consideration of more general debates on energy availability that include broader aspects such as geological constraints, vulnerability to terrorism, infrastructure bottle necks, and short term energy disruptions for various reasons.

availability, as it implicitly includes the possible peaking of global oil production. The IEA provides an annual World Energy Outlook (WEO) with forecasts of energy supply and demand. The IEA has been criticised for basing its forecast on the underlying assumption that market mechanisms always ensure that supply meets demand (Friedrichs, 2011), a common approach in neoclassical (environmental) economics (Venkatachalam, 2007). In their critique of the 2008 WEO, Aleklett et al. (2010) conclude that future world crude oil production is unlikely to return to 2008 levels, suggesting that the actual production of oil in 2030 (75.8 million barrels/day) will fall short of the officially forecast 101 Mb/d. The severe economic and societal implications of such a deficit have been discussed for a wide range of scenarios and contexts (Bailey et al., 2010; Becken, 2011; Friedrichs, 2010; Hirsch, 2008).

Some observers claim that the finite nature of global fossil fuel supplies is the overriding constraint to economic development, while others argue that the limited ability of the atmosphere to function as a carbon sink is the principal constraint (Friedrichs, 2011; Verbruggen & Al Marchohi, 2010). Whatever the case, it is clear that the continuous burning of fossil fuels exacerbates both problems. Carbon dioxide emissions from fossil fuel combustion are the main driver of climate change, with $CO_2$ emissions having grown by about 80% between 1970 and 2004 alone (IPCC, 2007). Recent climate change studies have shown that the IPCC findings from 2007 are conservative, and that many components of the climate are changing faster than expected (Allison et al., 2009). The current trend in emissions therefore demands bold policies. The increasing recognition of energy availability and climate change as twin challenges, for example in terms of technological innovation (Bauen, 2006) or renewable energy source planning (Leggett & Ball, 2012), is a promising development. Integrated approaches to addressing these problems would reduce perverse outcomes in which, for example, the reduced availability of cheap oil would make more

carbon-intensive coal and non-conventional resources (e.g., tar sands) more financially attractive (Verbruggen & Al Marchohi, 2010).

### 2.2 Awareness and perceptions

Public opinion and concern about climate change have been well documented across the world for some time (e.g., Leiserowitz et al., 2010a; Lorenzoni & Pidgeon, 2006; Upham et al., 2009). Overall, levels of awareness of climate change are very high (e.g., 71% of Britons are very or fairly concerned; Reser et al., 2011), although there has been a decrease in concern in the last few years. For example, a study found that 63% of citizens in Hamburg, Germany, considered climate change to be a serious or very serious threat in 2008, but this percentage fell to 44% in 2011 (Ratter et al., 2012). Decreased public concern, which has also been observed in other parts of the world (e.g., Leiserowitz et al., 2010b), has been explained by information fatigue, recent weather events, and political failures. Recent research specifically highlights the negative effects of the global recession and high unemployment rates on public concern about climate change (Scruggs & Benegal, 2012).

In contrast to climate change, research on people's perceptions of energy availability is limited (Corner et al., 2011), especially in relation to long-term shortages as opposed to short-term issues such as blackouts (Longo et al., 2008). Some research explores attitudes towards different energy sources, for example identifying that coal is perceived as most harmful (Truelove, 2012), and solar and wind energy are generally viewed positively (Corner et al., 2011). Further research has been undertaken on consumers' willingness to pay for renewable energy and related policies (Longo et al., 2008). A recent public poll found that the vast majority of Americans believe that the energy situation in the United States is very or fairly serious, and just over half believe that the US will face serious energy shortages in the next five years (PollingReport, 2012).

