Environmental Decision Making and Behaviours: How to People Choose how to Travel to Work?

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Environmental decision making and behaviours: How do people choose how to travel to work?

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Abstract: The daily commute is an important element of transport and travel behaviour in the UK, and as such is relevant to discussions about the environment and sustainability, as well as social well-being. Economic research on the matter focuses on cost and structural factors, with preferences being given, whilst the psychological literature looks at how preferences are formed from attitudes and values, but tends to underplay the role of structural variables. This paper develops a simple structure of how attitudes, values and behaviours are linked, and tests them with multinomial and ordered regressions using data from Defra's *2007 Survey of Attitudes and Behaviours in Relation to the Environment*. The results found that attitudes towards cars and driving were a significant factor in transport choices, but environmental beliefs were only mildly significant, and only for some travel choices. Structural variables, here proxied by distance to work, were influential in most travel choices, as was age. Stated environmental behaviours however, were almost entirely insignificant. The results were robust, and suggest that policies aimed at structural or attitudinal change would be more effective than policies aimed at changing people's environmental values.

Key Words: Transport, Commute, Environment, Values, Attitudes, Decision-making

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INTRODUCTION

Understanding the factors that lie behind people's daily commuting decisions is important for both transport and environmental policy, but too often, the psychological, sociological and economic aspects of such research have been kept apart. Previously, there has been a separation of investigations, with some academic research looking at the economic and structural factors which influence people's choices, and other research - led by psychologists and sociologists - looking at how values and attitudes lead to choices being made. Very little has been done to combine the two, particularly in the realm of transport economics. This is surprising, since it seems likely that both aspects combine in many people's process-making.

This paper will look at how individuals' environmental attitudes and values shape their choice of method by which they travel to work. That is, it will ask whether people are affected by their concern or understanding of environmental issues to the extent that they will travel by methods perceived to be more environmentally aware or, on the other hand, do financial and structural concerns override most people's environmental values?

LITERATURE REVIEW

Economic Literature

A large number of the transport economics papers which look at decision making are largely based on McFadden's 1974 paper, which took the proposed development of a public transport system in San Francisco as its basis. A binary decision was modelled where people were assumed to have the choice of travelling by car or by the new public transport system. Costs of both private and public transport were estimated, including the costs of time spent waiting and travelling. A "pure auto-mode" preference effect was also calculated which found that over half the population would travel by car even if costs and times for public transport were zero. However, no variables were tested that looked at environmental beliefs or values, other than possibly "People drive cars that are too big" and "Buses smell of fumes", both of which were insignificant at the 5% level. The paper discusses the variables that correspond to attitudes in taste and behaviour (such as becoming angry in traffic jams) and reasons that it is better from a policy analysis view to bypass researching people's attitudes and go straight to researching the policies that may have shaped these.

One issue which McFadden treated as exogenous in his study was residential location. He recognised the sample selection issues concerning how people made choices based around where they live, found that people think living near public transport is a key decision in choosing that travel method. Other studies have looked at the relationship between housing location choice and travel choice in more depth, such as Cervero and Radisch (1996), Kitamura et al (1997), Cervero (2002), Bagley and Mokhtarian (2002), Schwanen and Mokhtarian (2005), and Feldman and Simmonds (2007). A range of hypothesis have been raised and tested to study how people may choose a neighbourhood on the basis of the travel commitments it would involve, or how people

choose travel methods based on the neighbourhood characteristics, or how these may interact with each other. The dynamic inter-relationships of two importance choices – work and home location – mean that such studies are not completely pertinent here. However, it is crucial to note that environmental attitudes and values can play a role in such large decisions.

When considering values and behaviours against more structural variables such as location, Kitamura et al (1997) found that attitudes have a stronger or more direct association with travel than local land use characteristics. That is, factors such as local housing density and public transport accessibility were found to be less influential than attitudes such as "driving allows me more freedom" and "too many people drive alone".

Similarly, Bagley and Mokhtarian (2002) find that the attitudinal and lifestyle variables, such as a tendency to accept pro-environmental statements, have a stronger effect on travel choice than the location. Their methodology was based on the structural equations modelling (SEM) approach, and the same dataset as Kitamura et al (1997) from San Francisco. They find that pro-environmental beliefs are linked to pro-high-density and pro-transit attitudes, and lead to an increase in transit miles and commute distance, but no significant relationship with miles cycled. Overall, Bagley and Mokhtarian (2002) find that residential location has very little impact on travel behaviour, which suggests that personal variables, such as beliefs, have a stronger impact than structural variables such as location. This may be because personal variables influence the choice of location, but the SEM approach attempts to capture such interrelations. The authors note that both attitudes and behaviours change over time, and people adapt to the situations they are in, but overall the study "found *no* impact of residential location on attitudes" (Bagley and Mokhtarian, 2002:295, emphasis theirs). Dynamic interrelationships were outside the scope of their study, but it is an interesting side-note to reflect upon how changeable variables can be.

One study that looks in particular at the travel decisions to work across the UK was carried out by Parkin et al (2008), who studied the factors that lie behind cycling to work. Although it would seem likely that this would be, at least in part, related to environmental attitudes, the study does not look into this aspect. Rather, it examines physical and infrastructure variables, such as road condition, hilliness and the presence of cycle paths. Hilliness is found to be a key variable, which suggests that structural factors are key to people's decision making and behaviour. Similarly, Black et al (2001) look at factors which influence people's decision to walk to school. Again, structural factors are key, in this case, difficulty parking at school and square of distance among the significant results. Subsequent research was able to divide the respondents into three groups but the Environmental Awareness group was the least influential[2].

Overall, the literature on transport decisions makes little reference to environmental values as an explanatory variable. Black et al (2001) use a range of questions on environmental and personal attitudes to travel, and find some significantly affect people's decisions to walk to school. However, the wider range of literature suggests that there are complex interactions between the variables, and that the decisions are made through a process over time. The next section of this paper will therefore look at the wider, less economic-based literature into travel decision making and environmental beliefs.

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[2] The other groups were Individual Responsibility and Awareness, and Car-Centredness.

Psychological Literature

There is a field of psychology that looks at how environmental behaviour is related to both attitudes and values (see Davies et al, 2002 and Schultz et al, 1995 for summaries). This literature largely ignores financial/economic incentives to behaviour, and instead assumes that what drives an action or behaviour are the underlying values and perspectives on the world. Of particular interest is how values and attitudes can be 'layered', with broad values (e.g. about the environment) not entirely aligned with more precise attitudes, for example about recycling. Eagly and Kulesa (1997) define attitudes as the "psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour." Overarching attitudes are known as values. Based on Katz (1960), they discuss how people can change their attitudes (or have their attitudes changed) by changing values. These definitions are subject to a degree of discussion but in general, it is accepted that people have different types of attitude or values which can influence each other and influence behaviour in different ways.

