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Environmental concern over time: evidence from the longitudinal analysis of a British cohort study from 1991 to 2008

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Abstract

Objective

We examined whether and how levels of environmental concern changed over time in the UK, from 1991 to 2008-2009, as well as how environmental concern relates to socio-economic characteristics across this same time frame.

Methods

Using item response theory models on the last three sweeps of the British National Child Development Study 1958, we evaluated a measure of environmental concern. Then, using latent growth curve models (LGCM) we estimated the pattern of change for environmental concern across time. Finally, theoretically relevant socio-demographic characteristics were introduced as covariates into the LGCM.

Results

We found a small but significant downfall of the mean level of environmental concern over time, with individual-level values displaying higher dispersion in 2008-2009 against the previous sweeps of data. We also found that political orientation has significant effects on the outcome and on its changes across time.

Conclusions

Hypotheses regarding the influence of interest in politics and voting choices on environmental concern are supported. The increasing variance of environmental concern over time warrants further investigation.

Key words: environmental concern, latent growth curve models, item response theory models, cohort studies

Scientific and societal attention to human-caused environmental problems started spreading worldwide in the early 1970s, following the publication of *The Population Bomb* (Ehrlich 1968), *The Limits to Growth* (Meadows et al. 1972), Rowland and Molina's (1975) dissemination of their findings on the depletion of the ozone layer, and the 1973-74 energy crisis (Buttel 1987; Dunlap 1997). Research related to North America, highlighted by Dunlap (1997), showed that this interest seemed to decline in the mid-1980s only to grow further afterwards until around 2008-2009, when an additional contraction was recorded internationally (Leiserowitz et al. 2010; Nerlich 2010). For example, in 2009 a Gallup poll reported an inversion of the 25-year-long tendency to prioritise protection of the environment over economic growth amongst a representative sample of the U.S. population. Although differences between countries have been observed, Dunlap and York (2008) reviewed findings from the major international surveys on environmental attitudes and reported cross-national support for environmental protection, defining this trend as the result of "global phenomena […] no longer limited to the wealthy nations of the world" (*Ibid.*: 550).

Potential interpretations of the changing levels of attention to environmental issues over time include the immediate salience of environmental issues (Leiserowitz et al. 2010), the status of the economy (Buttel 1975; Jones and Dunlap 1992; Leiserowitz et al. 2010), the periodic predominance of other major socio-political issues (Leiserowitz et al. 2010), and indeed some combination of all these (Pidgeon 2010). Complicating the picture are the many different ways in which environmental attitudes have been measured, as underscored by Yeager et al. (2010).

Economic crises and related financial hardships are thought to represent the biggest source of distraction from environmental issues. For example, as Dunlap (1997) observes, Ronald Regan's 1980 election campaign slogan '*Make America great again*', implied a clear rejection of the developmental limits proposed by the Club of Rome. However, in the mid-80s, major environmental events such as the destruction of entire communities in Bhopal, India (1984), and Chernobyl, Ukraine (1986), pushed public opinion against unfettered heavy industrial production.

By the early 1990s, concern about environmental issues reached previously unprecedented levels, which, as Dunlap observed (1997), was driven as much by burgeoning anti-globalisation movements as it was by the intrinsic salience of environmental issues. During this time, critiques of the free-market policies championed by

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a coalition of the International Monetary Fund, World Trade Organisation and World Bank were paralleled by the call for environmental justice and concerns about the problematic externalities of industrial and economic development (Rhodes 2003).

Background

The main literature on environmental attitudes can be found within social psychology and sociology. In general, the socio-psychological literature has focused on their ontological structure, by building on attitude theory, whilst sociologists have mainly concentrated on theories towards the spread of their social bases. Nonetheless, the two disciplines are often interlinked when it comes to empirical research settings.

There has been much discussion on the theoretical contours of and methodological approaches to understanding environmental attitudes. A key issue is how to define *attitudes towards the environment* (Fransson and Garling 1999; Upham et al. 2009). Indeed, projects such as the International Social Survey Programme (ISSP) Environment I (1993), II (2000) and III (2010), the World Value Survey since 1981, and the European Commission's Eurobarometer series provide a wealth of data allowing cross-national comparisons of attitudes towards environmental issues; however, the different operationalisation applied in each of these sources leads to difficulties in results' comparisons between studies.