### 2.3 Environmental behaviour

Research into understanding people's energy- or climate change-related behaviour has a long tradition. Improving the understanding of pro-environmental behaviour, for example in relation to which behaviours matter, what antecedents are significant, and what interventions are effective (Steg & Vlek, 2009), will greatly assist policy implementation and societal change. While it appears that individuals are not consistent in their environmental behaviour, it has become apparent that a number of factors, including risk perceptions and concerns, attitudes, knowledge, norms, empowerment, and context, seem to influence behaviour. Risk perceptions about environmental change in general, and concern about climate change in particular, were found to relate positively to changes in environmental behaviour (Tobler et al., 2012). Truelove (2012) conceptualised risk perceptions as a process with emotional and cognitive dimensions to analyse US residents' perceptions of the risks associated with different energy sources. Truelove's study revealed misperceptions and fears amongst the population that could inform energy planning and policy making. Importantly, perceptions are often based on indirect experiences and are shaped by the media and other discourse. Risk perceptions are not independent of beliefs and knowledge (O'Connor et al., 1999), which were also found to be relevant antecedents of the willingness to engage in pro-environmental behaviour.

The Theory of Planned Behaviour (Ajzen, 1991; Ajzen & Fishbein, 2005) is a useful theoretical frame in this context as it explains how people evaluate their options in particular situations, thus forming their attitudes, and influencing intentions and behaviour. Normative concerns or moral obligations, as well as perceptions of control, barriers, or powerlessness (Aitken et al., 2011; Tobler et al., 2012) can be important influences. While people who are concerned about the environment and/or feel a moral obligation to change their behaviour are generally more likely to do so, the relationship is typically weak (Kollmuss & Agyeman,

2002; in Tobler et al., 2012). For example, a Swedish study on electricity reduction showed that people who were environmentally concerned did not necessarily try to reduce their electricity demand (Viklund, 2004). The strongest link between attitudes and norms on the one hand, and pro-environmental behaviour on the other, exists for those actions that are low-cost and do not necessitate major changes. Examples include recycling, or indirect behaviours such as voting for a politician who champions environmental values. Direct actions that are of a higher cost – that is, those that involve greater sacrifices, are less likely to be implemented, even by those who recognise the need to act. Transport behaviour is the most commonly noted example of such high cost behaviour (Tobler et al., 2012).

This literature review has shown that energy, climate change, and the economic situation are interrelated, and that consumers who are concerned about the environment are typically more likely to show pro-environmental behaviour. However, the drivers of consumer behaviour have not yet been analysed systematically, i.e. it is not known what concerns (energy availability, climate change) drive the support of particular energy-related behaviours and policies. This study attempts to address this shortcoming.

## 3. Method

### 3.1 Data source

This research uses quantitative data from the Eurobarometer 75.4 in which energy availability and climate change were two topics. The Eurobarometer comprises a set of surveys on different topics in the 27 countries of the European Union (EU). It is authored by the European Commission and produced by TNS Opinion & Social and the Leibniz Institute for the Social Sciences (GESIS). From June 4 to 19, 2011, face-to-face interviews were conducted in people's homes and the data were captured using computer assisted personal interviews (CAPI). Larger countries had samples of at least 1,000 respondents and smaller countries (Luxembourg, Cyprus, and Malta) had approximately 500 interviewees each. The

final sample size was *n*=26,840 EU citizens (GESIS, 2012). The authors were not part of the research team, but were granted access to the data and used them on a secondary basis. Climate change and energy availability are global-scale problems and mitigating these problems requires the efforts of consumers in many countries. These issues go beyond national borders and they are increasingly discussed and responded to (e.g., the EU Emissions Trading Scheme) at the supra-national level. Therefore, a large-scale analysis at an aggregate level seemed appropriate.

**3.2 Measures and variables**

The variables of this study come from four main areas: concerns, consumer behaviour, policy perceptions and future beliefs, and control variables (Table 1). First, respondents were asked about their concerns regarding energy availability, climate change, and the economic situation. Generally speaking, a concern can be defined as a cause of anxiety or worry (Oxford Dictionaries, 2013). Concerns about climate change have been studied in previous research by measuring general and specific concerns about the effects of climate change (e.g., Corner et al., 2011; Demski, 2011; Roser-Renouf & Nisbet, 2008). For example, in the study by Corner et al. (2011), concerns about energy availability were measured using six items: the unaffordability of electricity, rationed electricity, energy dependence on other countries, electricity supply disruptions because of terrorist attacks, running out of fossil fuels, and power cuts. In the present study, concern is measured by respondents indicating whether they perceive energy availability (*energy*), climate change (*climate*), or the economic situation (*economy*) as the single most serious problem facing the world as a whole (multiple answers were possible; Table 1). Although asking for a serious world problem is a simplified approach, the question should be adequate to capture concern.