Looking first at values, there is a body of literature than examines how environmental values are linked to transport decisions. There is mixed evidence for how transport preferences are associated with concern for the environment, pro-social orientations and pro-individual values. Joireman et al (2004) summarise the findings from Van Vugt et al (1995 and 1996), Van Lange et al (1998) and Joireman et al (1997); although these come from a broad 'family' of research using the social dilemma model, the results are not conclusive. Joireman et al (2004) then test whether travel decisions are based on people's temporal concerns, that is, whether they are consider future consequences or not, and they find that the relationship between people's perceptions of the negative environmental impact of cars and preference for public transport was only significant when there was a high consideration of future impact. This suggests that the interrelationships between values and preferences can be complex and affect each other.

Other studies have looked at what may limit the relationship between values, beliefs and behaviour. Derksen and Gartrell (1993) found that environmental attitudes only affect behaviour in communities with easy access to recycling. Similarly, Diekmann and Preisendörfer (2003) test the hypothesis that environmental concern influences environmental behaviour primarily in low-cost or low-hassle situations, but found none was significantly correlated to stated environmental concern. The authors suggest that this is because such travel behaviours are "high-cost" and so leave little room for people's concern.

Grob (1995) developed and tested a model of the relationships between environmental attitudes and pro-environmental behaviour, which is summarised in Figure 1.

Figure 1: Grob's Model of Environmental Behaviour. Source: Grob (1995)
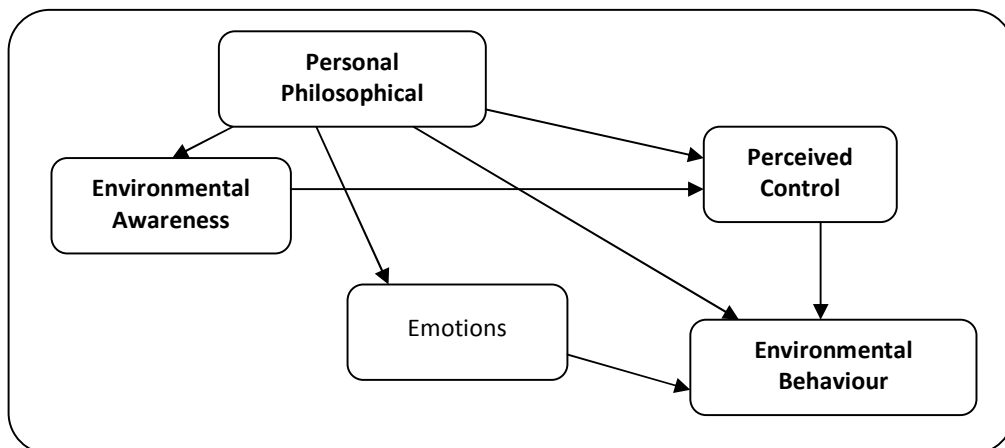
In general, the accuracy of this research is hard to estimate since the key variable measured does not consider differences in various types of environmental behaviour. Also, Grob recognises that the model only represents individual level research, and reflects that "it would be worthwhile to include other categories on influence (i.e. socio-economic, geographical, and cultural location) to gain a more comprehensive pattern of the extent to which environmental behaviours are due to physical, individual, historical and cultural influences" (p.218). However, it seems robust enough to show that the model shown in Figure 1 would be a useful mental picture of the sorts of value-attitude-behaviour relationships tested in this paper.

Similarly, Barr et al (2001) test the structural framework shown in Figure 2. Similar to Grob's 1995 model, develops the flow from values to behaviour, in this case for recycling behaviour. Compared to Grob's model it has less interlinkages, but does introduce situational variables as an influence on both intention and behaviour. It does not however, consider attitudes as an intermediary between values and intention/behaviour. This is an interesting development, but allows the authors to focus on the impact of the situation or structure around an individual's travel choice which is likely to be a strong limiting or enabling factor. The model was tested on data from interviews in Exeter in the UK, and found that recycling was predicted primarily by "logistical" considerations, that is, the situational variables, whereas reuse and reduction of waste was predicted more by values and concerns. This suggests that different types of travel behaviour may be influenced by different types of variables, including structural/situational variables as well as attitudes and values.

Figure 2: Barr et al's Conceptual Framework. Source: Barr et al (2001)
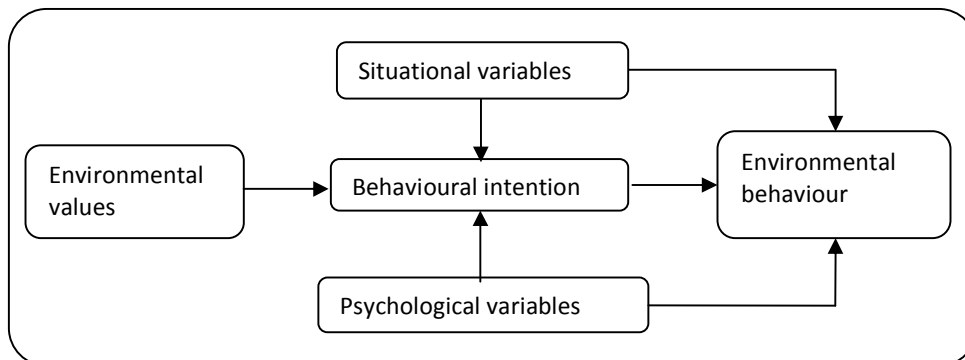
Another study which has taken the individual's context into account is Dijst et al (2008). They present an overview of attitude theory and other models relevant to travel behaviour and show the development of simple attitude-behaviour relationships to incorporate intention, habit (or past behaviour), goals and behavioural desire. Each of these acts as an intermediary between attitudes and observed behaviour, with varying levels of complexity involved. Three types of model are compared: The customary model (CM), which is similar to most econometric models; the extended model of goal-directed behaviour (EMGB); and the hybrid model (HM). The EMGB assumes that behaviours are based on utilitarian considerations (p.834) but incorporates the idea of behavioural desire, a level of motivation necessary to transform reasons to act into readiness to act. The HM integrates the CM with the EMGB to see if it is possible to see what can shape the attitudes and behavioural desires. The study uses shopping as a way of looking at travel behaviour, comparing internet with location-based shopping tripsand finds that the EMGB provides greater insight than the CM, but combining the two adds even more explanatory ability. That is, "an individual's context and resources are important in explaining shopping volition and, ultimately, shopping behaviour" (p.844).

Synthesis

Both the economic and psychological literature look at similar sorts of problems concerning people's responses to environmental problem and their environmental behaviour. However, they do tend to take different approaches, with the psychological literature developing frameworks for the interrelationships between different personal or situational characteristics, whereas the economic modelling looks more at financial, time and structural considerations. These can be incorporated by finding relevant attitudinal and value variables. Of course, these variables will have to be constructed in different ways, and will have different types of impact. Usually structural, or situational, variables will be limiting factors, for example, people may want to take the train but no route exists, or the distance may be too far to walk.

The literature that looks specifically at values and attitudes suggests that there is a hierarchy of focus and influence. That is, values focus on the bigger picture, and attitudes reflect people's position towards precise behaviours or events. However, since people can hold a number of values that may link to a particular attitude or behaviour, complex relationships can occur, which means that predicting a simple relationship between values and behaviour may be a vast over-simplification of the situation (Eagly and Kulesa, 1997).