In an attempt to clarify the concept of environmental attitudes, hence, we referred in particular to the related notion of environmental concern, of which Dunlap and Jones (2002) have given the following definition: "Environmental concern refers to the degree to which people are aware of problems regarding the environment and support efforts to solve them and/or indicate a willingness to contribute personally to their solution" (*Ibid.*: 485). Unpacking the term further they state that "environmental" is the *substantive content* (or *topic*, or *object of concern*), operationalised by the researchers as the relevant issue or set of issues (e.g. acid rain, water pollution, air pollution) and "concern" represents a linguistic medium through which researchers elicit respondents' responses to environmental problems from amongst "the universe of expressions of concern" (*Ibid.*: 486). Dunlap and Jones' (2002) definition has the benefit of intuitive simplicity and we do not propose to vary from it in the current study. In particular, therefore, *environmental concern* is intended here as the perceived importance of environmental issues as social problems, both *per se* and in comparison with other socio-political topics.

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Regarding the aetiology of environmental attitudes, Upham *et al.* (2009) observed a predominant view within sociology that an individual's context, i.e., "factors that are economic, social, political, institutional and cultural in nature", shapes his/her psychological predispositions, so that "attitudes are secondary – a consequence, not a cause" (*Ibid.*: 16). For instance, practice theory and consumption sociology consider environmental attitudes as outcomes of socially-learned habits or practices, also defined as socio-technical systems of provision (*Ibid.*). Studies on the social determinants of environmental concern have flourished, and Fransson and Gärling (1999) offer a thorough review of some of these.

On the spread of environmental concern amongst the general population, Dalton and Rohrschneider (1998) identified two opposing perspectives: one that perceives environmental concern as a response to the deterioration of global environmental resources, and elaborates a critical view towards the technocratic solutions to environmental depletion (Dobson 1990; Dunlap et al. 2000); the other hypothesises a cultural and generational shift of values generated by the socio-economic progress of westernised democracies (Inglehart 1995). Inglehart (1995) claimed that environmental concern (which in his theoretical perspective is one of the cardinal post-materialistic values which are now dominant in advanced industrial societies) appears to be highly correlated with per-capita gross national product. Indeed, Inglehart has mostly explained the emergence and widespread of environmentalism by manipulating Maslow's (1954) theory of the hierarchy of human needs and applying it to country-level analyses.

Dunlap and York (2008) advanced a fierce critique of Inglehart's findings, claiming that the methodology used by Inglehart in his World Values Survey (WVS) programme produced a distorted vision of the interaction between economic well-being and environmental concern. Indeed, further analyses of country-level differences carried out on a large-scale dataset from four comparative surveys (including the WVS) indicated a tendency opposite to Inglehart's statements, after individual-level characteristics were controlled for. Nonetheless, more recent research showed that when willingness to pay for the protection of the environment is considered then, also at the country-level, wealth is associated with environmental concern (Franzen and Vogl 2013).

At the individual-level of analysis, Dunlap and Van Liere (1984) forwarded five hypotheses on the relation between socio-demographic factors and differences in attitudes toward the environment: (i) The *age hypothesis*: younger people are more concerned about the environment than older ones. The hypothesised explanation is that

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younger are more open to changes to the social order, thus to accept to deal with new challenging problems; (ii) the *social class hypothesis*: environmental concern is positively associated with education and income. This might be in line with the theory of the *hierarchy of needs* (Maslow 1954) following which the upper and middle classes, after easily satisfying their basic material needs, focus on satisfying other 'higher' needs (Fransson and Garling 1999). However, it was found that, between the two factors that constitute social class in the sociological literature, education has constantly shown a stronger association with environmental attitudes than income (Laidley 2013). Preston and Feinstein (2004) found that "there is a large and significant effect of taking a vocational course and increased environmental concern […]. These effects seem to confirm that education is associated with increased environmental awareness and sustainability more generally" (*Ibid.*: 26); (iii) the *residence hypothesis*: the higher level of exposure to the consequences of environmental deterioration of urban residents makes them more environmentally concerned than residents in rural areas; (iv) the *political-ideology hypothesis*: liberal opinions are associated with stronger pro-environmental attitudes. This might be explained by the hypothesis that environmental reforms are seen as contrasting some of the principles on which conservative policies rely. Moreover, liberal ideologies are more inclined to reforms and innovative action (Kamieniecki 1995); (v) the *gender hypothesis*: women hold stronger feelings about the consequences of environmental impoverishment. Nonetheless, this statement has been either contradicted (Arcury and Christianson 1990) or revised through more complex explanations for this relationship, i.e. the *mother* and *father effects*: the role of gendered socialisation leads mothers to focus on children health and fathers on children economic safety with opposite effects on environmental concern (Blocker and Eckberg 1989). Stern et al. (1995) also report stronger biospheric-altruistic values for women.