Second, to assess consumer behaviour, the respondents were asked by the interviewer whether they had personally taken any actions to fight climate change over the past six

months. In case of a positive reply, they were provided with a list of eleven actions (*A1 to A11*; see Table 1) and they had to indicate which ones they had taken. Self-reported behaviour can be problematic because it relies on the respondent's memory and might therefore be prone to false reporting. Some participants might have better memories in relation to environmental behaviour than others, especially when it is important to them. There is also a risk of a potential social desirability bias in questions of pro-environmental behaviour (Viklund, 2004). However, six of the eleven assessed actions relate to one-off purchases like a new car with low fuel consumption, a low-energy home, or new household appliances and therefore it can be assumed that the respondents still remember them. The total number of actions (*actions*) was obtained by adding up the eleven action variables (Table 1).

Third, policy perceptions were assessed with two items and the respondents' beliefs regarding future energy consumption with three items (the actual wording can be seen in Table 1). Fourth, a set of control variables was used to describe the personal situations of respondents. These variables include gender (*male*), age, educational level (*education*), the perceived financial situation of the household (*finance*), marital status, the presence of children in the household (*children*), life satisfaction (*satisfaction*), type of community, and nationality (see Table 1 for wording and categories).

Insert Table 1 here

**3.3 Data analysis**

The data analysis consisted of two main steps and was performed using SPSS version 20. First, the categories and codes of the variables were checked for plausibility and all values of the category *don't know* were recoded into missing values. The two policy perception variables (*boost economy, taxation*) were recoded into dummy variables by summarising the two agreement categories (*1*=totally agree, 2=tend to agree) under *1* and the

two disagreement categories (*3*=tend to disagree, *4*=totally disagree) under *0*. These dummy variables can be entered into regression analyses in the second step described below.

Second, a total of 17 regression analyses (method: enter[2]) were carried out to answer the main research question of this study ('Does concern about energy availability and climate change influence consumer behaviour, policy perceptions, and future beliefs?'). The variables capturing consumer behaviour (*actions, A1* to *A11*), policy perceptions (*boost economy, taxation*), and future beliefs (*renewable energy, energy consumption, car fuel*) were used as the dependent variables. In the case of dependent dummy variables, logistic regression analyses were run, while linear regressions were calculated for ordinal and metric dependent variables. The ordinal variables can be considered quasi-metric because they met the requirements of having same interval sizes and being measured using at least five-point scales (Bortz, 2005; Wittenberg & Cramer, 1998). The two policy perception variables had been recoded into dummy variables because they did not meet this requirement. The three perceived concerns (*climate, energy, economy*) were entered as independent variables into the regression models.

A set of control variables was included to control for other personal characteristics or circumstances that might affect consumer behaviour, policy perceptions, and future beliefs. For example, it was important to control for gender and education because women and better educated people were found to be more willing to engage in pro-environmental behaviour (O'Connor et al., 1999). Moreover, age and education have been found to influence behavioural change in previous research (Tobler et al., 2012). It was also crucial to control for nationality due to differences amongst nationalities in people's worldviews, interactions with nature (Eisler et al., 2003), policy environments, and public debates (Pointvogl, 2009).

[2] This means that all independent variables were entered into the regression analysis at the same time.

These differences are particularly evident in relation to energy policies in different European countries (Umbach, 2010). All regressions were of the following general form:

(1) $Actions = \beta_0 + \beta_1\, climate + \beta_2\, energy + \beta_3\, economy + \beta_4\, male + \beta_5\, age + \beta_6\, age2 + \beta_7\, education + \beta_8 finance + \beta_9\, children + \beta_{10}\, satisfaction + \sum_{i=1}^{4} \beta_i\, marital\ status + \sum_{i=1}^{3} \beta_i\, community + \sum_{i=1}^{28} \beta_i\, nationality + \varepsilon$