In combining the discussions about values and attitudes into an economic framework, such complexities have to be considered carefully. Without wishing to ignore them altogether, this research is looking to develop a synthesis that allows interaction between the fields. This being so, the model shown in Figure 3 will be used. Here, values and attitudes set preferences, which together with structural variables lead to the final choice of commuting method. The dashed lines from values to attitudes and around preferences show unobserved factors. For example, it is not within the scope of this project to analyse how values and attitudes are interrelated, but rather to examine which has a more influential role in travel decisions. However, it is important to bear in mind the extra complexities between all these factors during the subsequent development of and results from the following research.

Figure 3: The model of values, attitudes and behaviour. Dashed lines show unobserved factors.
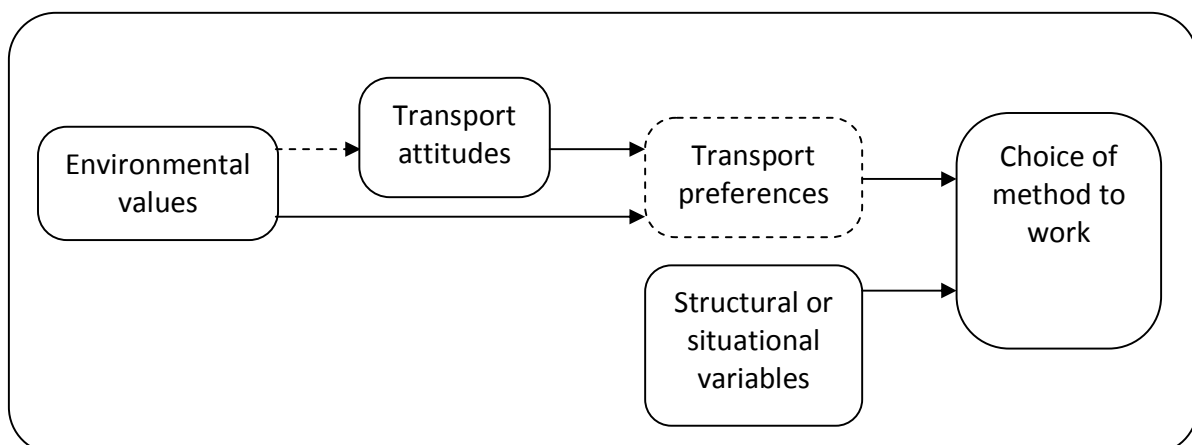
METHODOLOGY

The previous section shows that there is a strong theoretical background for understanding the relationship between attitudes, values and behaviour. Using the hierarchy of attitudes and values, we can assume that environmental values can influence more precise attitudes, which in turn influence behaviour. It seems likely that there may be some disparities between values and behaviour, but less between attitudes and behaviour. Also, based on Grob (1995), values are likely to influence how much people understand about environmental issues, which also affects behaviour.

In terms of measuring the extent to which this is true, a number of assumptions have to be made about how environmental values and attitudes can be measured. A large number of studies such as Barr et al (2001), Black et al (2001), Poortinga et al (2004) and Schwanen and Mokhtarian (2005) have successfully used a series of questions with Likert-scale answers to assess various environmental opinions, values and attitudes.

Behaviour can be measured by either revealed or stated methods. The former is where actual behaviour is observed, whereas stated methods indicate preferences for behaviour in a hypothetical situation. Since the choice of commuting method is a common decision for most people, and reflects the individual's situational variables, it is much to be preferred over stated preferences. It is important to bear in mind that the variable used for this in the research has to accurately capture the behaviour desired. That is, care has to be taken if proxies are used since these can involve other factors that may be missed out from the test. Also, it has to be remembered that because one environmental behaviour has been tested, the results may not hold for other behaviours, depending on their relationship to values, attitudes and structural variables.

The dominant methodological forms of research into the area are econometric regressions, usually using a logit regression, or SEM. The latter approach is predominantly used in the literature to estimate connections between variables and interlinkages. It also requires that relationships have to be posited beforehand, and then the size of that relationship is tested. The logit regression methods only estimate a single relationship, but can accurately estimate the marginal impact of the variables which constitute this relationship. As this paper is only looking at the effects of environmental values on commuting behaviour, the econometric approach seems most appropriate.

Multinomial logit and probit regressions are very common in the literature and are used for regressions where the dependent variable is in separate categories but these are not ranked or ordered in any way. They are comparable in their construction, theory and results, and differ in their underlying cumulative probability function. The multinomial logit has been more popular in the past due to simpler calculations needed but in recent years, greater computational access has meant that the multinomial probit has become more popular (Weeks, 1997). The differences between the two mean that the marginal effects of a logit cannot be compared without transformation with a probit. However, the regressions can - and often are - used in conjunction with each other as a basic form of sensitivity analysis. Even without the transformation of the marginal effects, the results can be compared to see if there are any differences in either the significance or the scale of the coefficients and the significance of the regression overall

Multinomial regressions can be carried out with a large range of variables. Having too few variable risks underspecifying the model by leaving out any important or relevant factors. This would lead to the factors that were used seeming more important than they actually are. Having too many variables reduces the explanatory power of the regression and risks making the model

too weak or complex to give any insights. A balance therefore has to be found, and this is usually developed by testing a number of regressions containing variables which seem likely - based on theory or previous studies - to be relevant.

In order to find the relative impact of individuals' environmental values and attitudes on their commuting methods, the regression will need to explore the structural variables and the attitudinal variables. The former are the factors which may limit or allow the transport choices available to the individual. These are likely to be location based - how near to public transport, quality of local roads, ease of cycling and so on - and individual based - such as someone's age, job type, or number of children.

Attitudinal variables will be concerned with exploring people's views towards the environment and environmental behaviour. As we have seen, these can be precise attitudes towards a particular concern or activity, or can be broader values; both are often researched using Likert scales. As Black et al (2001) showed, these can be compiled into groups of similar attitudes or values and tested like that, or can be included individually as variables. The latter method risks over-specifying the model and introducing correlation between variables that are linked. However, care must be taken in correlating such questions, since people may have strong pro-environmental opinions in one field, such as recycling, but not in another, for example fuel efficiency. Creating an indicator, or index score, of results should offer the desired balance here, since it can combine relevant indicators but be reflective of each individual's spread of attitudes or values.

It is therefore considered that using a variety of variables, including indicators of people's environmental values and attitudes towards transport should be used in a multinomial regression, using both logit and probit methods as a basic form of sensitivity comparison. Also, if the data is available in a suitable form, a simple ordinal regression, using both the logit and probit methods, can be carried out to see if there is any information to be gained from this method.

DATA

The 2007 *Survey of Public Attitudes and Behaviours Towards the Environment* (Defra, 2007) was carried out on behalf of the UK government on a representative sample of 3,618 people from across England. It looks at people's attitudes, values and behaviours on a range of environmental issues, including travel, energy efficiency and awareness of climate change. The resulting dataset has nearly 500 responses coded for most of the participants, many of which are Likert-scale responses to questions such as "Humans are severely abusing the environment" and "I sometimes feel guilty about doing things that harm the environment", with 1 being the code for the response "strongly agree" and 5 being the code for "strongly disagree"[3], and additionally codes for "Don't know" and "not stated".