Using repeated cross-sectional data from the series 1973-1990 of the National Opinion Research Centre's General Social Survey (NORC GSS), Jones and Dunlap (1992) provided further evidence for all 5 of these hypotheses.

Thus, the purposes of this study are: (i) to validate a repeated measure of environmental concern from a cohort study, i.e., the British National Child Development Study 1958 (NCDS); (ii) to observe how that measure changed over time and (iii) to elucidate the role of individual level socio-demographic characteristics in determining levels of environmental concern and the changes therein. As stated above, *environmental concern* is intended here as the perceived importance of environmental issues as social problems both of itself and in

comparison with other socio-political topics. As per availability in the NCDS dataset, the socio-demographic characteristics included in our analysis are: occupational status, educational level, political beliefs, gender and presence of children.

Methods

Unlike much of the previous work in this area, our approach is to focus on patterns of association in a longitudinal and individual-level perspective rather than using cross-sectional aggregate data. As Dale and Davis (1994) have argued, observing the same individuals over time strengthens the analysis of attitude change and specifically how these changes may be related to individual and contextual characteristics.

Data and variables. The NCDS is one of only a few large surveys that has a measure of environmental concern common to multiple sweeps, specifically 1991, 1999-2000 and 2008-2009, when the cohort members were aged 33, 42 and 50 years old respectively. Our sample in 2008-2009 was made of 9790 individuals, compared to 11469 in 1991 and 11419 in 1999-2000, whilst the pooled sample of 13292 cases. We made the standard assumption that data were Missing at Random (MAR) (Hawkes and Plewis 2006; Little and Rubin 1989). The reference population for our study will be regarded as those who were born in the late 1950s in Great Britain (Plewis et al. 2004).

Environmental concern was assessed using three items, each measured on a 5-point Likert scale anchored by "Strongly disagree" (coded as 0) and "Strongly agree" (coded as 4): (i) "We should tackle problems in the environment even if this means slower economic *Growth*"; (ii) "Preserving the environment is more *Important* than any other political issue today", and; (iii) "*Problems* with the environment are not as serious as people claim" (which was reverse-scored to have the same conceptual direction as the other items).

Political orientation was assessed by: (i) a 4-point Likert scale asking the respondent's level of *Interest in politics*, with responses anchored at 0 (Not interested) and 3 (Very interested), and (ii) four dummy variables based on voting choices at the previous general election, coded as *Abstained*, *Mainstream-Right* (voted Conservative) which is used as the reference category, *Mainstream-Left* (voted Labour or Liberal Democrat) and *Small Parties* (a heterogeneous and small category: 2.4% in 1991, 3.4% in 1999-2000 and 5.1% in 2008-2009). Socio-economic statuses were represented by: (i) Two dummy variables for economic activity, with *Employed*

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(full- and part-time) and *Inactive* in the labour market (i.e. in full-time education, home and family care and wholly retired) compared to those *Unemployed* (i.e. seeking work); (ii) two dummy variables for the highest educational qualification, that is,, *Medium* (NVQ2-3 or equivalent) and *High* (NVQ4-6 or equivalent) compared to the reference of *Low* (NVQ1 or none). Other theoretically relevant demographic variables comprised: (i) a dummy variable for *Female*, and (ii) a dummy variable for having *Children* in the household.