The variable age squared (*age2*) made it possible to capture quadratic effects of age. For example, middle-aged people might be more likely to show climate change-friendly behaviour than adolescents and seniors. Such an inverse u-function could not be captured by the age variable which only allowed estimating linear effects. Since nominal variables (*marital status, nationality*) and ordinal variables that are not quasi-metric (*community*) should not be entered into a regression model, they were recoded into dummy variables; that is, a dummy variable was computed for each category. For example, for *marital status*, four dummy variables for each of the four categories of marital status were computed. Three dummies were entered into the regression model and one dummy was excluded because it served as the reference category – in other words, all effects had to be interpreted with regard to this category. The same procedure was applied to the variables *community* (reference: *rural area*) and *nationality* (reference: *other nationality*). Although multicollinearity is generally a small sample problem (Gujarati, 2003), the independent variables were checked for multicollinearity. As all correlation coefficients (except for age and age squared) were below .9, there were no identifiable multicollinearity issues (Tabachnick & Fidell, 2007). An α-level of .05 was used for all statistical tests.

## 4. Results and discussion

### 4.1 Sample structure and concerns

The descriptive statistics (Table 1) show that 45.8% of the respondents were male and the average age was 47.8 years. With regard to concerns, most of the respondents felt that the

combined effect of poverty, hunger, and lack of drinking water was the single most serious problem facing the world as a whole (38.3%), followed by the economic situation (32.3%), and climate change (31.8%). International terrorism was ranked fourth (27.0%), followed by the spread of infectious diseases (26.2%), armed conflicts (23.8%), the availability of energy (19.8%), the increasing global population (15.2%), and the proliferation of nuclear weapons (15.0%). The percentages show that the economic situation and climate change were ranked among the top three, while energy availability was not perceived as a major concern. This finding supports previous research which has found that the issue of energy availability is publicly avoided (Friedrichs, 2011). With regard to consumer behaviour, the respondents had taken on average 2.6 actions to mitigate climate change over the prior six months. These actions ranged from reducing waste and regularly separating it for recycling (63.5%; *A10*) to buying a new low-energy home (2.7%; *A4*; Table 1).

**4.2 Influence on consumer behaviour**

The regression results for consumer behaviour are summarised in Table 2. The first model shows significant effects of *energy*, *climate*, and *economy* on *actions*. A comparison of the un-standardised coefficients indicates that people concerned about climate change undertook more actions than people concerned about energy availability or the economic situation. The standardised coefficients (beta values) confirm that *climate* has the highest impact on *actions* and *economy* the lowest.

Differences were found regarding the type of action taken, for example in relation to mobility (Tobler et al., 2012). *Climate* and *energy* had a significant positive impact on *A2* (using environmentally-friendly alternatives to private car); however, only *energy* had a significant effect on *A1* (buy a new car with low fuel consumption). This finding seems surprising because car use negatively impacts on climate change, and so it was reasonable to expect that people concerned about climate change would undertake this action.

Nevertheless, this result is consistent with previous research suggesting that concerns about climate change do not necessarily prompt people to reduce car use (Tobler et al., 2012). On the other hand, only *climate* had a significant impact on *A9* (avoid taking short-haul flights). This may be explained by the considerable media attention devoted to the climate impacts of aviation (Becken, 2007) and the lack of debate about the impacts of oil prices on air travel (Becken & Lennox, 2012).

With regard to actions at home, *climate* and *energy* had a significant influence on *A5* (choice of energy efficient household appliances). Interestingly, *climate* had a significant effect on A3 (insulation of home to reduce energy consumption), whereas *energy* and *economy* had not, even though insulating one's home would result in both energy and cost savings. Moreover, *climate* and *economy* had a significant (although only at the 5% level) impact on *A6* (switch of energy supplier).