This data is therefore based on people's stated responses rather than observed behaviour, which gives the opportunity for people to lie or give misleading responses. Arguably the only motive for this would be to impress the survey administrator with responses that may seem more

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[3] For the regressions, these were recoded where necessary so that 1 becomes "strongly disagree" and 5 becomes "strongly agree" and so on. This is to make the results of the regressions more intuitive to understand, as an increase in agreement shows as a higher number.

socially acceptable. This seems a weak argument given that the surveys are anonymous and there would be very little gain from lying to impress a stranger. The other weakness in self-reported data would be with questions that ask about a comparison with a baseline, such as "I know a lot about climate change" or "how many people in the country would be willing to use a car less". In these cases, the respondent has to make a decision based on their own knowledge or perception of other people's knowledge or attitudes. Such questions may provide interesting answers, for example in comparing perceptions of public willingness against revealed willingness, but also have the weakness that people can be badly informed about others' opinions or knowledge. This being so, such questions need to be treated carefully.

Table 1 and Table 2 show the descriptive statistics for the dependent and independent variables used in the analysis. The dependent variable is the primary method to the usual place of work, and the results are clearly dominated by people who drive to work. The quantity of people who use a motorcycle or similar is surprisingly low, but this may be a reflection of the seasonal nature of such transport. For example, if people only use motorbikes in good weather, they may well consider it as a secondary method, with another method (such as car or lift sharing) as their primary or usual method. Another limitation of this as a dependant variable is that it does not include if people include other purposes alongside their commute, such as including the school run en route to work, or shopping on the way home. Some people may have strong anti-car attitudes, or pro-environmental values, but these are ameliorated by the practicality or necessity of multi-purpose trips.

Table 1: Descriptive statistics of the dependent variable "method_to_work". Source: Defra (2007).

Code	Description	Freq.	Percent
1	Drive	742	69.48
2	Get a lift with someone from household	33	3.09
3	Get a lift with someone outside household	22	2.06
4	Motorcycle/moped/scooter	5	0.47
5	Taxi/minicab	5	0.47
6	Bus	51	4.78
7	Train	38	3.56
8	Underground/Metro/Tram/Light railway	18	1.69
9	Cycle	42	3.93
10	Walk	112	10.49
Total		1,068	100

Multinomial logit and probit regressions require the property of *independence of irrelevant alternatives* (IIA) amongst the categories of the dependent variable. This means that the relative odds between two of the variables is not affected by the other alternatives (Heij et al, 2004). In this case, constructing the dependent variable as, for example, between driving, walking and everything else should result in the same odds between driving and walking compared with constructing the dependent variable as all ten categories. In this case, the IIA condition is satisfied.

The independent variables shown in Table 2 were selected as they offered the most relevant variables in answering the research question. A number of other possible variables from the 2007 *Survey* were considered but not used either because of low response rates (for example, people's reserve choice of method to work) or ambiguity of responses (for example, whether the respondent lives in an urban or rural area, or how much they consider themselves knowledgeable

about climate change). There is a lack of information about the respondents' location, since the survey only locates people to one of nine Government Office Regions in England. This is too vague to be able to assess either the social or geographical variables that may be pertinent. Also, it is clear that most of the variables have coded responses, either stratified or binary. The stratified responses are where people's answers were recorded in bands, such as age from 0-15, 16-25 and so on. The weakness of this is that a fuller range of responses would give more precise variability in the regression, in particular in understanding any marginal effects. However, these methods are used in surveying to encourage people to be open and honest about subjects like age and income which are important for the survey users and are likely to be sensitive to the respondents. Since the codings are sensibly laid out, it is possible to still use them, but it has to be remembered when interpreting the results that they represent a shift in the stratified bands, rather than a unitary shift in age or income.

Table 2: Descriptive Statistics of the independent variables. N=1068. Source: Defra (2007).

Name	Description	Type of data	Min	Max	Mean	S.D
hhold_income	Overall household income last year	Stratified: 1= under £2,500; 15 = £100,000 or more	1	15	8.452	3.368
age	Age of respondent	Stratified: 1=0-15; 6=65+	2	6	3.434	1.002
gender	Gender of respondent	1=male, 2=female	1	2	1.465	0.499
miles_to_work	Distance from home to usual place of work (miles)	Stratified: 1=0-1 miles; 8=51+miles	1	8	3.448	1.824
procarav	Average response to pro-car attitude questions	Likert: 1=strongly disagree; 5=strongly agree	1	5	2.946	0.689
anticarav	Average response to anti-car attitude questions	Likert: 1=strongly disagree; 5=strongly agree	1	5	3.022	0.663
proenvav	Average response to pro-environmental values questions	Likert: 1=strongly disagree; 5=strongly agree	1.7	4.6	3.298	0.372
antienvav	Average response to anti-environmental values questions	Likert: 1=strongly disagree; 5=strongly agree	1.111	4.389	2.535	0.524
behavioursum	Sum of responses to questions of environmental activity	sum of below	0	5	1.360	1.270
enviro_talk	Response to "I often talk to friends or family about things they can do to help the environment"	0=no; 1=yes	0	1	0.307	0.462
enviro_persuade	Response to "I try to persuade people I know to become more environmentally-friendly"	0=no; 1=yes	0	1	0.219	0.414

enviro_work	Response to "I've suggested improvements at my workplace/the place where I study to make it more environmentally-friendly"	0=no; 1=yes	0	1	0.253	0.435
enviro_ethics	Response to "I've told relatives or friends to avoid buying from a particular company because I feel they are damaging the environment"	0=no; 1=yes	0	1	0.141	0.349

A number of variables have been constructed from a set of results from the *Survey* in order to combine similar opinions or attitudes. *Proenvav* and *antienvav* are based on questions from the *Survey* asking for the respondents' values on environmental issues. They were then separated by the author into pro-environmental questions and anti-environmental attitudes and then divided by the number of questions in each set to give a result for each between 1 and 5, with 1 being strong agreement and 5 being strong disagreement (recoded for the regression as explained earlier). Whilst there may be a chance that using both in the same regression may result in strong correlation between the two, this is not too great a concern since they ask different questions about different aspects of the environment, so they are not simply opposites – people may have strong opinions both ways or *vice versa*. Similarly, *procarav* and *anticarav* were constructed using responses for questions asking about people's attitudes to travel. The questions that make up these are shown in Table 3 and Table 4. It can be seen that some of the component questions are more strongly worded than others, or cover larger scale problems. However, when aggregating these, it is more important to have an overview of people's attitudes and values than a detailed breakdown. Also, if weightings were applied, or more groupings developed, this would have to be based on subjective work by the author. Restricting the aggregation to two broad groups allows for comparisons to be made without sacrificing too much objectivity.

Table 3: The make-up of the composite transport attitude variables.

Procarav	Anticarav
When I am getting ready to go out, I don't usually think about how I am going to travel, I just get in the car	I find travelling by car can be stressful sometimes
I like travelling in a car as a driver or passenger	I would like to reduce my car use but there are no practical alternatives
It is important to build more roads to reduce congestion	It would be easy for me to reduce my car use
People should be allowed to use their cars as much as they like, even if it causes damage to the environment	For the sake of the environment, car users should pay higher taxes
Driving my car is too convenient to give up for the sake of the environment	
Travelling by bus is mainly for people who can't afford any better	
I would only travel by bus if I had no other choice	

Table 4: The make-up of the composite environmental value variables.

