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Individual pro-environmental behaviour in the household context

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Non-technical summary

At the national level, energy overuse is a direct (e.g. household energy use, transport choices) and indirect (via the purchase of consumption goods and services) result of the aggregation of millions of individual and household decisions. To achieve the Department for Energy and Climate Change's aim of reducing UK greenhouse gas emissions by 80% by 2050, UK citizens will have to radically and permanently change their behaviour to use significantly less carbon-intensive products and services and to reduce overall energy demand.

This paper focuses on such individual and household level decisions. The social coordination of life, caring responsibilities and time pressure are likely to dictate what people can and cannot do in terms of pro-environmental behaviour, despite their pro-environmental attitudes and concerns. Such constraints may have a larger impact on some household members than others. Using '*Understanding Society*', a large multipurpose household survey for the UK, we analyse which individual and household characteristics have an impact on individual pro-environmental behaviour, and whether individual pro-environmental behaviour is shaped by the type of households people live in. We then compare pro-environmental behaviours and attitudes of couples, by analysing whether people living together influence each other's pro-environmental behaviour, and how pro-environmental behaviours and attitudes of both members of the couple contribute to pro-environmental behaviour at the household level.

We find, consistently with previous research, that women seem to have higher pro-environmental behaviour than men, although they seem less willing to compromise their lifestyle in order to behave in a more environmentally friendly way. Having a university degree has a consistently positive correlation with pro-environmental behaviour.

Most importantly, differences in individual pro-environmental behaviour depend on the structure of the household the individual lives in. On average, people living alone and people living in couples without children have higher pro-environmental behaviour than people living in couples with children, even after controlling for their environmental attitudes and values. Although this would require further investigation, the results suggest the possibility of a life-cycle pattern of pro-environmental behaviour, which is higher for people living alone and for couples without children, but lower for people living in couples with children. The presence of children may generate constraints – in terms of time and practices – that make it harder to pursue pro-environmental behaviours.

Individual pro-environmental behaviour appears to be affected by partner's behaviour and attitudes, and when dealing with pro-environmental choices that pertain to the household level, both partners' behaviours and attitudes seem relevant for household decisions. While pro-environmental behaviours and attitudes of the female partner seem more relevant than those of the male partner in the household decision of separating items for recycling; in the decisions of whether to buy a green tariff from the energy provider, pro-environmental behaviour of the male partner seems more relevant than that of the female partner.

Overall the results suggest a complex interrelation between individual and household characteristics in the decisions about pro-environmentally friendly behaviours. Effective policies to maximise pro-environmental behaviours of individuals and minimise household's carbon footprint will need to take into account that individuals' decisions and actions depend on constraints generated by the other members of the household.

Individual Pro-environmental Behaviour in the Household Context[*]

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Abstract
This paper exploits a new large data source on environmental behaviours and attitudes of people living in the UK to analyse to what extent the household context affects pro-environmental behaviours at the individual and household levels. The results suggest that singles and people living in couples without children have higher pro-environmental behaviour than people living in couples with children. Individual pro-environmental behaviour is affected by partner's attitudes and behaviours, and both partners are equally relevant for household decisions. The results also show a positive correlation between concerns about the environment and pro-environmental behaviours.

Keywords: environmental behaviour; individuals, households

JEL Classification: D10, Q50

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1. Introduction

At the national level, energy overuse is a direct (e.g. household energy use, transport choices) and indirect (via the purchase of consumption goods and services) result of the aggregation of millions of individual and household decisions. To achieve the Department for Energy and Climate Change's aim of reducing UK greenhouse gas emissions by 80% by 2050, UK citizens will have to radically and permanently change their behaviour to use significantly less carbon-intensive products and services and to reduce overall energy demand even if substantially de-carbonised. This paper focuses on such individual and household level decisions, and analyses how individual pro-environmental behaviour depends on the household context and on the other people the individual lives with. The social coordination of life, caring responsibilities and time pressure are likely to dictate what people can and cannot do in terms of pro-environmental behaviour, despite their pro-environmental attitudes and concerns (e.g. Shove 2010). Such constraints may have a larger impact on some household members than others.

The large literature on environmental psychology has a long tradition of trying to model people's pro-environmental behaviour and ways to influence it (e.g. Barr 2006; Shove 2010). Empirically, the literature has provided evidence on how pro-environmental behaviour correlates with individual characteristics such as age, gender, religiosity, race (see e.g. Stern et al. 1993; Stern 1999; Johnson et al. 2004; Franzen and Meyer 2010). However, little attention has been given to the role of household characteristics and how the pro-environmental behaviour of the individual is correlated with that of other household members (e.g. Munro 2009). One of the main reasons is that the current empirical literature on environmental behaviour and attitudes is greatly limited by problems of data availability.

This paper uses a large scale multipurpose survey which provides data on pro-environmental behaviour of all adult members of the household. The data have been recently used to analyse selected pro-environmental behaviours at the individual level by Lynn and Longhi (2011). This paper goes beyond Lynn and Longhi (2011) by focusing on the interaction between the individual and other household members. The first contribution is the analysis of which individual and household characteristics have an impact on individual pro-environmental behaviour, and whether the impact of such individual and household characteristics vary depending on the household structure (e.g. being single rather than in a couple, presence of children). The second contribution is the comparison of pro-environmental behaviours and attitudes of couples, by analysing whether people living

together influence each other's pro-environmental behaviour, and how pro-environmental behaviours and attitudes of both members of the couple contribute to pro-environmental behaviour at the household level.

The findings suggest that individual pro-environmental behaviour differs according to the household type: on average, people living alone and people living in couples without children have higher pro-environmental behaviour than people living in couples with children irrespective of their environmental attitudes and values. Individual pro-environmental behaviour appears to be affected by partner's behaviour and attitudes, and when dealing with pro-environmental choices that pertain to the household level, both partners' behaviours and attitudes seem relevant for household decisions. We find, however, that pro-environmental behaviours and attitudes of the female partner seem more relevant than those of the male partner in the household decision of separating items for recycling; in the decisions of whether to buy a green tariff from the energy provider, pro-environmental behaviour of the male partner seem more relevant than that of the female partner. The results also consistently show a statistically significant positive correlation between own concerns about the environment and own pro-environmental behaviours, which goes against the value-action gap idea (e.g. Shove 2010). Partner's concerns about the environment, however, do not seem to have an impact on own pro-environmental behaviour.

2. Individual pro-environmental behaviour and "the others" in the household

When analysing the relationship between attitudes towards the environment and pro-environmental behaviours the literature often focuses on individuals in isolation, removed from their household context (e.g. Kollmuss and Agyeman 2002; Whitmarsh 2009). This approach assumes that people are free from household level constraints and is probably acceptable for people living alone, although little role is allowed for the constraining effects of the normative structures of everyday life such as workstyles, and accepted 'ways of consuming'. For people living with a partner the relationship between individual attitudes and behaviours is likely to become rather complex as it may partly depend on the attitudes and behaviours of the partner. Adding children and other household members within this context is likely to further complicate matters. For example, even someone who is highly concerned about the environment may end up making decisions that are less environmentally friendly (e.g. driving rather than using public transport) to accommodate the needs of other household members (e.g. the need to take children to different schools within a short time

span before going to work). Similarly, walking or cycling to work may become unfeasible, at least for some household members, if the two partners work in very different locations, or if the decision of the neighbourhood where to live depends on the preferred school catchment areas. Such differences in constraints across different types of households may significantly complicate the relationship between an individual's pro-environmental attitudes and their behaviour irrespective of their environmental values. Therefore, it may not be surprising to find that pro-environmental behaviour is comparatively lower for people with dependent children for example.

While some decisions, even if constrained by other's needs, result in individual behaviours of each member of the household (how much to drive how much clothing to wear when cold, or turning the tap off when brushing one's teeth), others result in household behaviours that are – by definition – common to all members of the household (where to live, how warm the house should be, using energy-saving light bulbs, or taking family holidays to a closer location thus reducing the number of flights taken). Most of these types of decisions are likely to involve bargaining between two or more household members. Decisions at the household level may depend on pro-environmental behaviours and attitudes of the different members of the household, on the gender role division or on task specialisation within the household (e.g. Bianchi et al. 2000) and on the economic resources that each partner brings into the relationship (e.g. Khan 2008).[1] Women may have a bigger impact on decisions that involve typically female roles; for example, if separating items for recycling is considered part of housework and she is doing most of it (e.g. Zelezny et al. 2000; Pettifor 2012). Men may have a bigger impact on financial decisions (buying a green energy tariff), if they are the main breadwinners. On the other hand, in modern households, where both partners engage in paid work and gender roles are more blurred, both men and women may have similar weight in the final household choices (e.g. Oates and McDonald 2006). There is also increasing evidence that (adult) children also play a role in the consumption decisions of the household (e.g. Dauphin et al. 2011). It is likely that individual pro-environmental behaviour and household pro-environmental choices depend on the presence – and age – of children in the household.