The results also indicated similarities in the actions of the three groups: *Energy, climate,* and *economy* had a significant effect on *A8* (buy locally produced food), *A10* (reduce and separate waste), and *A11* (cut consumption of disposable items). One explanation could be that the consumption of locally produced products has been promoted by governments, especially in an uncertain economic climate. Another explanation could be that people had other reasons for taking actions such as saving money or eating healthy food (Tobler et al. 2012), or even to enhance their social status (Jackson, 2002). These findings support the fact that these actions are very common in Europe and have become part of social practice (Barr et al., 2011). No significant influence of the three concerns could be found for *A4* (buy a low-energy home) and *A7* (generate renewable electricity). It is likely that the lack of action in these two areas is related to the high costs associated with their implementation (Steg & Vlek, 2009), especially when there is a sense of powerlessness and the commons dilemma (Aitken et al., 2011), and the potential free riding of others on ones' investment (Venkatachalam,

2007). In summary, it seems that all groups reported performing most of the repeated behaviours (*A2, A8-A11*), while the responses for one-off purchases (*A1, A3-A7*) were more dependent on the type of concern. From a methodological perspective, it must be noted that significant effects are more likely in large sample sizes like the present dataset. However, not all effects across all 17 regression analyses were significant.

Insert Table 2 here

**4. 3 Influence on policy perceptions and future beliefs**

The regression results for policy perceptions and beliefs about the future are summarised in Table 3. They show that *climate* had a significant effect in all regression models. These results are consistent with previous studies suggesting that policies are more acceptable to people who are aware of the problems they are designed to address (Steg & Vlek, 2009). Remarkably, *energy* only had a significant impact on *renewable energy*. Thus, these people did not believe that policies or future behaviour will lead to significant changes in energy consumption. This is an important finding and supports the suggestion that climate policies could be used as a useful hedge against the negative impacts of reduced energy availability or the increasingly discussed 'Peak Oil' (Rozenberg et al., 2010). Thus, in the absence of public support for energy policies (as such), addressing climate change can be a pragmatic pathway towards reducing oil vulnerability. This is critical because, according to some, the "Peak of the Oil Age" has been reached (Aleklett et al., 2010, p. 1398) and future growth plans require substantial rethinking by policy makers and investors. It has been argued that revenues generated from taxes, or levies on fossil fuels, for example in the form of a carbon tax (as a climate policy), could raise essential funds that could be used to facilitate a transition to a low-carbon economy (Verbruggen & Al Marchohi, 2010). As it stands, such energy policies would only be supported by people who are concerned about climate change and not by people concerned about energy availability. The only policy that

was supported by those concerned about the economy was the one that boosted the economy (Table 3).

Insert Table 3 here

**4.4 Implications**

This study has several implications for policy makers. It confirms that concern about climate change is correlated with the uptake of direct and indirect pro-environmental behaviours (Tobler et al., 2012), although this does not extend to those actions that require substantial personal or financial costs (one-off purchases). What is critical, though, is that concerns about energy availability did not result in any support for policies to address those concerns. Moreover, there were fewer supportive views about future energy patterns compared with concerns about climate change. This raises crucial questions about the differences between people who perceive climate change as a risk compared with those who recognise the continued availability of currently used energy sources as a problem.

There are several possible explanations for this surprising difference. First, it is possible that the framing and discourse around climate change, with very compelling 'story lines' that evoke much more than simple facts (Scrase & Ockwell, 2010), create greater support than the potentially more matter-of-fact reporting on energy challenges (Friedrichs, 2011). While a systematic analysis is missing, it appears that climate change has received greater media coverage (e.g. see Ahchong & Dodds, 2012) than energy availability, because of the ongoing quest for an international agreement and the involvement of several United Nations agencies. No such process exists for the challenge of energy availability, and in particular 'Peak Oil'. The often emotional debate around climate change may be more conducive to individual decision making, characterised by bounded rationality. If consumers were as utilitarian as economic models assume, those concerned about the economic situation should be very supportive of energy-saving behaviour and policies, considering that the

energy availability objective is closely related to nations' "international survival" (Scrase & Ockwell, 2010, p. 2229).

Another explanation is that people who are concerned about energy availability do not necessarily have this concern because of their understanding of the external costs of energy or the implications of a global decline in the production of oil. Their concern could instead be due to a perception that momentary system failures could result in energy shortages, and that the problem could be overcome by political or technological solutions. A recent opinion poll in the United States, for example, revealed that 28% of respondents blamed US oil companies for the recent increase in gasoline prices, with another 25% blaming other oil producing countries and 21% blaming the Obama administration. In addition, 49% believe that drilling for more oil is the single best way for the US to invest in order to reduce dependency on foreign oil (PollingReport, 2012). These findings support the notion that concern about energy availability is not necessarily related to environmental concerns or values. Practical books on dealing with (energy) crises, such as Rawles (2010), are more stemming from a survivalist perspective than an ecological one.