Proenvav	Antienvav
We are close to the limit of the number of people the earth can support	The so-called 'environmental crisis' facing humanity has been greatly exaggerated
When humans interfere with nature it often produces disastrous consequences	Humans are capable of finding ways to overcome the world's environmental problems
Humans are severely abusing the environment	Scientists will find a solution to global warming without people having to make big changes to their lifestyles
The Earth has very limited room and resources	Humans were meant to rule over the rest of nature
If things continue on their current course, we will soon experience a major environmental disaster	It would embarrass me if my friends thought my lifestyle was purposefully environmentally friendly
I sometimes feel guilty about doing things that harm the environment	Being green is an alternative lifestyle it's not for the majority
The government is doing a lot to tackle climate change	I find it hard to change my habits to be more environmentally-friendly
If government did more to tackle climate change, I'd do more too	Any changes I make to help the environment need to fit in with my lifestyle
I do worry about the changes to the countryside in the UK and the loss of native animals and plants	I need more information on what I could do to be more environmentally friendly
So many people are environmentally-friendly these days, it does make a difference	The environment is a low priority for me compared with a lot of other things in my life
	It's only worth doing environmentally-friendly things if they save you money
	Climate Change is beyond control - it's too late to do anything about it
	The effects of climate change are too far in the future to really worry me
	It's not worth me doing things to help the environment if others don't do the same
	It's not worth Britain trying to combat climate change, because other countries will just cancel out what we do
	It takes too much effort to do things that are environmentally friendly
	I'd struggle to find the time to be any more environmentally-friendly than I am now

The other composite variable is labelled *behavioursum*. This is created by summing the binary responses to five questions about people's environmental behaviour, and has two functions. The first is to see if people have coherent behaviours amongst travel-to-work decisions and the five given here; the second is to measure people's environmental values through revealed responses. The five questions are shown in Table 2, and are *enviro_talk, enviro_persuade, enviro_work, enviro_ethics*. It can be seen that while 31% of respondents claim they often talk to friends and

family about environmental behaviours, only 14% have spoken to them about purchasing from particular companies. The composite variable will be included in one set of regressions (multinomial logit and probit) and in a second set the variables will be included separately too see if there is any individual significance. Black et al (2001) used factor analysis in compiling sets of responses, but still adjusted these manually after inconclusive results, which is why the method was not used in this research.

RESULTS

Multinomial Regression

The results of four regressions are shown in Table 5. Logit1 and Probit1 were run with *behavioursum* as a composite variable, and Logit2 and Probit2 include the components of *behavioursum* as separate variables. All the regressions are multinomial, with driving as the base case; positive coefficients imply that an increase in the variable means an increase in the likelihood of an individual taking that form of transport relative to driving. Each of the regressions is jointly significant at the 1% level as shown by the LR chi-squared or Wald chi-squared statistic.

The regression shows that some modes of transport are more significantly estimated than others. In particular, bus, rail and cycling all have a large number of significant variables at the 5% level or higher. This is perhaps because they have the greater number of responses, or because they are most affected by age, distance and environmental considerations. A third reason could be is that over a range of distances to work, they are the closest alternatives to driving.

Income is, perhaps surprisingly, not significant (at the 10% level or better) for most of the transport modes, except for rail, light rail and motorbike. This is perhaps because rail and light rail are comparatively more expensive than other substitutes in the areas where these are option. Age is a more significant variable, with older people more likely to drive than to take most of the other options. Gender shows some interesting characteristics; it is not usually significant but females are more likely to be driven by another member of the household, and males more likely to cycle.

Table 5: Results of regressions

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
2. Lift Share (as driver)													
hhold_income	-0.036	0.536		-0.013	0.703		-0.036	0.532		-0.013	0.697	
age	-0.459	0.019	**	-0.312	0.004	***	-0.460	0.019	**	-0.307	0.005	***
gender	0.857	0.031	**	0.473	0.034	**	0.881	0.028	**	0.487	0.031	**
miles_to_work	-0.226	0.076	*	-0.186	0.011	**	-0.228	0.073	*	-0.190	0.009	***
procarav	-0.914	0.006	***	-0.637	0.001	***	-0.871	0.008	***	-0.620	0.001	***
anticarav	0.596	0.040	**	0.349	0.029	**	0.583	0.045	**	0.348	0.029	**
proenvav	0.672	0.212		0.412	0.185		0.605	0.257		0.380	0.217	
antienvav	0.515	0.233		0.382	0.125		0.584	0.171		0.420	0.089	*
behavioursum	-0.224	0.189		-0.127	0.197							
enviro_talk							-0.139	0.744		-0.079	0.748	
enviro_persuade							0.024	0.958		0.020	0.943	
enviro_work							-0.306	0.490		-0.191	0.449	
enviro_ethics							-0.179	0.740		-0.151	0.639	
constant	-4.382	0.093	*	-2.576	0.087	*	-4.589	0.076	*	-2.706	0.070	*
3. Lift Share (as passenger)													
hhold_income	0.016	0.820		0.015	0.689		0.021	0.758		0.019	0.615	
age	-0.810	0.002	***	-0.470	0.001	***	-0.787	0.002	***	-0.467	0.001	***
gender	-0.787	0.113		-0.397	0.126		-0.684	0.172		-0.348	0.195	
miles_to_work	0.049	0.718		-0.007	0.922		0.062	0.646		0.010	0.901	
procarav	-0.492	0.213		-0.439	0.046	**	-0.522	0.193		-0.454	0.044	**
anticarav	0.421	0.222		0.241	0.199		0.469	0.175		0.280	0.145	
proenvav	-0.259	0.671		-0.081	0.815		-0.325	0.606		-0.134	0.707	
antienvav	0.491	0.358		0.348	0.231		0.576	0.286		0.393	0.187	
behavioursum	-0.040	0.846		-0.026	0.817							
enviro_talk							-0.042	0.937		-0.090	0.757	
enviro_persuade							0.013	0.984		0.039	0.910	
enviro_work							-1.287	0.098	*	-0.710	0.069	*
enviro_ethics							0.831	0.144		0.498	0.125	
constant	-0.408	0.895		-0.487	0.773		-0.764	0.808		-0.671	0.698	
4. Motorcycle, scooter, moped													
hhold_income	0.333	0.056	*	0.148	0.053	*	0.324	0.061	*	0.144	0.065	*
age	-0.337	0.455		-0.198	0.355		-0.405	0.370		-0.220	0.303	
gender	-0.224	0.822		-0.128	0.787		-0.391	0.695		-0.160	0.739	
miles_to_work	-0.071	0.804		-0.060	0.665		-0.087	0.764		-0.048	0.736	
procarav	0.092	0.910		-0.062	0.880		0.001	0.999		-0.126	0.756	
anticarav	-0.794	0.263		-0.314	0.359		-0.857	0.222		-0.336	0.336	
proenvav	2.113	0.126		1.000	0.139		2.120	0.124		1.037	0.122	
antienvav	-0.602	0.584		-0.100	0.854		-0.850	0.458		-0.231	0.683	
behavioursum	0.413	0.229		0.206	0.249							
enviro_talk							0.561	0.627		0.374	0.482	
enviro_persuade							-0.323	0.785		-0.200	0.740	
enviro_work							1.084	0.304		0.425	0.382	
enviro_ethics							-0.033	0.979		-0.130	0.843	
constant	-11.164	0.094	*	-5.912	0.070	*	-9.338	0.164		-5.242	0.104	
5. Taxi													
hhold_income	-0.103	0.504		-0.022	0.754		-0.099	0.528		-0.021	0.770	
age	-1.026	0.088	*	-0.512	0.060	*	-1.018	0.090	*	-0.504	0.066	*
gender	0.649	0.502		0.176	0.700		0.646	0.508		0.228	0.635	
miles_to_work	-0.406	0.230		-0.255	0.112		-0.396	0.254		-0.243	0.143	
procarav	0.900	0.290		0.377	0.401		0.943	0.269		0.366	0.414	
anticarav	-1.164	0.096	*	-0.533	0.125		-1.159	0.094	*	-0.564	0.112	
proenvav	-0.327	0.782		0.124	0.832		-0.377	0.756		0.069	0.910	
antienvav	0.470	0.587		0.325	0.472		0.452	0.621		0.363	0.439	