On top of this, exchange of opinion across household members may result in changes in individual attitudes over time. The large literature on homogamy suggests that people tend to choose partners that are similar to themselves in terms of socio-economic background and

[1] Although this literature mostly refers to decisions about housework, it is likely that similar mechanisms are in place when taking other types of decisions.

attitudes, and that partners may become more similar the longer they stay together (e.g. Kan and Heath 2006; Brynin and Ermisch 2009).

To put things more formally, we can adopt the theoretical framework on household consumption decisions originally developed by Browning and Chiappori (1998). In this model the household derives its utility from consumption. The consumption of the household (U^H) is the sum of the consumption of all household members, and each household member's consumption depends on the overall income of the household (q) and on his or her relative bargaining power (μ). The utility is maximised at the household level, rather than at the individual level. In the case of a household made of only two people, A and B, each with individual utility u^A and u^B, the maximisation problem is:

$$U^H(q,\mu)=\max_{q^A,q^B,Q}\left[\mu u^A(q^A,q^B,Q)+(1-\mu)u^B(q^A,q^B,Q)\right] \quad (1)$$

Subject to the constraint:

$$q^A+q^B+Q = q \quad (2)$$

Where q^A and q^B are the goods individually consumed by persons A and B, while Q are shared goods; q is the overall consumption, which should equal total expenditures. In this framework all income is consumed and there are no savings. Alternatively, if we think of savings as a type of consumption, they would be included in q^A, q^B and Q. Equation (2) is essentially a budget constraint once we think of the monetary value of consumption. The parameter μ summarises the decision process and is essentially a measure of the relative bargaining power of persons A and B. Hence, changes in prices may be compensated by changes in income so that the overall household utility does not change, although the individual utility of persons A and B may change (Browning and Chiappori 1998).

We can extend the interpretation of this model to environmental behaviour if, for example, we assume that besides goods consumption, persons A and B may derive utility from pro-environmental behaviour (e.g. feeling that they do their bit for the environment) at the individual level (e.g. by personally taking their bags when shopping) and at the household level (e.g. by buying a green energy tariff as a household). Persons A and B may attach different utility to their individual and collective pro-environmental behaviour and may have different bargaining power when taking household decisions. Such bargaining power (μ) may be due to relative income and resources but also, for example, on the strength of their beliefs in climate change. In the model above, individual utility also depends on the

consumption of the other person in the household: $u^A(q^A,q^B, Q)$ and $u^B(q^A,q^B, Q)$. This may include opinions of the partner. The budget constraint may include, besides the cost of consumption, time use if behaving environmentally friendly subtracts time to other activities.

The model can be extended to more than two household members (see Browning and Chiappori 1998 and Dauphin et al. 2011), where the j^{th} household member has utility u^J, consumption q^J and bargaining power μ^J.

On the basis of this theoretical framework the following sections show that individual pro-environmental behaviour depends on the household context and that pro-environmental decisions of couples depend on pro-environmental behaviour and concerns of both adult members of the household.

3. Data and descriptive statistics

3.1. Data: Understanding Society

The analysis is based on data from 'Understanding Society', the new UK Household Longitudinal Survey (UKHLS). UKHLS is a large scale multipurpose survey which includes a large amount of data on individual and household characteristics, labour market behaviour, individual and household income, together with data on environmental and other types of behaviours. Because of the multipurpose structure of the survey, it is unlikely that respondents self-select into the study on the basis of their level of interest in environmental issues. The data include overall about 90,000 people in 40,000 households (although not all can be used for the analysis in this paper); the same questions are asked to all adult members of the household, thus allowing the analysis of correlations of environmental attitudes and behaviours across household members.

Despite the longitudinal structure of the data, questions on environmental habits and behaviours are only asked in the first wave: hence, the analysis in this paper is essentially cross-sectional. Additional questions on environmental attitudes and behaviours have been asked in the fourth wave; these data are not yet available.

3.2. Measuring pro-environmental behaviour

We compute a measure of pro-environmental behaviour by combining answers to the following questions: "How often you personally…"

1. Leave your TV on standby for the night;
2. Switch off lights in rooms that aren't being used;

3. Keep the tap running while you brush your teeth;
4. Put more clothes on when you feel cold rather than putting the heating on or turning it up;
5. Decide not to buy something because you feel it has too much packaging;
6. Buy recycled paper products such as toilet paper or tissues;
7. Take your own shopping bag when shopping;
8. Use public transport (e.g. bus, train) rather than travel by car;
9. Walk or cycle for short journeys less than 2 or 3 miles;
10. Car share with others who need to make a similar journey;
11. Take fewer flights when possible.

Possible answers to all these questions are 1 Always, 2 Very often, 3 Quite often, 4 Not very often, 5 Never, 6 Not applicable, cannot do this. We recode these variables to lie between zero and four, and such that higher values identify behaviours that are more environmentally friendly. We can then sum up the answers to all these questions and create an index of pro-environmental behaviour which ranges from zero to 44. Based on 46,970 individual responses, Figure 1 shows that the distribution of the measure of pro-environmental behaviour is close to a normal distribution. The median is 20, while the mean is 20.140 (see also Table 1).

How does pro-environmental behaviour vary across household types? Table 1 shows descriptive statistics for the measure of pro-environmental behaviour by household types. The results suggest that men have on average lower pro-environmental behaviour than women, and that couples with children and single parents have lower pro-environmental behaviour than people living alone or in couples without children.

The bottom part of Table 1 focuses on couples, which may be either married or cohabiting, with or without dependent children. The descriptive statistics suggest that, within the couple, the woman seems to have higher pro-environmental behaviour than the man; the correlation between men and women is not as large as one may have expected: about 0.517, but is statistically different from zero.

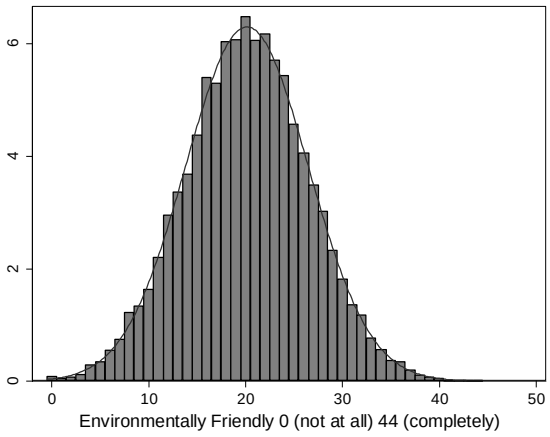

Figure 1: Measure of environmental friendliness

Table 1: Pro-environmental behaviour of people in different types of households

Pro-environmental behaviour	Observations	Min	P25	Median	Mean	P75	Max
All	46,970	0	16	20	20.140	24	44
Selected household types							
Single men	3,310	0	16	20	19.845	24	40
Single women	4,042	0	17	21	21.208	25	44
Men in couples without children	6,257	0	16	20	19.705	24	44
Women in couples without children	6,684	0	17	21	21.011	25	44
Men in couples with children	3,846	0	15	19	19.168	23	44
Women in couples with children	4,885	0	17	21	20.623	25	43
Men single parent	119	4	16	21	20.504	25	36
Women single parent	1,712	1	16	21	20.430	25	40
Couples	11,317				Correlation: 0.517*		
Men		0	15	19	19.235	23	44
Women		0	17	21	20.705	25	44

+ Significant at 5%, * Significant at 1%

Figure 2 contrasts pro-environmental behaviour of the male and female partner. The horizontal axis shows the median pro-environmental behaviour of the male partner, while the vertical axis shows the median pro-environmental behaviour of the female partner. The figure shows that there is some homogamy, but that there is also a large variation within couples. If there was perfect homogamy, i.e. both partners scored the same in the measure of pro-environmental behaviour compared to the respective medians, then all points should be aligned on a straight line. Perhaps pro-environmental behaviour is not one of the most relevant characteristics in the choice of a partner.