Policy making targeted at decarbonising economies (for the twin benefits of greenhouse gas reduction and increased energy security) could therefore either continue to emphasise the climate change dimension of energy policies (appealing to 32% of the European population), or it may have to consider re-framing the debate on energy availability in a way that appeals to those who are concerned about this issue. As it stands, European energy policy is driven by market forces and a separation of energy questions from political developments (Umbach, 2010), resulting in decisions dominated by protectionism and nationalism (Pointvogl, 2009). Addressing these challenges may assist in developing new discourse about the urgency of achieving low-carbon energy availability.

Finally, this research raises questions about the role of consumers and the extent to which necessary change will stem from changes in consumer behaviour. The concept of citizen-consumers may not work for complex problems such as energy availability and climate change (Barr et al., 2011), as these challenges demand fundamental changes to the role consumption plays in society (Jackson, 2002). The relationship between the consumer and the state, the concept of *homo politicus* as the prototype of an altruistically behaving and politically engaged being (Faber et al., 2002), and the underlying paradigms of how humans interact with their environments are at the core of ecological economics, and they are pertinent considerations in addressing the risks of climate change and resource depletion.

## 5. Conclusion

This study investigated whether concerns about energy availability and climate change influence consumer behaviour in the EU. Empirical analyses showed that people who are concerned about climate change are more likely to undertake actions to mitigate climate change, to agree to energy policies, and to believe in change future energy consumption patterns than people who are not concerned about climate change or who are concerned about energy availability or the economy. The findings have implications for policy makers in the sense that concerns about energy availability, and the capacity of energy policies to address this issue, have to be communicated in more detail (e.g., by providing data about global oil production) and more effectively (e.g., by outlining the serious implications of energy shortages) to the public.

This research has some limitations that also offer directions for future research. The quantitative approach across a large number of countries provides a coarse assessment of underlying issues that need to be explored further in more targeted, and possibly qualitative, research. This could be achieved through interviews and focus groups which would allow a deeper exploration of the somewhat surprising finding that consumers who are concerned

about energy availability are disinclined to respond actively. Complex behaviours such as the well-established rebound effect where users of energy-efficient alternatives ultimately consume more energy in absolute terms could be investigated as part of this research.

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Table 1

*Overview and descriptive statistics of variables*

| Variable | Description | Scale | Mean (SD) or % of respondents |
|---|---|---|---|
| Concern | | | |
| Energy | Energy availability is the single most serious problem facing the world as a whole (*1*=yes) | Dummy | 19.8% |
| Climate | Climate change is the single most serious problem facing the world as a whole (*1*=yes) | Dummy | 31.8% |
| Economy | The economic situation is the single most serious problem facing the world as a whole (*1*=yes) | Dummy | 32.3% |
| Consumer behaviour | | | |
| Actions | Number of personally taken actions to fight climate change over the past six months | Metric | 2.6 (1.9) |
| A1 | You have bought a new car and its low fuel consumption was an important factor in your choice (*1*=yes) | Dummy | 9.6% |
| A2 | You regularly use environmentally-friendly alternatives to using your private car such as walking, biking, taking public transport or car-sharing (*1*=yes) | Dummy | 26.7% |
| A3 | You have insulated your home better to reduce your energy consumption (*1*=yes) | Dummy | 18.7% |
| A4 | You have bought a low-energy home (*1*=yes) | Dummy | 2.7% |
| A5 | When buying a new household appliance e.g. washing machine, fridge or TV, you choose it mainly because it was more energy efficient than other models (*1*=yes) | Dummy | 31.2% |
| A6 | You have switched to an energy supplier or tariff supplying a greater share of energy from renewable sources than your previous one (*1*=yes) | Dummy | 6.5% |
| A7 | You have installed equipment to generate renewable electricity yourself in your home, e.g. solar panels, heat pump or wind turbine (*1*=yes) | Dummy | 4.7% |
| A8 | You buy locally produced and seasonal food whenever possible (*1*=yes) | Dummy | 37.3% |
| A9 | You avoid taking short-haul flights whenever possible (*1*=yes) | Dummy | 8.4% |
| A10 | You try to reduce your waste and you regularly separate it for recycling | Dummy | 63.5% |
| A11 | You try to cut down on your consumption of disposal items whenever possible, e.g. plastic bags from the supermarket, excessive packaging (*1*=yes) | Dummy | 46.9% |
| Policy perception | | | |
| Boost | Fighting climate change and using energy more efficiently can boost the economy and jobs | Dummy | 86.7% |