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
behavioursum	0.426	0.287		0.216	0.284								
enviro_talk							0.947	0.361		0.515	0.320	
enviro_persuade							0.271	0.841		0.223	0.722	
enviro_work							-0.027	0.982		-0.084	0.883	
enviro_ethics							0.750	0.548		0.290	0.644	
constant	-1.309	0.825		-2.106	0.476		-1.267	0.834		-2.039	0.498	

6. Bus

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
hhold_income	-0.027	0.576		-0.012	0.668		-0.033	0.500		-0.016	0.597	
age	-0.398	0.011	**	-0.281	0.003	***	-0.390	0.013	**	-0.279	0.003	***
gender	0.253	0.406		0.121	0.522		0.261	0.398		0.128	0.509	
miles_to_work	-0.217	0.031	**	-0.188	0.003	***	-0.215	0.033	**	-0.187	0.003	***
procarav	-1.242	0.000	***	-0.801	0.000	***	-1.212	0.000	***	-0.784	0.000	***
anticarav	0.556	0.018	**	0.312	0.025	**	0.556	0.020	**	0.318	0.023	**
proenvav	0.827	0.054	*	0.507	0.052	*	0.809	0.058	*	0.508	0.052	*
antienvav	1.092	0.002	***	0.638	0.003	***	1.070	0.002	***	0.633	0.003	***
behavioursum	-0.149	0.275		-0.079	0.349							
enviro_talk							-0.187	0.601		-0.081	0.713	
enviro_persuade							-0.800	0.094	*	-0.455	0.101	
enviro_work							0.059	0.867		-0.009	0.968	
enviro_ethics							0.382	0.349		0.254	0.331	
constant	-4.344	0.037	**	-2.333	0.067	*	-4.388	0.037	**	-2.424	0.058	*

7. Train

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
hhold_income	0.156	0.007	***	0.086	0.013	**	0.160	0.006	***	0.088	0.011	**
age	-0.461	0.023	**	-0.363	0.003	***	-0.463	0.023	**	-0.367	0.003	***
gender	-0.214	0.571		-0.223	0.339		-0.191	0.619		-0.219	0.357	
miles_to_work	0.446	0.000	***	0.242	0.000	***	0.453	0.000	***	0.246	0.000	***
procarav	-1.325	0.000	***	-0.911	0.000	***	-1.396	0.000	***	-0.944	0.000	***
anticarav	0.488	0.097	*	0.270	0.130		0.530	0.075	*	0.291	0.107	
proenvav	-0.734	0.150		-0.446	0.146		-0.736	0.148		-0.438	0.155	
antienvav	0.304	0.502		0.290	0.272		0.325	0.479		0.256	0.339	
behavioursum	0.043	0.775		0.028	0.766							
enviro_talk							0.095	0.824		0.012	0.963	
enviro_persuade							0.296	0.512		0.156	0.588	
enviro_work							-0.263	0.529		-0.145	0.576	
enviro_ethics							-0.432	0.427		-0.305	0.377	
constant	-0.852	0.740		-0.062	0.968		-0.844	0.743		0.081	0.958	

8. Underground, tram, light railway

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
hhold_income	0.213	0.006	***	0.115	0.005	***	0.230	0.004	***	0.121	0.004	***
age	-0.301	0.243		-0.253	0.057	*	-0.302	0.246		-0.245	0.067	*
gender	-0.718	0.190		-0.374	0.189		-0.641	0.248		-0.322	0.270	
miles_to_work	0.056	0.693		-0.002	0.985		0.067	0.646		0.009	0.912	
procarav	-1.074	0.018	**	-0.746	0.003	***	-1.178	0.010	**	-0.817	0.002	***
anticarav	0.494	0.210		0.237	0.245		0.538	0.176		0.269	0.193	
proenvav	1.161	0.093	*	0.628	0.103		1.146	0.099	*	0.624	0.110	
antienvav	1.285	0.022	**	0.737	0.014	**	1.309	0.022	**	0.777	0.013	**
behavioursum	0.062	0.763		0.042	0.717							
enviro_talk							0.296	0.606		0.162	0.600	
enviro_persuade							0.457	0.462		0.189	0.575	
enviro_work							-1.038	0.135		-0.450	0.190	
enviro_ethics							-0.352	0.662		-0.247	0.563	
constant	-9.688	0.005	***	-4.842	0.007	***	-9.699	0.006	***	-4.934	0.007	***

9. Cycle

	logit1 Coef.	P>|z|		probit1 Coef.	P>|z|		logit 2 Coef.	P>|z|		probit2 Coef.	P>|z|	
hhold_income	0.071	0.164		0.047	0.133		0.070	0.167		0.048	0.126	
age	-0.420	0.014	**	-0.272	0.009	***	-0.440	0.011	**	-0.283	0.007	***
gender	-0.872	0.014	**	-0.485	0.021	**	-0.902	0.011	**	-0.496	0.019	**
miles_to_work	-0.907	0.000	***	-0.582	0.000	***	-0.908	0.000	***	-0.588	0.000	***