In the top right quadrant of the figure are those couples in which both partners score higher than the median, while in the bottom left quadrant are those couples in which both partners score below the median. We could think of all those couples as homogamous.

However, a fair number of couples are in the other two quadrants, where either she scores higher than the median and he scores lower, or he scores higher and she scores lower.

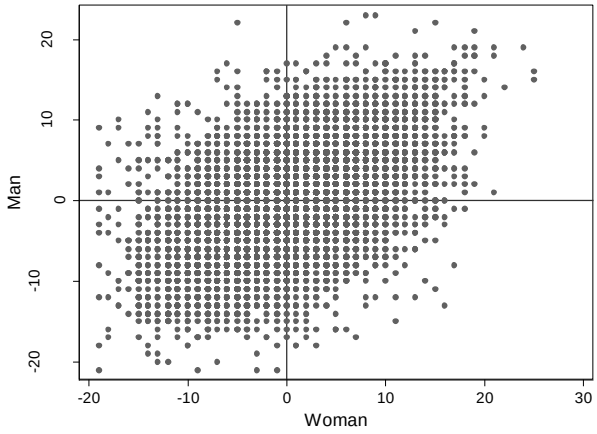

Figure 2: Average score of male and female partners compared to the median

When a large number of indicators are available, focusing on only one or few single aspects of a complex behaviour entails loss of information on all other dimensions, and may give an incomplete account of people's behaviours. On the other hand, analysing a large number of separate indicators contemporaneously might miss important correlations and might produce results too complex to summarise. Furthermore, it is possible that peoples' behaviour may seem inconsistent across domains (e.g. Kaiser et al. 1999; and more recently Steg and Vlek 2009 and Lynn forthcoming), although it is also possible that motivations for certain behaviours differ across domains, and that the environment may not be the main reason for some of the actions (see also Whitmarsh 2009). Although not perfect, the measure of pro-environmental behaviour used in this paper can be interpreted as a measure of people's overall attitudes to environmentally friendly behaviours, since respondents may decide to participate in these behaviours or not, and with different levels of intensity. Furthermore, since it encompasses different domains, the impact of non-environmental types of motivations should be reduced in this context.

It is also worth noting that although all 11 questions implicitly refer to behaviours that reduce people's carbon footprint, this measure of pro-environmental behaviour is not necessarily related to the carbon footprint of the respondent. For example, substantial saving in terms of carbon emissions can be obtained when people (e.g. couples) live together since, for example, it is only one dwelling (rather than two) that has to be heated. The focus of this paper is on people's day-to-day behaviours rather than on their carbon footprint.

This measure of pro-environmental behaviour is rather simple, and its simplicity makes it results easier to interpret. However, it has the drawback of giving equal weight to all behaviours even though they have different environmental impact (such as taking fewer flights versus buying recycled paper products). It is common in the literature to use factor or principal component analysis to combine the indices into one or few summary indicators. Factor and principal component analyses typically associate a different weight (loads) to each indicator; the weights are computed so to maximise the underlying variability of all indicators which is captured by the few factors or components (although, even in this case, the weights may not reflect environmental impact). As a robustness test we also repeat the analysis using the first loading factor of a factor analysis rather than the measure of pro-environmental behaviour. The results are robust to the use of this different measure.

3.3. Other environmental attitudes

Besides the measure of pro-environmental behaviour, the data allow us to compute a measure of environmental concern. The survey includes questions on whether the respondent agrees or disagrees with the following statements: 1. I'd like to do a bit more to help the environment; or I'd like to do a lot more to help the environment; 2. I would be prepared to pay more for environmentally friendly products; 3. If things continue on their current course, we will soon experience a major environmental disaster. We add a value of one for each statement the respondent agrees with. We also subtract one for each of the following statements the respondent agrees with: 1. The so-called 'environmental crisis' facing humanity has been greatly exaggerated; 2. The effects of climate change are too far in the future to really worry me; 3. It's not worth me doing things to help the environment if others don't do the same; 4. It's not worth Britain trying to combat climate change, because other countries will just cancel out what we do; 5. Climate change is beyond control - it's too late to do anything about it. We also subtract a value of one for each statement the respondent disagrees with: 6. People in the UK will be affected by climate change in the next 30 years; 7. People in the UK will be affected by climate change in the next 200 years.

Hence, overall the measure of environmental concern constructed in this way can be positive, for those who are concerned about environmental problems, negative, for those who are not concerned, or zero, for those who are in a more neutral position. Based on about 40,000 respondents, the mean of this variable is about -0.40 with a standard deviation of 2.22. The minimum is -7 and the maximum is +3.

Other variables relevant to analyse pro-environmental behaviour come from questions related to people's perception of their own pro-environmental behaviour. We construct a series of dummy variables to identify how people feel about what they are currently doing for the environment. The first dummy has value one for those who say that they would like to do a lot more to help the environment, as opposed to being happy with what they do at the moment. From answers to the question about how people feel about their current lifestyle we construct one dummy for those who say that they do not really do anything that is environmentally friendly or do one or two things that are environmentally friendly and zero otherwise; and one dummy for those who say that they are environmentally friendly in most things or in everything they do. Those who reply that they do quite few things that are environmentally friendly score zero in both dummies and can therefore be interpreted as the reference group. We finally have one dummy for those who say that any changes they make to help environment need to fit in with their lifestyle.

Cross-tabulations of these variables suggest that those who would like to do more for the environment are those who on average already score higher in the measure of pro-environmental behaviour. This suggests that we may have two separate groups of people: those who are positively engaged in pro-environmental behaviour, and those who do not seem to care too much about the environment. Those who claim they would like to do more to help the environment also tend to score higher in the measure of environmental concern. This may suggest that for some people behaving in a more pro-environmental way is a by-product of other types of behaviours. There is also a positive and statistically significant correlation between environmental concern of the male and female partner, around 0.360.

Bi-variate correlations cannot go very far in the analysis of pro-environmental behaviour, and multivariate analysis, taking into account all covariates, is more appropriate.

4. Method

The empirical analysis is structured into four parts. For comparison with the previous literature, we start by analysing pro-environmental behaviour at the individual level. We then analyse different types of households separately (people living alone, couples with and without children) to understand whether individual pro-environmental behaviour varies depending on the composition of the household, and whether we can detect a life-cycle pattern in pro-environmental behaviour. The third part of the analysis focuses on correlations in individual pro-environmental behaviour across couples. Finally, we compare the relevance

of the individual pro-environmental behaviour of the two members of the couple in the final household decisions.

4.1. Individual pro-environmental behaviour

We start by analysing pro-environmental behaviour at the individual level. Previous studies have already shown that pro-environmental behaviour correlates with age, gender, religiosity, race (Stern et al. 1993; Stern 1999; Johnson et al. 2004; Franzen and Meyer 2010). However, most of this evidence is based on samples much smaller than UKHLS, often including large amounts of data on environmental behaviour but few other individual and household characteristics. This first step of the analysis is intended to test the robustness of the previous results to the inclusion of various additional covariates, and to analyse the impact of individual and characteristics that have not been analysed before.

We estimate a model in which the dependent variable (EB_i) is the measure of pro-environmental behaviour of person *i*, and among the explanatory variables we include individual and household characteristics (X'_{Ii} and X'_{Hi}) and environmental attitudes and beliefs (Z'_i):

$$EB_i = \alpha + X'_{Ii}\,\beta_I + X'_{Hi}\,\beta_H + Z'_i\,\gamma + \varepsilon_i \qquad (3)$$

In X'_{Ii} we include age, a dummy for whether the respondent is of pensionable age, a dummy for women, dummies for education level, employment status. For those who have a job we also include one dummy for part-time and one for temporary job; those with no job and those with a full-time (for the first dummy) or a permanent job (for the second dummy) have a value of zero. The impact of these two variables has to be interpreted in conjunction with the impact of employment status. In X'_{Hi} we include a dummy for married or cohabiting. To analyse the impact of levels of income on pro-environmental behaviour we also include wages for those in paid employment (in X'_{Ii}), and equivalised household income (in X'_{Hi}).

Since UKHLS oversamples certain ethnic minority groups (McFall 2012) we also include in X'_{Ii} dummies for those who belong to the (oversampled) ethnic minority groups and for immigrants (born outside the UK). Although they are not the focus of our analysis, these dummies are necessary to avoid bias due to possible differences in pro-environmental behaviour across ethnic groups (e.g. Johnson et al. 2004).