Analysis. We first evaluated the measurement properties of the 3-item environmental concern scale. We fitted a one-dimensional, 2-parameter normal ogive item response theory (IRT) model, based upon the polychoric correlations among the ordinal questionnaire responses (Lord 1965). We fitted this model to each wave in the pooled dataset containing all three waves using a total of 12,994 cases analysed (298 missing cases). The final IRT model therefore had three factors, representing environmental concern in sweep 1, sweep 2 and sweep 3, respectively. Items' measurement errors were serially correlated, as to allow for the longitudinal structure of our data. Following Hu and Bentler (1999) we evaluated the fit of the model using a combination of the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI), with the model Chi-Square reported for completeness. Values of RMSEA less than 0.05, or greater than 0.95 for the CFI and TLI, were taken to indicate good fit. Model estimation was based on Mean- and Variance-adjusted Weighted Least Squares (WLSMV) (Muthen, 1997).

The model fit indices obtained were good: RMSEA 90% C.I. = 0.025-0.033; CFI = 0.995; TLI = 0.989; Chi-square = 175.560 (degrees of freedom, d.f. = 15). (See Figure A1 in the online appendix). The standardised loadings affirm that the largest impact of the latent construct is on the *Growth* item, particularly in the latter two time points. Thus, uni-dimensionality of the environmental concern factor (EC) at each time point is supported. The factor variance in 2008-2009 (equal to .791, p-value = 0.000) was larger than in the previous two sweeps, showing the greater variability of the cohort's environmental attitudes in the final sweep.

We then proceeded to use Latent Growth Curve Models (LGCM) to evaluate longitudinal intra-individual trajectories of environmental concern, and the between-individual differences in these trajectories (Bollen and Curran 2006). We first fitted an unconditional LGCM to the environmental concern scale. This model represented individual trajectories of environmental concern scores over the three waves as a function of fixed and latent intercepts and slopes. The fixed intercept and slope tell us about the average level of concern at the

first wave and the average rate of change over time. The latent intercept assesses the extent to which there is variation between individuals in environmental concern at the first wave, and latent slope assesses the between-individual variation in the linear rate of change in concern across the waves (Muthén and Asparouhov 2002; Singer and Willett 2003). We then fitted a conditional LGCM (Bollen and Curran 2006), where the environmental concern items and the latent growth factors were regressed on observed covariates, to evaluate the plausibility of the various hypotheses outlined above.

Results

Figure 1 shows the percentages of responses falling in the top two categories of each indicator (sum of the categories "Agree" and "Strongly agree"). These percentages are falling over time for all items, most notably for the item *Growth* (down by 20.6 percentage points from 2000 to 2008).

Figure 1 about here

Unconditional LGCM

The specification for the unconditional LGCM was as described in Bollen and Curran (2006). One intercept and one slope growth factor were specified. Loadings from each wave's EC factor to the intercept growth factor were fixed to one. Loadings from the EC factors to the slope growth factor were fixed to 0 for 1991, 9 for 2000 and 17 for 2008, reflecting the number of years between sweeps. Finally, strong factorial invariance (Meredith 1993) was specified for the EC factors, by constraining the EC factor loadings, thresholds and scale factors to be equal for each item across waves. Again, the estimator chosen was WLSMV and the number of cases was 12994.

The results found a negative value for the fixed slope, (Estimate = -0.018, p-value = 0.000), implying significantly declining mean change over time. Figure 2 shows the model-estimated linear trajectory for the means of the EC factors in each sweep; the means of EC are shown to decrease slightly over time.

Figure 2 about here

The correlation between the intercept and slope growth factor was negative and significant (-0.216, p-value = 0.024), i.e. those with higher levels of environmental concern in 1991 record a steeper decline over time than those with initially lower levels. The variance of the intercept growth factor (0.422, p-value = 0.000) suggests

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that individuals significantly differed from each other in their EC in 1991. The slope growth factor's variance was marginally non-significant at the 95% level (p-value = 0.092), suggesting reasonably stable rates of decline in EC across the cohort.

This model had reasonable but not close fit to the data (Chi-square = 2232.461, 36 d.f., p-value = 0.000; CFI and TLI = 0.938; RMSEA 90% C.I. = 0.066-0.071). The modest lack of fit appeared related to the non-linearity of the trajectory in EC over the study, particularly for the *Growth* item. With only three time points we were unable to add in a quadratic term to the model to improve fit, but continued with this model in the knowledge that the assumption of a linear trajectory was clearly a limitation.