| Variable | Description | Scale | Mean (SD) or % of respondents |
|---|---|---|---|
| economy | in the EU (*0*=disagree; *1*=agree) | | |
| Taxation | Taxation should be based more on the way we use energy (*0*=disagree; *1*=agree) | Dummy | 77.2% |
| Future belief | | | |
| Renewable energy | Do you think that in 2050 people will be using renewable energy sources such as wind and solar power more than they do now? (from *1*=no, definitely not to *5*=yes, definitely) | Ordinal | 4.44 (.8) |
| Energy consumption | Do you think that in 2050 people will consume energy more efficiently than they do now? (from *1*=no, a lot less efficiently to *5*=yes, a lot more efficiently) | Ordinal | 4.38 (.8) |
| Car fuel | Do you think that in 2050 cars will still be using petrol or diesel or will cars be fuelled in a more energy efficient way? (*0*=petrol or diesel, *1*=a more efficient way) | Dummy | 85.5% |
| Personal situation (control variables) | | | |
| Male | Gender (*0*=female, *1*=male) | Dummy | 45.8% |
| Age | Age (in years) | Metric | 47.8 (18.4) |
| Age2 | Age squared (=age*age) | Metric | 2622.3 (1825.1) |
| Education | Education level (harmonized across countries; from *1*=pre-primary education to *7*=second stage of tertiary education) | Ordinal | 4.1 (1.3) |
| Finance | Judgment of current financial situation of household (from *1*=very bad to *4*=very good) | Ordinal | 2.7 (.8) |
| Children | Children in household (*1*=yes) | Dummy | 38.8% |
| Satisfaction | On the whole, are you very satisfied, fairly satisfied, not very satisfied or not at all satisfied with the life you lead? (from *1*=not at all satisfied to *4*=very satisfied) | Ordinal | 3.0 (.8) |
| Marital status | Marital status (*1*=unmarried, *2*=(re)married/single with a partner, *3*=divorced or separated, *4*=widowed) | Nominal | 1: 19.9%, 2: 62.9%, 3: 7.7%, 4: 9.5% |
| Community | Type of community the respondent lives in (*1*=rural area or village, *2*=small or middle sized town, *3*=large town) | Ordinal | 1: 35.5%, 2: 36.9%, 3: 27.7% |
| Nationality | Nationality of the respondent (27 nationalities of EU and other nationality) | Nominal | / |

Table 2

*Summary of regression results for consumer behaviour (displayed are the un-standardised coefficients)*