Among household characteristics we also include dummies for homeownership, dummies for the presence of children of various ages and dummies for the presence of other adults in the household (other than the respondent for singles and other than the two members of the couple for those who are married or cohabiting). We also include dummies for the nine English Government Office Regions plus Scotland, Wales, and Northern Ireland. Finally, we include a dummy for those households who live in rural areas.

In Z'_i we include a dummy for those people who claim they would like to do more to help the environment, one for those who say they do little that is environmentally friendly, one for those who say they do many things that are environmentally friendly. We also include a dummy for those respondents who state that any changes they make to help the environment need to fit with their lifestyle, as well as the measure of environmental concern. These variables should pick up the correlation of individual pro-environmental behaviour with people's perception of the relevance of environmental problems and their attitudes towards them (these are correlations, not causations). We can treat the dependent variable (EB_i) as continuous and estimate Equation (1) by OLS.

After estimating equation (3) including all respondents, we also repeat the estimation separately by selected household types. It is possible that individual pro-environmental behaviour differ depending on the type of household they live in. For example, even people concerned with the environment may behave is a comparatively less pro-environmental way if they have young children. Substantial differences across people with different household types may indicate the presence of a life-cycle pattern in people's pro-environmental behaviour. Here we compare pro-environmental behaviour of single men and women, men and women in couples without children, men and women in couples with children, and single mothers. There are not enough single fathers in our data to allow the estimation of a separate model.

4.2. Correlations across household members

Given the household structure of UKHLS, we can analyse whether there is a correlation of pro-environmental behaviour across members of the household. Here for simplicity we focus on couples and estimate a model in which the measure of pro-environmental behaviour of the male partner is a function of his partner's behaviour and vice versa:[2]

[2] We also exclude household with other adult members. Based on the our theoretical framework, additional adults should not merely be included as dummies, but their individual pro-environmental behaviour and

$$EB_{ih}^{M} = \alpha_1 + \eta_1 EB_{ih}^{F} + X'_{Iih}{}^{M} \beta_{I1} + X'_{Hih} \beta_{H1} + Z'_{ih}{}^{M} \gamma_1 + \varepsilon_{ih1}$$
$$EB_{ih}^{F} = \alpha_2 + \eta_2 EB_{ih}^{M} + X'_{Iih}{}^{F} \beta_{I2} + X'_{Hih} \beta_{H2} + Z'_{ih}{}^{F} \gamma_2 + \varepsilon_{ih2} \quad (4)$$

EB_i^M and EB_i^F are the measures of pro-environmental behaviour of the male and female partner in household *h*. Here the dependent variable in the first equation is used as one of the explanatory variables in the other equation, thus creating simultaneity. The two equations are estimated jointly by means of three-stages least squares (Zellner and Theil 1962), where the endogenous variable (the pro-environmental behaviour of the partner) is instrumented by the individual characteristics and beliefs.

$X'_{Iih}{}^{M}$, and $X'_{Iih}{}^{F}$ are the individual characteristics of the male and female partner and include the same variables as X'_{Ii} in equation (3); X'_{Hih} includes the same household characteristics as X'_{Hi} in equation (3) and is the same for both partners. $Z'_{ih}{}^{M}$ and $Z'_{ih}{}^{F}$ are the environmental attitudes and beliefs of the male and female partners and include the same variables as $Z'_i{}^{F}$ in equation (3).

Finally, we analyse household dynamics to tease out how environmental attitudes and behaviours of the two partners impact on environmental decisions at the household level. Hence, we estimate models in which the dependent variable is a behaviour which relates to the whole household (B_h) and among the explanatory variables we have the measure of pro-environmental behaviour of both partners:

$$B_h = \alpha + X'_h \beta + \eta_F EB_{ih}^{M} + \eta_M EB_{ih}^{F} + Z'_{ih}{}^{M} \gamma_M + Z'_{ih}{}^{F} \gamma_F + \varepsilon_{ih} \quad (5)$$

The dependent variable B_h is either a dummy for whether the household always separates items for recycling (almost 80% of households say they always separate items for recycling), or a dummy for whether the household is on a green energy tariff (just above 2% of households are on a green tariff). Among the explanatory variables we have the household characteristics plus a dummy for whether married as opposed to cohabiting and a dummy for the presence of old (pensionable age) people in the household (X'_h), the measures of pro-environmental behaviour (EB_{ih}^{M} and EB_{ih}^{F}) and the measures of environmental attitudes and beliefs ($Z'_{ih}{}^{M}$ and $Z'_{ih}{}^{F}$) of the male and female partner. In the models about recycling we also include among the explanatory variables a dummy which is one if the respondents claim

attitudes should also be included in the model, thus making the interpretation of the results too complex for the scope of this paper.

that there is lack of – some – of the recycling facilities in the area (bottle banks; paper, plastic bag recycling points, or garden waste recycling facilities). In the green tariff models we also include the total number of rooms in the house where the household lives.

The main aim of these last two models is to have an idea of the relative contribution of the two household members in the decisions of separating items for recycling and of buying a green energy tariff. When analysing decisions at the household level, often researchers include characteristics of the head of the household, which is often the male partner. However, there is yet no evidence guiding this choice: whether it is the male or the female partner who has a larger impact on household decisions and whether their individual contribution to the household decision depends on the type of pro-environmental behaviour we analyse, is still an open question.

Finally, since both dependent variables are dummies, the models are estimated by probit.

5. Results

5.1. Individual pro-environmental behaviour

Table 2 shows the results of the models analysing correlates of pro-environmental behaviour at the individual level, as in Equation (3). The first three columns show models including the main household characteristics, while the last three show models including details of the household structure to analyse the additional impact of belonging to a certain type of household.

The results are in line with the previous empirical literature (see e.g. Mobley et al. 2010; Lynn and Longhi 2011) and suggest that older people, women, and people with higher levels of education score on average higher in the measure of pro-environmental behaviour, although people who are of pensionable age score comparatively lower. People living in households with young children or other adults (not the partner) score comparatively lower. These additional adults may be adult children or grandparents, other relatives, or non relatives. Because of small numbers it is not possible to disaggregate the impact of different types of additional adults. The impact of the absence of children is clear from the last three columns of Table 2, where the dummies for children become statistically insignificant, but clear differences emerge across household types. Single men and women, and men and women living in couples without children have higher in pro-environmental behaviour than men and women in all other household types, with singles scoring on average higher than

people in couples. This is consistent with the idea that other household members are likely to impose constraints that may have a negative impact on individual pro-environmental behaviour. Although a more thorough analysis should be based on repeated observations over time, these results are suggestive of a life-cycle pattern of pro-environmental behaviour. This pattern may be U-shaped, and the lowest point may be reached when the couple has dependent children.

Individual pro-environmental behaviour also seems to be correlated with economic activity. Unemployed people, those who have a temporary job and those who work part-time have higher pro-environmental behaviour, while self-employed and – to a lesser extent – those in paid employment score comparatively lower than inactive people (the reference group). Higher equivalised household income and higher wages are correlated with lower pro-environmental behaviour. This may suggest that poorer people have on average higher pro-environmental behaviour than richer ones. This difference, however, may be due to financial difficulties – preventing people from adopting more expensive and less environmentally-friendly behaviours – rather than to genuine concern about the environment (a rebound effect e.g. Chitnis et al. 2013; Druckman et al. 2011). The impact of individual wages becomes statistically insignificant if the measures of environmental attitudes are completely excluded from the model, while the impact of education almost doubles. This may suggest a correlation between these variables and pro-environmental attitudes of the individual.

Perhaps surprisingly, people living in privately rented accommodations (the reference group) seem to have higher pro-environmental behaviour than homeowners and than people living in socially rented accommodations. Probably because of constraints, people living in rural areas have lower pro-environmental behaviour than those living in urban areas.

Although not shown in the table for reasons of space, the models also include dummies for region of residence, for foreign born and for belonging to an ethnic minority. The results suggest that people living in London have on average higher pro-environmental behaviour, consistently with Glaeser and Kahn (2010), who find that cities promote more environmentally sustainable lifestyles than their suburbs. People born in the UK seem to have lower pro-environmental behaviour on average than those born abroad (immigrants), but there do not seem to be obvious differences across ethnic groups.