Conditional LGCM

The next task is to answer our research questions regarding relationships between environmental concern and socio-demographic characteristics over time. The predictors were divided into time-invariant covariates (year 1991 data), i.e. *Female*, *Children* and *Interest in politics*; and time-varying covariates, i.e. *Abstained*, *Mainstream-Left*, *Small Parties*, *Employed*, *Inactive*, *Medium educational level* and *High educational level*. Figure 3 shows the general structure of the conditional model. The intercept and slope growth factors were regressed on the time-invariant predictors, evaluating to what extent EC in 1991 and change in EC over time were predicted by these variables. For the time-varying predictors, the EC factor for each wave was regressed on the relevant predictor.

Global fit indices confirmed a good fit of our model to the data, with CFI and TLI equal to 0.956 and 0.951 respectively; the RMSEA was 0.023, with 90% C.I. between 0.022 and 0.024. The Chi-square test value was predictably significant for such a large sample (1271.864, with 269 d.f.). Figure 3 shows the model structure and the (standardised) estimated path coefficients for this model. To avoid clutter, the estimates for the latent variables are omitted from Figure 3 and are shown separately in Table A1 of the online appendix (link to the online appendix).

Because of the choice of predictors' reference categories, the fixed growth parameters represent the averages for cohort members who are male, without children, and who are not interested in politics, net the effects of time-varying covariates. The positive value of the slope's intercept suggests that, for this reference category, the EC

score increased on average by 0.009 of a standard deviation per year, or about 17% between 1991 and 2008; however this is not significant. The remaining estimates for this model will be interpreted through Figure 3.

Figure 3 about here

Unlike the unconditional model presented above, the covariance between slope and intercept (-0.001, p-value = 0.683) is not significant. Following Bollen and Curran (2006), the interpretation of this model has to take into account (i) the effects of the latent growth factors describing change, net of the effects of the time-varying covariates, which in our case were measures of educational level, employment status and Party voted for in the last general elections; (ii) the random latent growth process on the repeated measures of EC, while modelling individual variability as a function of gender, presence of children, and interest in politics.

In figure 3 we can see the values of each path coefficient, and significant paths for a 95% confidence level are identified with a star. Starting from the direct effects of the time-varying covariates, we observe that educational levels and employment statuses are not significant. Those who voted for a small party in the previous general elections present significantly higher levels of environmental concern than those who voted for a major right-wing party, for each time point; this is also true for those who voted for a major left-wing party as well as for abstainers, although the latter category recorded lower values than the other two across time. Therefore, voting choice could be considered as a consistent predictor of environmental concern across time points.

Moving to the TIC, figure 3 reveals that only *Interest in politics* is a significant predictor of both intercept and slope. The effect of this TIC on the slope is negative, suggesting slower rate of change over time as interest in politics increases; the size of the effect of this predictor on the slope growth factor (-1.147, p-value < 0.05) was larger than the average slope, suggesting that EC increased over time for participants with the greatest political interest. Finally, having children only affects the initial values of EC (-0.106, p-value < 0.05), with parents being less concerned than non-parents about environmental problems; however, contrarily to previous hypotheses, gender (*Female*) does not contribute significantly to neither of the growth factors (p-value > 0.05).

Conclusions

The main finding of our study is that EC on average declined slightly between 1991 and 2008-2009, but also that interest in politics, non-voting, voting left-wing and smaller parties offset that decline. The 2008-2009

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sweep of NCDS coincided with the onset of the current financial crisis and it is noteworthy that the EC question that showed the greatest change over time was the one that counterposed environmental and economic concerns. This finding is concordant with Newport (2009) in the US context. Regarding the British population considered here, the increased variance in the EC measure (from a value of .547, p-value < 0.05 in 1991, to a value of .791, p-value < 0.05 in 2008, as shown in figure A1 in the online appendix) may also suggest progressive polarisation around extreme positions and this may warrant further investigation.