	logit1			probit1			logit 2			probit2		
	Coef.	P>|z|		Coef.	P>|z|		Coef.	P>|z|		Coef.	P>|z|	
procarav	-0.891	0.003	***	-0.598	0.001	***	-0.938	0.002	***	-0.629	0.000	***
anticarav	-0.135	0.607		-0.006	0.968		-0.143	0.583		-0.012	0.938	
proenvav	-0.011	0.982		0.071	0.805		0.066	0.890		0.112	0.701	
antienvav	-0.074	0.860		0.064	0.795		-0.158	0.711		0.013	0.959	
behavioursum	0.109	0.412		0.060	0.467		-0.095	0.810		-0.075	0.760	
enviro_talk												
enviro_persuade							-0.073	0.876		-0.030	0.916	
enviro_work							0.401	0.293		0.230	0.330	
enviro_ethics							-0.176	0.716		-0.178	0.572	
constant	4.681	0.049	**	2.082	0.152		5.026	0.036	**	2.315	0.114	
10. Walk												
hhold_income	-0.029	0.499		-0.021	0.507		-0.027	0.532		-0.017	0.582	
age	-0.104	0.444		-0.103	0.293		-0.108	0.431		-0.107	0.278	
gender	0.444	0.127		0.346	0.100		0.495	0.092	*	0.388	0.068	*
miles_to_work	-3.091	0.000	***	-2.005	0.000	***	-3.073	0.000	***	-2.008	0.000	***
procarav	-0.305	0.170		-0.265	0.099	*	-0.328	0.144		-0.277	0.086	*
anticarav	-0.089	0.692		0.000	0.998		-0.081	0.722		0.009	0.954	
proenvav	0.818	0.035	**	0.578	0.042	**	0.845	0.030	**	0.596	0.037	**
antienvav	-0.171	0.589		-0.087	0.708		-0.242	0.450		-0.143	0.541	
behavioursum	-0.116	0.339		-0.069	0.428							
enviro_talk							-0.241	0.468		-0.137	0.565	
enviro_persuade							-0.147	0.701		-0.091	0.744	
enviro_work							-0.634	0.080	*	-0.555	0.032	**
enviro_ethics							-0.131	0.763		-0.019	0.950	
constant	2.660	0.166		1.552	0.269		2.790	0.149		1.663	0.239	
N	1068			1068			1068			1068		
Pseudo R2	0.2540						0.2611					
Log likelihood	-945.802			-948.283			-936.88			-938.490		
LR Chi-sq (81) [logit]	644.18	0.000	***				662.02	0.000	***			
Wald chi2(81)				324.23	0.000	***				334.38	0.000	***

Base case is travel by private car.

*** = significant at the 1% level; ** = significant at the 5% level; * = significant at the 10% level

Distance to work is significant, particularly for public transport and for non-motorised transport. The results agree with the idea that there are structural limits to cycling, walking and using buses, and that trains are considered better for longer distances. Looking at option 2, lift sharing with someone from your household, it can be seen that *procarav* is negative and strongly significant, and *anticarav* is positive and significant at the 5% level. This suggests that within households, people who do not like driving are more likely to be driven than to drive, which makes clear sense. In most cases where attitudes towards or against cars are significant, *procarav* is more significant and larger than *anticarav*. That is, pro-car attitudes are more powerful indicators of drivers than anti-car attitudes are indicators of non-drivers. For example, in the case of travelling by train, positive attitudes towards driving are a stronger indicator of someone driving rather than taking the train compared with anti-car attitudes which point towards using the train. Attitudes towards cars have little impact on people choosing to walk, but pro-environmental values are significant at the 5% level and positive for all the regressions.

However, environmental considerations are not important under any of the regressions. This gives support to the theory that attitudes are more important predictors of behaviour than values. The environmental value variables are not very significant in most transport decisions except in the choice to walk – and here the car attitudes have little significance. Also of note are the environmental values variables for bus and light railway. Here, they are significant but in both cases, both the pro- and anti-environmental values are positive. As was stated earlier in the methodology section, this is not necessarily a mistake, since the variables were constructed to allow a range of values to be expressed under pro- and anti- labels. It could be that people who take these methods develop stronger opinions, due perhaps to encounters with bus fumes, advertising or other people.

Finally, both the regressions that looked at *behavioursum* as a single variable and as separate variables found these to be largely insignificant predictors of travel choice. Where there is some significance at the 10% level of better, there is a negative sign on the coefficient. This suggests that people who drive instead of walk, take the bus or lift share as a passenger are more likely to have spoken to other people or their work about being more environmentally friendly. Whether this is a displacement effect whereby people feel guilty for driving so speak up (or tell the interviewer they have done so) is impossible to tell from the dataset. Since the evidence is fairly weak, it is difficult to say how robust this observation is.

Overall, the results are reasonably strong and coherent, and show that people are more likely to choose their method of commuting based on attitudes to transport than environmental values. In terms of sensitivity analysis, the logit and probit results show similar significances and signs to each other, which suggests that the results are not highly sensitive to the underlying regression analysis used.

Ordered Regression
As a second level of sensitivity analysis, and to explore the data further, a simple ordered regression was run. In this case, instead of the dependent variable being different types of transport where the order does not matter, the levels of the dependent variable are ordered or ranked. The differences between the levels of the variable are still meaningless however, so the ranking is ordinal not cardinal. To

enable this, the dependent variable has been recoded into three groups: Driving self, motorised shared transport and non-motorised transport. They are arranged in such a way that the order is ascending from less environmentally friendly to more environmentally friendly. The descriptive statistics for these are shown in Table 6. Again, driving dominates, but there are no very small groups, which should help the power of the regressions.

The independent variables will be the same as before, except *behavioursum* and the associated behavioural variables will be dropped since they showed little significance. Both ordered probit and ordered logits will be run, for the same reasons as before. A new variable was created too, *miles_sq*, which is *miles_to_work* squared. Of course, *miles_to_work* was a stratified variable, not an actual record of miles, but it was considered interesting to look at the effect of *miles_sq*, because it is likely that non-motorised transport will be highest for shortest distances, then driving, and then trains for longest distances. *Miles_to_work* as a single variable would not be able to describe this effect, if it exists.

Table 6: Descriptive statistics for *Method_to_Work2* used in the ordered regressions.

	Frequency	%
Driving/motorbike	747	69.94
Motorised shared transport	167	15.64
Non-motorised transport	154	14.42
Total	1,068	100.00

Table 7: Results from the ordered logit and probit regressions.

method_to_work2	ologit			oprobit		
	Coef.	P>|z|		Coef.	P>|z|	
hhold_income	0.033	0.141		0.017	0.187	
age	-0.288	0.000	***	-0.165	0.000	***
gender	-0.044	0.769		-0.033	0.700	
miles_to_work	-1.651	0.000	***	-0.988	0.000	***
miles_sq	0.153	0.000	***	0.091	0.000	***
procarav	-0.707	0.000	***	-0.398	0.000	***
anticarav	0.186	0.096	*	0.108	0.091	*
proenvav	0.314	0.116		0.172	0.131	
antienvav	0.317	0.054	*	0.184	0.050	*
cut1	-2.863			-1.715		
std error	1.022			0.581		
cut2	-1.669			-1.013		
std error	1.019			0.579		
N	1068			1068		
LR Chi-sq(9)	269.39	0.000		288.32	0.000	
Log-likelihood	-740.455			-730.985		
Pseudo R2	0.1539			0.1647		

Table 7 shows the results of the ordered logit and ordered probit regressions. The logit and probit methods show similar results in terms of significances and signs, although the probit has smaller standard errors for the cut points, which suggests it may be the stronger of the two. Both have a high overall significance.

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Income and gender are insignificant, but the other personal and structural variables are. Both *miles_to_work* and *miles_sq* are significant, and have different signs, suggesting that over medium distances, people are more likely to drive and over longer distances public transport it more used. Older people are more likely to use less environmentally friendly transport.