Despite the fact that many of the variables included in the model have a statistically significant impact on individual pro-environmental behaviour, we could argue that the impact is often relatively small: coefficients smaller than one suggest that the impact of most

variables, singularly taken, is not enough to move the individual pro-environmental behaviour up one point (up one action, e.g. moving from 20 to 21) in the scale of pro-environmental behaviour, which ranges from 0 to 44. The largest coefficients are found for education: those with a degree seem to score on average 2.3 points higher in the scale of pro-environmental behaviour when we do not account for pro-environmental attitudes, but only about 1.4-1.6 points higher when we do account for attitudes. The decrease in the impact of education after controlling for attitudes may suggest that formal education correlates with more awareness or interest in environmental problems. However, typically education increases wages and household income, which partly offsets the positive impact of education: earning £1,000 more each month on wages reduces pro-environmental behaviour by 1/10 of behaviours, and we find a similar (slightly larger) impact for equivalised household income. This is also consistent with the idea that poorer people may have comparatively higher pro-environmental behaviour because they cannot afford the cost of lower pro-environmental behaviour: they may use public transport because they cannot afford a car or put more clothes on when cold because they cannot afford higher heating bills. This is consistent with the literature on rebound effects which would in turn suggest that financial aids may have a negative impact on pro-environmental behaviour (Chitnis et al. 2013; Druckman et al. 2011). Being self-employed, on the other hand, is associated with about 1.3-1.5 fewer pro-environmental behaviours. Having a mortgage has a similar negative impact.

There does not seem to be a relevant discrepancy between people's perception of what they do for the environment and how they score in the measure of pro-environmental behaviour. Those who say they do many things that are environmentally friendly and those who score higher in the measure of environmental concern have higher pro-environmental behaviour. Those who say they do only few things that are environmentally friendly, and those who say that the changes they make to help the environment need to fit in with their lifestyle score lower in the measure of pro-environmental behaviour. However, those who say they do little that is environmentally friendly score only about 2.3 points lower in the measure of pro-environmental behaviour, while those who say they do many things score only 1.6 points higher. Overall, the difference between these two groups is only about four behaviours out of 44. This is, perhaps not as much as one would have expected but is probably because most people concentrate in the middle of the distribution of pro-environmental behaviour (see Figure 1) with very few people scoring very low, and few scoring very high. A precise description of who scores very high or very low is out of the scope of this paper, and left for future research.

The main reason for adding the two variables 'I do little that is environmentally friendly' and 'I do many things that are environmentally friendly' to the model was to test whether there is a consistency between how many environmentally friendly behaviours people adopt (the measure of pro-environmental behaviour) and how much they think they do for the environment. However, these are not variables that can *explain* pro-environmental behaviour and the direction of causality for such variables is questionable. Hence, we do not use them in the rest of the models. Excluding these two variables from the models does reduce the models fit but still shows the relevance of the other three environmental attitudes.

Table 2: Determinants of individual pro-environmental behaviour

	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.016*	0.031*	0.035*	0.013*	0.028*	0.032*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Of pensionable age	-0.467*	-0.506*	-0.861*	-0.459*	-0.506*	-0.857*
	(0.132)	(0.135)	(0.138)	(0.134)	(0.137)	(0.140)
Female	0.888*	0.976*	1.209*	0.878*	0.918*	1.171*
	(0.060)	(0.061)	(0.062)	(0.105)	(0.108)	(0.110)
Married/Cohabiting	-0.186+	-0.060	-0.033	-0.017	0.077	0.120
	(0.077)	(0.080)	(0.081)	(0.127)	(0.132)	(0.134)
Single men				0.680*	0.664*	0.695*
				(0.167)	(0.173)	(0.177)
Single women				0.793*	0.863*	0.920*
				(0.161)	(0.168)	(0.172)
Men in couples without children				0.372*	0.417*	0.439*
				(0.142)	(0.147)	(0.150)
Women in couples without children				0.434*	0.580*	0.575*
				(0.131)	(0.136)	(0.140)
Men in couples with children				0.096	0.100	0.222
				(0.173)	(0.179)	(0.183)
Women in couples with children				0.087	0.126	0.170
				(0.159)	(0.164)	(0.167)
Men single parent				1.100	1.233	1.533+
				(0.620)	(0.652)	(0.647)
Women single parent				-0.102	-0.065	-0.031
				(0.205)	(0.213)	(0.217)
Degree	1.355*	1.595*	2.294*	1.360*	1.604*	2.303*
	(0.109)	(0.112)	(0.113)	(0.109)	(0.112)	(0.114)
Other higher qualification	0.510*	0.737*	1.156*	0.518*	0.750*	1.168*
	(0.116)	(0.120)	(0.121)	(0.116)	(0.120)	(0.121)
A levels	0.278*	0.383*	0.692*	0.288*	0.397*	0.706*
	(0.104)	(0.106)	(0.108)	(0.104)	(0.107)	(0.108)
GCSEs	0.161	0.153	0.335*	0.169	0.163	0.346*
	(0.100)	(0.102)	(0.103)	(0.100)	(0.102)	(0.103)
Self-employed	-1.296*	-1.482*	-1.407*	-1.316*	-1.497*	-1.433*
	(0.137)	(0.143)	(0.147)	(0.139)	(0.144)	(0.148)
In paid employment	-0.451*	-0.635*	-0.677*	-0.457*	-0.638*	-0.684*
	(0.105)	(0.108)	(0.111)	(0.105)	(0.109)	(0.112)
Unemployed	0.399*	0.330+	0.382+	0.399*	0.330+	0.380+

	(0.144)	(0.147)	(0.149)	(0.145)	(0.148)	(0.150)
Has job which is temporary	0.567*	0.619*	0.721*	0.552*	0.601*	0.702*
	(0.136)	(0.142)	(0.146)	(0.136)	(0.142)	(0.146)
Has a job which is part-time	0.475*	0.524*	0.596*	0.506*	0.560*	0.635*
	(0.096)	(0.099)	(0.101)	(0.097)	(0.100)	(0.102)
Eq. annual househ. income (1,000)	-0.146*	-0.159*	-0.129*	-0.144*	-0.158*	-0.126*
	(0.028)	(0.029)	(0.030)	(0.028)	(0.029)	(0.030)
Usual monthly wage (1,000)	-0.087+	-0.103*	-0.066	-0.091*	-0.106*	-0.072
	(0.034)	(0.036)	(0.037)	(0.035)	(0.036)	(0.037)
Home owned outright	-0.447*	-0.389*	-0.429*	-0.441*	-0.389*	-0.428*
	(0.128)	(0.132)	(0.136)	(0.129)	(0.133)	(0.137)
Home owned with mortgage	-1.067*	-1.137*	-1.186*	-1.065*	-1.134*	-1.187*
	(0.112)	(0.117)	(0.120)	(0.113)	(0.117)	(0.121)
Home social rent	-0.594*	-0.748*	-0.896*	-0.589*	-0.743*	-0.891*
	(0.133)	(0.138)	(0.140)	(0.133)	(0.138)	(0.140)
Children aged 0-2	-0.331*	-0.401*	-0.410*	-0.177	-0.215	-0.254
	(0.128)	(0.132)	(0.135)	(0.147)	(0.151)	(0.155)
Children aged 3-4	-0.106	-0.142	-0.136	0.007	-0.008	-0.021
	(0.138)	(0.144)	(0.148)	(0.145)	(0.151)	(0.155)
Children aged 5-11	-0.146	-0.138	-0.096	0.009	0.042	0.059
	(0.099)	(0.103)	(0.106)	(0.117)	(0.121)	(0.124)
Children aged 12-15	-0.188	-0.166	-0.152	-0.101	-0.066	-0.065
	(0.110)	(0.113)	(0.116)	(0.116)	(0.120)	(0.122)
Other adults in household	-0.391*	-0.445*	-0.484*			
	(0.083)	(0.086)	(0.089)			
Rural area	-0.453*	-0.385*	-0.398*	-0.447*	-0.381*	-0.393*
	(0.087)	(0.090)	(0.093)	(0.087)	(0.090)	(0.093)
Would like to do more to help environ.	0.074	-0.300*		0.074	-0.299*	
	(0.073)	(0.075)		(0.073)	(0.075)	
Do little that is environ. friendly	-2.324*			-2.323*		
	(0.070)			(0.070)		
Do many things environ. friendly	1.623*			1.622*		
	(0.095)			(0.095)		
Changes to need to fit with lifestyle	-0.487*	-0.727*		-0.490*	-0.730*	
	(0.064)	(0.066)		(0.064)	(0.066)	
Environmental concern	0.421*	0.557*		0.421*	0.556*	
	(0.017)	(0.017)		(0.017)	(0.017)	
Constant	24.029*	23.032*	21.787*	23.627*	22.594*	21.308*
	(0.258)	(0.260)	(0.257)	(0.257)	(0.260)	(0.257)
Adjusted R^2	0.174	0.123	0.082	0.174	0.123	0.083
Observations	36,767	36,767	36,767	36,767	36,767	36,767

Standard errors in parenthesis; + Significant at 5%, * Significant at 1%

Other explanatory variables: dummies for ethnic group, for foreign born, and for (government office) region of residence. Reference groups: other household types (two or more unrelated adults, families with adult children etc.); no qualification (education); inactive (labour market status); permanent job or no job, and full-time job or no job (job characteristics); private rent (home ownership); no children (children of different ages).