Dunlap (1997) describes how different political ideologies seem to handle the tension between environmental protection and economic growth differently; those with right-wing political views tend to deny the natural-world limits to the growth of production and consumption (see also: Kamieniecki 1995). Net of the effects of the other covariates, our conditional LGCM model suggested that voting for the Conservative Party (the reference category) is associated with lower levels of environmental concern than any other voting choice (including non-voting), as - consistently across all time points - the coefficients for the latter are all positive and statistically significant. Finally, 'Interest in politics' was considered in this model as affecting the growth factors, rather than directly the measure of environmental concern at each time point, as previous exploratory analysis showed this to be time-invariant. Amongst the three TICs, this represents the significant predictor of both initial level of environmental concern and its rate of change. The values of its path coefficients state that higher interest in politics is associated with higher initial levels of environmental concern and a slower rate of decline over the three sweeps.

Contrary to Dunlap and Van Liere (1984) and Blocker and Eckberg (1989) but concordant with Arcury and Christianson (1990), in our study, gender did not have any influence on EC, once presence of children and interest in politics were accounted for.

The NCDS dataset does not contain a variable that measures cohort members' income. Nonetheless, we considered the categorical variable 'Economic activity' a good proxy of working and financial status. Thus, in order to test the *social class hypothesis* (Dunlap and Van Liere 1984) the effects of 'Economic activity' and 'Educational level' were observed in the conditional LGCM. This choice was driven by the decision to observe potential differences in the effect of education and employment on EC, as suggested by the literature (for example, see: Laidley 2013). However, the model in figure 3 suggests that, net the effect of TICs and the other

TVCs, 'Educational level' and 'Employment status' are not significant predictors of environmental concern over time in our population of reference.

Dunlap and Van Liere's (1984) hypotheses have been investigated previously across different populations. Within our single-cohort research context, however, two of their socio-demographic hypotheses, i.e., the *age hypothesis* and the *residence hypothesis* could not be considered. Therefore, we were not able to assess whether potential change in the level of environmental concern over time is related either to the cohort members getting older or to the effects of the cultural and historical events that have characterised these cohort members' lives (an economic crisis, for instance). Moreover, we did not have available any information regarding the place of residence for our sample, as the only geographical information that was made accessible in the dataset was at the level of the Government Office Regions (a very broad British geographical categorisation with limited discriminatory power for our purposes).

Whilst we acknowledge the immense value of NCDS and other cohort studies, we argue that a more thorough operationalisation of environmental attitudes should be pursued for future cohort studies and longitudinal studies in general. We should also consider the limits of the power of attitude data in detecting socio-cultural change, which even with panel data is hampered by the irregular snapshots that are taken of the study sample. In a more general sense, there is the troublesome question of the attitude-behaviour gap and the social policy import of the aggregated response to attitude items is always open to question (Fransson and Garling 1999). However a plausible position here is that although explicit pro-environmental attitudes may not be sufficient to lead to pro-environmental behaviour they are probably a necessary precursor.

In conclusion, our empirical findings for the British context analysed here underscore the importance of people's broader ideological and attitudinal structure in defining their environmental attitudes. We have identified a mild shift away from pro-environmental attitudes in Great Britain during the 1990-2008 period. We have also identified an increase in the variance of environmental attitudes, which suggests that these have become more polarised during this period. This may in itself reflect the wider political divisions within our society, but the continuing importance of the environment as a socio-political issue is underlined by these findings.