| Variable | Actions[1] | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 | A11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (linear) | (A1-A11: logistic regressions) | | | | | | | | | | |
| Energy | .187** | .139** | .123** | .059 | .042 | .114** | -.017 | .077 | .136** | .044 | .172** | .206** |
| Climate | .310** | .065 | .238** | .101** | -.143 | .208** | .132* | .043 | .293** | .195** | .248** | .324** |
| Economy | .114** | .041 | .014 | .043 | -.051 | .034 | .134* | -.114 | .116** | .021 | .189** | .142** |
| Male | -.284** | .250** | -.195** | .056 | .007 | -.151** | .038 | .241** | -.375** | -.190** | -.413** | -.415** |
| Age | .058** | .063** | .012* | .067** | -.007 | .078** | .069** | .054** | .041** | .027** | .039** | .033** |
| Age2 | -.001** | -.001** | .000** | -.001** | .000 | -.001** | -.001** | -.001** | .000** | .000** | .000** | .000** |
| Education | .247** | .190** | .152** | .179** | .232** | .188** | .186** | .166** | .174** | .206** | .153** | .139** |
| Finance | .147** | .383** | .041 | .198** | .179** | .172** | -.110* | .238** | .058* | .056 | .114** | .048* |
| Children | .065** | -.068 | -.071* | .151** | .133 | .136** | .020 | .131 | .002 | -.050 | .074* | .010 |
| Satisfaction | .159** | .190** | .064* | .139** | .139* | .116** | .166** | .269** | .095** | .125** | .144** | .101** |
| Unmarried | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* |
| Married | .210** | .642** | -.164** | .460** | .641** | .418** | .216** | .499** | .070 | .025 | -.006 | -.045 |
| Divorced | -.007 | .202 | -.078 | -.041 | .265 | .101 | .294* | -.105 | -.015 | -.094 | -.068 | -.018 |
| Widowed | -.042 | .085 | -.381** | .142 | .711** | .125 | -.164 | .461** | -.014 | -.152 | -.150* | -.179* |
| Rural area | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* | *REF* |
| Small town | .002 | -.098 | .287** | -.155** | .098 | -.045 | -077 | -.430** | -.044 | -.005 | .080* | .029 |
| Large town | -.080** | -.338** | .383** | -.304** | -.212 | -.168** | .161* | -.872** | -.164** | .151* | .008 | .083* |
| Nationality dummies | *included* | *included* | *included* | *included* | *included* | *included* | *included* | *included* | *included* | *included* | *included* | *included* |
| Constant | -.885** | -6.409** | -2.328** | -5.447** | -4.930** | -4.707** | -5.287** | -6.635** | -2.730** | -4.629** | -1.588** | -2.136** |
| $R^2$ | .256 | .155 | .147 | .125 | .075 | .150 | .162 | .157 | .102 | .159 | .224 | .139 |

*Note:* [1]Standardised coefficients (beta values) are .039 (energy), .075 (climate), and .028 (economy).
27 nationality dummies included, 'other nationality' is reference.
**$p$<.01, *$p$<.05.

Table 3

*Summary of regression results for consumers' policy perceptions and future beliefs (displayed are the un-standardised coefficients)*

| Variable | Policy perception | | Future belief | | |
|---|---|---|---|---|---|
| | Boost economy (logistic) | Taxation (logistic) | Renewable energy[1] (linear) | Energy consumption[2] (linear) | Car fuel (logistic) |
| Energy | .094 | .043 | .032** | .018 | .059 |
| Climate | .418** | .309** | .090** | .079** | .223** |
| Economy | .113** | .004 | .015 | .003 | -.020 |
| Male | -.045 | -.069* | .064** | .064** | -.154** |
| Age | -.004 | -.008 | .004* | .007** | .002 |
| Age2 | .000 | .000 | -.000* | -.000** | .000 |
| Education | .050** | .036** | .044** | .041** | .068** |
| Finance | .121** | .070** | .028** | .030** | .066* |
| Children | .011 | .019 | .019 | .012 | .026 |
| Satisfaction | .101** | .062* | .056** | .046** | .031 |
| Unmarried | *REF* | *REF* | *REF* | *REF* | *REF* |
| Married | -.070 | -.081 | -.014 | -.013 | -.168** |
| Divorced | -.038 | -.046 | -.009 | -.006 | -.052 |
| Widowed | .027 | .089 | -.013 | -.003 | -.216* |
| Rural area | *REF* | *REF* | *REF* | *REF* | *REF* |
| Small town | .009 | .077* | -.021 | -.009 | .171** |
| Large town | .030 | .000 | -.006 | -.012 | .219** |
| Nationality dummies | *included* | *included* | *included* | *included* | *included* |
| Constant | 1.091** | .891** | 3.811** | 3.700** | .603 |
| $R^2$ | .070 | .053 | .065 | .052 | .028 |

*Note:* [1]Standardised coefficients (beta values) are .017 (energy), .054 (climate), and .009 (economy).
[2]Standardised coefficients (beta values) are .009 (energy), .047 (climate), and .002 (economy).
27 nationality dummies included, 'other nationality' is reference.
**$p$<.01, *$p$<.05.