For a more detailed analysis of how pro-environmental behaviour may differ across household types, Table 3 shows models similar to the ones in column (2) of Table 2, but estimated separately for single men and women (columns (1) and (2)), men and women in

couples with and without children (columns (3) to (6)), and women who are the head of a single parent household (column (7)), for a total of seven separate models.

The comparison of the intercept in these seven models suggests that pro-environmental behaviour is highest for single women, followed by men and women in couples without children (maybe these are the household types that require fewer compromises between household members). Pro-environmental behaviour is lowest for men and women in couples with children, while single men and single mothers score somewhere in between.

The impact of the covariates has to be interpreted in comparison with people who do not have that specific characteristic, but who are of the same sex and have a similar household structure. However, in these models few explanatory variables seem to have an impact independently of the household structure, thus suggesting that household structure may be one of the most important drivers of variations in individual pro-environmental behaviour. Only three characteristics seem to have an impact on all household types. The first is education: as before, those with a degree have on average higher pro-environmental behaviour. The other two characteristics relate to environmental attitudes: those who are concerned about the environment have higher pro-environmental behaviour, while those who believe that the changes they make to help the environment need to fit in with their lifestyle have lower pro-environmental behaviour compared to people with a similar household structure.

In addition to these characteristics, among single men those who are self-employed have lower pro-environmental behaviour than those in other labour market statuses. There do not seem to be relevant differences among people with different job characteristics and income levels. However, those who say they would like to do more things to help the environment on average score lower in the measure of pro-environmental behaviour. Among single women, those with higher household income have lower pro-environmental behaviour, while those in a part-time job have comparatively higher pro-environmental behaviour. Similarly to single men, single women who say they would like to do more to help the environment have on average lower pro-environmental behaviour.

Column (3) of Table 3 suggests that, among men living in couples without children, those who are self-employed and those who are in a paid job have lower pro-environmental behaviour; however, those in a temporary and those in a part-time job score comparatively higher. Those who have a mortgage, those who live in a socially rented accommodation, and those who live in a rural area have lower pro-environmental behaviour. Among women in

couples without children, those who are older have higher pro-environmental behaviour. Job characteristics do not seem to have an impact on pro-environmental behaviour; however, those with higher equivalised household income, those who have a mortgage and those who live in socially rented accommodations have lower pro-environmental behaviour. Similarly to men, those who live in a rural area have lower pro-environmental behaviour than those living in an urban area.

Columns (5) and (6) show the models estimated for men and women in couples with children. Among men, it is those who are self-employed and those who own their home with a mortgage who have lower pro-environmental behaviour. Among women, those who are older have higher pro-environmental behaviour, while those who have higher wages and those who own their home with a mortgage have lower pro-environmental behaviour. Finally, the results for women who are a single parent suggest that it is those who are older who have higher pro-environmental behaviour. Those who are in a paid job have lower pro-environmental behaviour, although being in a part-time job seems to counterbalance this effect, consistently with the idea of constraints. Also in this case, those who own their home with a mortgage have lower pro-environmental behaviour.

Table 3: Determinants of individual pro-environmental behaviour – selected household types

	(1) Single men	(2) Single women	(3) Men in couples without children	(4) Women in couples without children	(5) Men in couples with children	(6) Women in couples with children	(7) Women single parent
Age	0.006	-0.003	-0.012	0.036*	0.021	0.078*	0.074+
	(0.012)	(0.012)	(0.010)	(0.009)	(0.018)	(0.018)	(0.029)
Of pensionable age	-0.292	0.137	0.223	-0.467	1.545	-3.917	-4.128
	(0.470)	(0.386)	(0.281)	(0.248)	(1.885)	(4.152)	(3.708)
Degree	1.238*	1.449*	1.038*	1.710*	1.813*	1.251*	0.423
	(0.405)	(0.397)	(0.258)	(0.275)	(0.371)	(0.370)	(0.685)
Other higher qualification	0.550	0.287	0.368	0.624+	1.415*	0.390	0.382
	(0.470)	(0.365)	(0.306)	(0.273)	(0.423)	(0.394)	(0.647)
A levels	0.232	0.598	-0.307	0.089	0.362	0.331	-0.920
	(0.374)	(0.412)	(0.248)	(0.283)	(0.377)	(0.377)	(0.583)
GCSEs	-0.249	0.418	-0.231	0.140	0.424	0.261	-0.494
	(0.404)	(0.352)	(0.275)	(0.238)	(0.371)	(0.357)	(0.514)
Self-employed	-1.542*	-1.065	-2.021*	-0.754	-1.736*	0.019	-1.893
	(0.533)	(0.677)	(0.359)	(0.432)	(0.570)	(0.452)	(1.091)
In paid employment	0.417	-0.908	-0.873+	-0.585	-0.180	-0.155	-1.851+
	(0.485)	(0.467)	(0.341)	(0.314)	(0.537)	(0.325)	(0.755)
Unemployed	0.910	0.664	0.205	-0.660	0.382	0.506	0.280
	(0.480)	(0.600)	(0.471)	(0.484)	(0.616)	(0.547)	(0.521)
Has temporary job	0.672	0.587	1.258*	0.818	0.869	0.602	1.369
	(0.586)	(0.611)	(0.410)	(0.431)	(0.504)	(0.457)	(0.961)
Part-time job	-0.296	1.502*	0.725+	0.510	0.887	0.028	1.179+
	(0.555)	(0.465)	(0.363)	(0.276)	(0.476)	(0.252)	(0.587)
Equiv. household income (thousands)	-0.092	-0.279+	-0.100	-0.137+	-0.006	-0.056	0.013
	(0.110)	(0.133)	(0.061)	(0.057)	(0.114)	(0.084)	(0.249)
Monthly wages (thousands)	-0.297	0.015	-0.120	-0.062	-0.094	-0.370*	-0.176
	(0.174)	(0.207)	(0.095)	(0.121)	(0.093)	(0.122)	(0.389)
Home owned outright	0.303	0.077	-0.123	-0.149	-0.480	-0.602	-0.327
	(0.401)	(0.396)	(0.321)	(0.302)	(0.516)	(0.443)	(1.059)
Home owned with mortgage	-0.642	-0.425	-0.961*	-0.974*	-0.782+	-0.921*	-1.287+
	(0.378)	(0.410)	(0.293)	(0.277)	(0.333)	(0.293)	(0.558)

Home social rent	0.721	-0.416	-1.184*	-0.767+	-0.201	-0.257	0.156
	(0.387)	(0.396)	(0.385)	(0.362)	(0.410)	(0.358)	(0.425)
Living as a couple but not married			-0.079	-0.048	-0.276	-0.500+	
			(0.244)	(0.227)	(0.289)	(0.245)	
Children 0-2					-0.177	-0.022	-0.500
					(0.281)	(0.252)	(0.479)
Children 3-4					0.089	0.226	-0.344
					(0.259)	(0.225)	(0.449)
Children 5-11					0.046	0.086	-0.312
					(0.248)	(0.214)	(0.397)
Children 12-15					-0.170	-0.483	-0.565
					(0.291)	(0.258)	(0.474)
Rural area	0.014	0.165	-0.396+	-0.424+	-0.340	-0.314	0.642
	(0.343)	(0.283)	(0.197)	(0.185)	(0.290)	(0.245)	(0.510)
Would like to do more for environment	-0.814*	-0.599+	0.026	-0.374	-0.064	-0.204	-0.866+
	(0.295)	(0.267)	(0.203)	(0.192)	(0.244)	(0.209)	(0.381)
Changes need to fit in with lifestyle	-0.382	-0.967*	-0.710*	-0.723*	-0.879*	-1.186*	-0.807+
	(0.254)	(0.232)	(0.171)	(0.163)	(0.224)	(0.196)	(0.354)
Environmental concern	0.594*	0.593*	0.499*	0.567*	0.550*	0.486*	0.566*
	(0.060)	(0.056)	(0.040)	(0.041)	(0.056)	(0.052)	(0.094)
Constant	22.360*	26.226*	24.544*	24.194*	21.966*	21.078*	22.887*
	(0.947)	(0.909)	(0.757)	(0.691)	(1.127)	(0.901)	(1.442)
Adjusted R^2	0.083	0.096	0.102	0.110	0.132	0.100	0.091
Observations	2,384	2,953	5,062	5,337	3,094	3,938	1,323

Standard errors in parenthesis; + Significant at 5%, * Significant at 1%

Other explanatory variables: dummies for ethnic group, for foreign born, and for (government office) region of residence.