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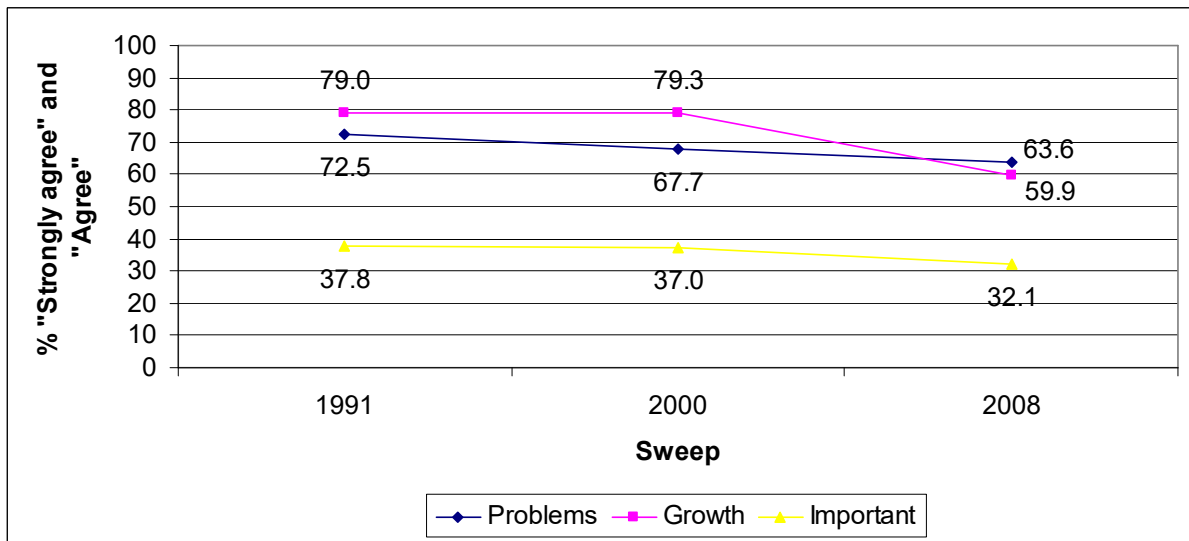Figure 1. Percentage values of "Strongly agree" and "Agree" to each item by sweep year.

Figure 2 Unconditional LGCM model: estimated-mean trajectory of environmental concern (EC) over time (12994 cases)
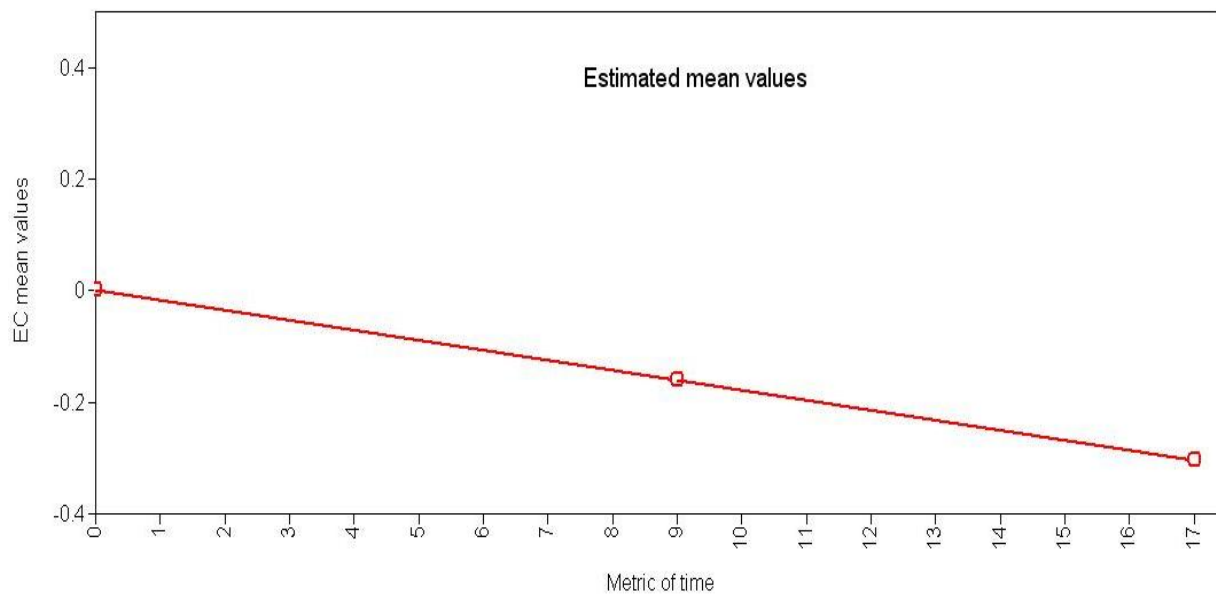

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Figure. 3 Path diagram for the final conditional growth curve model (6951 cases; * = path coefficients significant at the 95% confidence level). Standardised and unstandardised coefficients. Standardised coefficients are in italics; I = Covariate's effect on the intercept; S = Covariate's effect on the slope.