Pro- and anti- car attitudes are both significant, and with the expected signs. *Procarav* is however, both larger in scale and significance than *anticarav*. This is either due to the much larger amount of people driving than using other methods, thus making the variables which are linked to driving have a stronger effect.

Environmental values are much less strong than attitudes towards transport, and only anti-environmental opinions have a significant effect, but this is the opposite of what would be expected. Both the probit and logit show *antienvav* to have a positive effect on transport decisions, at a significant of just over 5%. This perhaps shows the weakness of using composite variables to quantify values. For example, the variable *antienvav* contains statements such as "It's only worth doing environmentally-friendly things if they save you money" which would perhaps be pro-cycling or pro-walking. It also contains statements which have a certain degree of mutual inconsistency, for example, "Climate Change is beyond control - it's too late to do anything about it," and "The effects of climate change are too far in the future to really worry me."

DISCUSSION

The results showed that distance to work was a crucial variable in people's selection of transport methods particularly in comparing driving with travelling by train, foot or bicycle. This is not a surprising result, and including the distance to work squared term in the ordered regression highlighted the importance of different distances. However, between different options that cover a similar distance, such as lift-sharing, bus motorcycling, or driving, distance is not a significant variable. Indeed, in these cases, the other variables are rarely significant as well. This suggests that structural limits are more important than the attitudinal and value aspects.

Another interesting point is that, as seen in Table 5, there are a number of significant factors in people's decision to lift share as driver compared to driving alone, but these are not so significant in the sharers who do not drive. Again, this could be because people feel (structurally) forced to drive, due to distance or lack of public transport, but dislike driving so take company. Environmental values are not important in people's decision to lift share.

One trend that was repeated for most of the regressions was that attitudes were a more significant indicator than values. Generally, the environmental values had insignificant or vague impacts on travel behaviour, whereas attitudes were a common predictor of behaviour. In particular, anti-car attitudes predict people are more likely to use non-driving methods, or at least to car-share. This may seem too obvious to need studying, but it is recognised that people may hold inconsistent or contradictory attitudes. This study adds to the literature which notices the greater consistency between attitudes and behaviour than values and behaviour. In a similar way, there are only very weak links between stated environmental behaviour as shown by people's willingness to talk to others or their employers about the environment, and travel behaviour. In economics, revealed behaviour is often felt to be a more reliable

indicator of preferences than stated behaviour, but here this suggests the opposite. This could be because of the narrow range of environmental actions (as shown in Table 2), all of which have a somewhat evangelical theme to them. That is, attempting to persuade others to change their environmental behaviours shows a high level of environmental concern, and so this variable does not capture the whole range of environmental concerns/values which may lead to travel behaviour change. Inasmuch as this variable is usable however, the results also add to the conclusion that values have a low impact on behaviour, and that leads to the possibility of inconsistent behaviours which would be difficult to sustain if the behaviour-value links were stronger.

This research also suggests a number of policy-relevant results. Firstly, age was a significant variable in people taking options other than driving alone. This suggests that policy measures aimed at encouraging behavioural change should be age-targeted. Obviously, policies cannot change people's ages, but it can focus on older age groups where there are larger numbers of people who are driving alone to work. Policies to encourage lift sharing or public transport use could therefore aim at things which these age groups prefer, such as comfort or flexibility. Further research would therefore be needed to find out exactly what these preferences are. Also, the significance of age suggests that in the long-run, the public may (if they keep their current attitudes) become less car-centric. Also, policies could be aimed at encouraging older people to cycle to work, for example, showing its health benefits. The second policy relevant finding is that structural variables are important; in particular, this research highlights the impact of the distances to work. Over short and long distances, people are more likely to use more environmentally friendly methods, but over medium distances people are more inclined to drive alone to work. In the long-term, people could be encouraged to work nearer home, or live nearer work, but this would need a large scale plan at both the national and local levels. A more workable policy suggestion would be to increase people's options for travelling a medium distances. Making driving alone less attractive and shared transport more attractive would help shift people's travel choices towards more environmentally friendly modes of transport over the medium distances. Again, the precise range of factors that would persuade people to change is not disclosed by this research. Thirdly, and most importantly, this research shows that attempts to change people's values – whether through information or education – are likely to have a low impact. The variables in the regressions that proxied environmental values were largely insignificant or vague in their impact on people's choice of commuting method. Limited resources would best be put towards the policies recommended above, rather than in attempting to change beliefs or values. Educational or informational policies that changed attitudes would however, have more success in changing behaviour. Looking back at Table 5, the issues raised in the *procarav* column could be addressed, for example by changing perceptions of bus travel. Of course, changing people's perceptions is different to changing the actual experience of bus travel – not only would buses have to change, this would have to be communicated to drivers on a level that will change their mentality towards travelling by bus.

CONCLUSION

This research paper has used econometrics to analyse what affects the choice of transport method people take to work. Using data from Defra's *2007 Survey of Attitudes and Behaviours in relation to the Environment*, (Defra, 2007) and based on a framework developed from both the economic and psychological literature, the research found a number of significant factors in this decision. Perhaps more interestingly, income and environmental values were not significant in people's travel choices. Attitudes to car travel and distance travelled to work were both important in most travel decisions.

Distance to work, and later distance squared, were both significant. This suggests that structural variables are key to individuals' travel decisions, but the dataset lacked information about other structural variables that could be used, such as proximity of a public transport route to the individual's work or the need to share commuting with other tasks such as the school run or shopping. Costs of travel also were not known. It may seem a large assumption to extrapolate from the significance of distance to work to the statement that structural variables are key, but this is backed up by the literature, for example, Parkin et al's (2008) findings on the likelihood of cycling to work in various UK regions.

Another possible weakness in the dataset was the lack of local variables, such as hilliness or vehicle related crime rates. Knowing these would probably have revealed more information about travel decisions as they are highly likely to influence behaviour. However, as the research did not aim to find every influential factor, but rather to assess the impact of environmental values, this is not a major weakness.

Finally, the results depend to quite a large extent on the formulation of the variables that measured environmental values, environmental behaviour and transport attitudes. These were taken from the *2007 Survey* and compiled to make composite variables, which avoided having too many variables in the equation, and allowed for a range of pro-environmental opinions (for example) being measured in one variable. This is a good thing, because people can have pro-environmental opinions in one respect, such as concern over climate change, but not in others such as the need for recycling. Compiling these attitudes and values into single variables allows the focus of the paper to remain focussed.

Overall, this paper presents an important synthesis of two strands of the environmental literature, from economics and psychology. The results shed light on transport behaviours and show that psychological insights about people's behaviours and attitudes can be integrated into an economic framework. Looking ahead, more work is needed in compiling attitudinal and value-based variables for future studies. In particular, it remains open to debate whether integrating a wide range of values or attitudes into one or two variables is a successful methodology, or whether tools such as factor analysis (such as Black et al, 2001) present a better way ahead. Future research could also look into the effectiveness of policies that are aimed at changing behaviour through changing attitudes. Whilst research like this paper suggests that this would be an effective strategy, the implementation and costs of such policies may make them unworkable. However, there is a growing body of literature around such questions, and this paper adds a useful contribution.

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