5.2. Correlations within couples

Table 4 shows the results of the estimation of Equation (2), which relates individual pro-environmental behaviour to the pro-environmental behaviour and beliefs of the partner. The first two columns focus on the relevance of the partner's pro-environmental behaviour, while the last two columns also include other types of environmental attitudes and behaviours. The results suggest that men and women whose partner has higher pro-environmental behaviour are more likely to have high pro-environmental behaviour themselves. The regression coefficients are 0.435-0.555 for men and 0.402-0.461 for women. In both models, both coefficients are statistically different from zero, but not statistically different from each other. Hence, having a partner who scores two points higher in the measure of pro-environmental behaviour results in roughly one point higher score in own pro-environmental behaviour. This does not necessarily mean that partners have a large influence on each other's pro-environmental behaviour, but at least that partners tend to have on average relatively similar levels of pro-environmental behaviour.

Other types of environmental attitudes of the partner do not seem to be relevant, with one exception: women's pro-environmental behaviour seem to be comparatively lower if the partner thinks that any changes he makes to help the environment need to fit in with his lifestyle. Her opinion on this matter, however, does not seem to influence his pro-environmental behaviour (a Wald test on the two coefficients suggests that the coefficient for men is statistically different from the coefficient for women). It is interesting to contrast these coefficients with the ones related to own opinions: women who think the changes they make to help the environment need to fit in with their lifestyle have on average lower pro-environmental behaviour than those who do not think so, and the impact of this belief is larger for women than for men (although, statistically, the two coefficients do not seem to be different from each other). Overall this may suggest a higher importance of lifestyle for women than for men.

In all cases, own pro-environmental attitudes and behaviours are more relevant than those of the partner. Consistently with the results in the previous tables, people who think the changes they do to help the environment need to fit in with their lifestyle have lower pro-environmental behaviour, while those who are more concerned about the environment have higher pro-environmental behaviour on average. The comparison of the regression coefficients suggests that the impact of these variables is larger for women than for men. The results of the other covariates are also in line with the results in the previous tables: age has a positive impact on pro-environmental behaviour for women; people with a degree have

higher pro-environmental behaviour; self-employed men have lower pro-environmental behaviour. People in a part-time job, men in a temporary job have higher pro-environmental behaviour, while people on higher wages have lower pro-environmental behaviour. Having a mortgage, being a social renter, and the presence of other adults in the household has a negative correlation with pro-environmental behaviour of the male, but not of the female partner. Living in a rural area has a negative correlation with pro-environmental behaviour of the female but not of the male partner. This suggests that, even for those living in the same household, male and female partners may perceive constraints differently, so that the same situation may have a different impact on pro-environmental behaviour of the two members of the couple. This may be the result, for example, of task divisions within the household.

Table 4: Determinants of pro-environmental behaviour of couples

	Male Partner	Female Partner	Male Partner	Female Partner
Partner				
Pro-environmental behaviour partner	0.435*	0.402*	0.555*	0.461*
	(0.044)	(0.040)	(0.081)	(0.065)
Would like to do more to help the environment			-0.012	-0.190
			(0.134)	(0.131)
Changes need to fit in with lifestyle			0.078	-0.274+
			(0.132)	(0.124)
Environmental concern			-0.087	-0.066
			(0.051)	(0.041)
Own				
Would like to do more to help the environment	-0.011	-0.102	0.083	-0.073
	(0.125)	(0.122)	(0.135)	(0.131)
Changes need to fit in with lifestyle	-0.576*	-0.607*	-0.389*	-0.567*
	(0.115)	(0.111)	(0.128)	(0.118)
Environmental concern	0.361*	0.385*	0.364*	0.392*
	(0.030)	(0.032)	(0.032)	(0.033)
Age	0.003	0.026*	0.001	0.022*
	(0.007)	(0.007)	(0.007)	(0.007)
Of pensionable age	0.069	-0.412	0.076	-0.395
	(0.230)	(0.219)	(0.220)	(0.205)
Degree	1.116*	1.054*	0.970*	0.980*
	(0.182)	(0.198)	(0.182)	(0.203)
Other higher qualification	0.579*	0.204	0.519*	0.170
	(0.201)	(0.188)	(0.190)	(0.173)
A levels	-0.074	0.189	-0.073	0.141
	(0.166)	(0.185)	(0.154)	(0.171)
GCSEs	-0.023	-0.010	-0.024	-0.021
	(0.172)	(0.164)	(0.159)	(0.151)
Self-employed	-1.694*	-0.114	-1.543*	-0.046
	(0.237)	(0.266)	(0.240)	(0.245)
In paid employment	-0.402	-0.182	-0.352	-0.167
	(0.218)	(0.198)	(0.204)	(0.184)
Unemployed	0.386	0.017	0.361	-0.018

	(0.279)	(0.308)	(0.258)	(0.283)
Has temporary job	0.526+	0.420	0.469+	0.382
	(0.254)	(0.270)	(0.236)	(0.250)
Has part-time job	0.463+	0.323+	0.423	0.282
	(0.234)	(0.157)	(0.221)	(0.145)
Equivalised household income (thousands)	-0.048	-0.078	-0.029	-0.072
	(0.048)	(0.045)	(0.049)	(0.046)
Monthly wages (thousands)	-0.119+	-0.218*	-0.112+	-0.190*
	(0.050)	(0.078)	(0.047)	(0.073)
Home owned outright	-0.182	0.087	-0.175	0.086
	(0.227)	(0.223)	(0.226)	(0.222)
Home owned with mortgage	-0.712*	-0.230	-0.622*	-0.176
	(0.197)	(0.198)	(0.204)	(0.208)
Home social rent	-0.977*	0.095	-0.911*	0.133
	(0.245)	(0.243)	(0.247)	(0.247)
Living as a couple but not married	-0.045	0.014	-0.022	-0.004
	(0.164)	(0.161)	(0.163)	(0.160)
Children 0-2	-0.104	-0.312	-0.069	-0.285
	(0.179)	(0.182)	(0.179)	(0.181)
Children 3-4	-0.044	0.094	-0.066	0.103
	(0.205)	(0.202)	(0.206)	(0.201)
Children 5-11	-0.171	-0.009	-0.162	0.009
	(0.154)	(0.152)	(0.154)	(0.152)
Children 12-15	-0.084	-0.012	-0.081	0.005
	(0.177)	(0.172)	(0.177)	(0.172)
Other adults in household	-0.358+	-0.025	-0.339+	0.016
	(0.143)	(0.141)	(0.143)	(0.143)
Rural area	-0.157	-0.301+	-0.106	-0.280+
	(0.142)	(0.139)	(0.145)	(0.140)
Constant	13.259*	14.356*	10.263*	13.254*
	(1.187)	(0.998)	(2.036)	(1.571)
Observations	8,487		8,487	

Standard errors in parenthesis; + Significant at 5%, * Significant at 1%
Other explanatory variables: dummies for ethnic group, for foreign born, and for (government office) region of residence.

Finally, Tables 5 and 6 analyse the impact of his and her individual pro-environmental attitudes and behaviours on household decisions of whether to recycle (Table 5) and on whether to buy a green tariff from the energy supplier (Table 6). Since the dependent variables in this case are binary and the models are estimated by probit, Tables 5 and 6 show marginal effects.

The results in Table 5 suggest that households are more likely to separate items for recycling if they are homeowners (maybe these households are less likely to move and may be more familiar with the recycling facilities available in the area), and if there are teenagers or older people in the household. The presence of young children seems to have the opposite impact. Couples who are cohabiting but not married are also on average less likely to separate items for recycling than those who are married. Households living in rural areas are

more likely to separate items for recycling, but comparatively less so if the respondent claims that there is lack of – some – of the recycling facilities in the area.

If one or both partners have high pro-environmental behaviour, the household is more likely to separate items for recycling. Having a pro-environmental behaviour ten points higher up the scale (for example a score of 31 rather than 21) increases the probability that the household separate items for recycling by about 4-5 percent, holding constant the pro-environmental behaviour of the partner. Given the correlation of pro-environmental behaviour within couples, it is likely that if one of the partner scores 10 points higher, the other partner also scores 10 points higher, which therefore increases the probability that the household separates items for recycling by about 9 percent. This figure seems rather high if we account that most household (80%) already claim that they "always separate items for recycling". However, it is relatively unlikely that people move 10 points higher in the measure of pro-environmental behaviour (1-2 points is more likely to be the norm, see the coefficients in the previous tables).

It is worth noting that, although the marginal effect for women is similar to that for men, the two are statistically different from each other, suggesting that her pro-environmental behaviour has a bigger impact than his on this type of household decision. If one or both partners score high in the measure of concern for the environment, the household is more likely to separate items for recycling, while this probability decreases if one or both partners think that the changes they make to help the environment need to fit in with their lifestyle. In both cases the coefficients for men and women are not statistically different from each other. These results are consistent with Oates and McDonald (2006), who find that recycling is often initiated and sustained by women, but that this activity is done jointly by different household members.

Table 5: Household separates items for recycling

	(1)	(2)	(3)
Home owned outright	0.120*	0.123*	0.123*
	(0.013)	(0.013)	(0.013)
Home owned with mortgage	0.075*	0.088*	0.078*
	(0.013)	(0.012)	(0.012)
Home social rent	-0.022	-0.010	-0.014
	(0.016)	(0.016)	(0.016)
Equivalised household income	0.004	0.004	0.001
	(0.003)	(0.003)	(0.003)
Living as a couple but not married	-0.044*	-0.040*	-0.047*
	(0.011)	(0.011)	(0.011)
Children 0-2	-0.024+	-0.023	-0.024+
	(0.012)	(0.012)	(0.012)
Children 3-4	0.001	-0.002	-0.001
	(0.014)	(0.014)	(0.014)
Children 5-11	0.012	0.012	0.010
	(0.011)	(0.010)	(0.011)
Children 12-15	0.032*	0.033*	0.031*
	(0.012)	(0.012)	(0.012)
Older members	0.064*	0.061*	0.069*
	(0.012)	(0.012)	(0.012)
Rural area	0.025+	0.031*	0.025+
	(0.010)	(0.010)	(0.010)
Lack of recycling facilities in area	-0.100*	-0.106*	-0.102*
	(0.022)	(0.022)	(0.022)
Pro-environmental behaviour – male partner		0.004*	
		(0.001)	
Pro-environmental behaviour – female partner		0.005*	
		(0.001)	
Changes need to fit in with lifestyle – male partner			-0.021+
			(0.009)
Environmental concerns – male partner			0.007*
			(0.002)
Changes need to fit in with lifestyle – female partner			-0.035*
			(0.009)
Environmental concerns – female partner			0.006*
			(0.002)
Observations	8,700	8,700	8,700

Marginal effects of a probit model; standard errors in parenthesis; + Significant at 5%, * Significant at 1%; other explanatory variables: dummies for (government office) region of residence.

Moving to the probability of buying a green tariff from the energy provider, Table 6 suggests that homeowners and households with higher income are comparatively more likely to sign up for green tariffs (often green tariffs are more expensive than traditional tariffs and not all renters may have a choice of supplier or tariff). However, the presence of older people in the household seems to be a deterrent, although we do not find any impact of the presence of children. The household is comparatively more likely to be on a green tariff if one or both

partners have high pro-environmental behaviour; in this decision his pro-environmental behaviour is more relevant than hers (the coefficients for his and her behaviours are statistically different from each other).

Table 6: Household is on a green tariff

	(1)	(2)	(3)
Home owned outright	0.025+	0.025+	0.025+
	(0.010)	(0.010)	(0.011)
Home owned with mortgage	0.016+	0.020*	0.017+
	(0.007)	(0.007)	(0.007)
Home social rent	0.001	0.007	0.005
	(0.009)	(0.010)	(0.010)
Equivalised household income (thousands)	0.003*	0.003*	0.002
	(0.001)	(0.001)	(0.001)
Living as a couple but not married	0.007	0.008	0.007
	(0.005)	(0.005)	(0.005)
Children 0-2	-0.002	-0.003	-0.003
	(0.005)	(0.005)	(0.005)
Children 3-4	0.004	0.003	0.003
	(0.007)	(0.007)	(0.006)
Children 5-11	0.003	0.003	0.003
	(0.005)	(0.005)	(0.005)
Children 12-15	0.001	0.000	-0.000
	(0.005)	(0.005)	(0.005)
Older members	-0.014*	-0.014*	-0.011+
	(0.004)	(0.004)	(0.004)
Rural area	0.008	0.009	0.008
	(0.005)	(0.005)	(0.005)
Number of rooms in house	0.001	0.001	0.000
	(0.001)	(0.001)	(0.001)
Pro-environmental behaviour – male partner		0.002*	
		(0.000)	
Pro-environmental behaviour – female partner		0.001+	
		(0.000)	
Changes need to fit in with lifestyle – male			0.002
			(0.004)
Environmental concerns – male partner			0.003*
			(0.001)
Changes need to fit in with lifestyle – female			-0.008+
			(0.004)
Environmental concerns – female partner			0.003*
			(0.001)
Observations	8,437	8,437	8,437

Marginal effects of a probit model; standard errors in parenthesis; + Significant at 5%, * Significant at 1%; other explanatory variables: dummies for (government office) region of residence.

If one or both partners have high concerns for the environment, the household is more likely to buy a green tariff, while it is comparatively less likely if she thinks that the changes

she makes to help the environment need to fit in with her lifestyle. This may be related to the comparatively higher cost of green energy tariffs, which may – in principle – subtract resources to other types of consumptions. Those who say that changes they make to help the environment have to fit in with their lifestyle are probably less likely to have an interest in environmental problems; this variable seems to be a powerful predictor of individual pro-environmental behaviour.

6. Summary and conclusions

Using a large multipurpose household survey for the UK, this paper analyses whether individual pro-environmental behaviour is shaped by the type of households people live in. Consistently with previous research, the results suggest differences in pro-environmental behaviour across individuals. Women seem to have higher pro-environmental behaviour than men, although they seem less willing to compromise their lifestyle in order to behave in a more environmentally friendly way. Having a university degree has a consistently positive correlation with pro-environmental behaviour.

Most importantly, differences in individual pro-environmental behaviour depend on the structure of the household the individual lives in. The results suggest the possibility of a life-cycle pattern of pro-environmental behaviour. Pro-environmental behaviour is higher for people living alone and for couples without children, but lower for people living in couples with children. It is possible that the presence of children generates constraints – in terms of time and practices – that make it harder to pursue pro-environmental behaviours. Another possible reason for such differences may be that social norms and practices differ across households. For example, it may be socially acceptable for a young man living alone to keep a very cold house, but not so for a family with young children or older people. Similarly, public transport may be easier when people have simple travel patterns (home-work-home) but not when travels involve multiple destinations in short times (school of young child-school of older child-work and the other way round).

Couples seem to show homogamy in pro-environmental behaviour, since partners tend to have similar pro-environmental attitudes and behaviours. Both partners' pro-environmental attitudes and behaviours matter for household decisions such as separating items for recycling and buying a green tariff from the energy provider although to different extents. Her pro-environmental behaviour seems to have a bigger impact than his when it

comes to separating items for recycling, while his pro-environmental behaviour seem to have a larger impact than hers in the decision of whether to buy a green energy tariff.

Overall the results suggest a complex interrelation between individual and household characteristics in the decisions about pro-environmentally friendly behaviours. Effective policies to maximise pro-environmental behaviours of individuals and minimise household's carbon footprint will need to take into account that individuals' decisions and actions depend on constraints generated by the other members of the household.

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