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## COHORT CHANGE, DIFFUSION, AND SUPPORT FOR ENVIRONMENTAL SPENDING IN THE UNITED STATES

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### Abstract

The long-standing and sometimes heated debates over the direction and size of the effect of socioeconomic status (SES) on environmental concern contrast post-materialist and affluence arguments, suggesting a positive relationship in high-income nations, with counter arguments for a negative or near zero relationship. A diffusion-of-innovations approach adapts parts of both arguments by predicting that high SES groups first adopt pro-environmental views, which produces a positive relationship. Like other innovations, however, environmentalism diffuses over time to other SES groups, which subsequently weakens the association. We test this argument using the General Social Survey from 1973 to 2008 to compare support for environmental spending across 83 cohorts born from around 1900 to 1982. In developing attitudes before, during, and after the emergence of environmentalism, varying cohorts provide the contrast needed to identify long-term changes in environmental concern. Multilevel age, period, and cohort models support diffusion arguments by demonstrating the effects, across cohorts, of three common indicators of SES – education, income and occupational prestige – first strengthen and then weaken. This finding suggests that diffusion of environmental concern first produces positive relationships consistent with postmaterialism arguments and later produces null or negative relationships consistent with global environmentalism arguments.

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An intense scholarly debate began in the 1990s and continues today, addressing what might appear to be a simple question: Does higher socioeconomic status lead to greater environmental concern? Yet decades of research have not brought consensus. To the contrary, the competing theories underlying the debate remain largely unchanged. In addition, the related empirical studies, examining both individual and cross-national relationships, continue to present contrasting findings.

The dispute stems, in part, from the variety of forms of environmental concern and measurements of such concern (Klineberg, McKeever, and Rothenbach 1998; Stern 2000). But another key difference stems from competing conceptualizations of the mechanisms underlying any potential association. Through the years, the dueling paradigms of “postmaterialism” and “global environmentalism” have shaped research in an either/or fashion and few have tried to integrate the paradigms, or at least find middle explanatory ground linking socioeconomic status and environmental concern.

The work presented here brings to the discussion a theoretical perspective not typically employed within this body of literature. We use diffusion theory to explore the potential for middle ground within the ongoing debate. Specifically, we hypothesize that the association between socioeconomic status and environmental concern varies temporally, demonstrating divergence across socioeconomic strata in times of lower overall levels of environmental concern but converging as environmental sentiment diffuses. We make use of 27 surveys,

covering 36 years, from the General Social Survey, with respondents representing cohorts born from before 1900 through 1983. Importantly, the included cohorts entered adulthood during periods of widely varying degrees of economic prosperity, environmental concern, and government action on behalf of the environment. To explore diffusion of environmental concern as related to socioeconomic status, we use a mixed-model approach to examine shifts in the association between a single measure of support for environmental spending – rather than environmental concern more generally – and education, income as well as occupational prestige.

This work does not focus on overall cohort changes nor on average group differences in environmental concern; these topics have been previously, and separately, investigated in some detail (e.g., McCright 2010; Wray-Lake, Flanagan and Osgood 2010). Rather, we focus on the intersection of the two topics, on how environmental concern varies by SES across cohorts, and the potential utility of diffusion theory in accounting for temporal shifts in the association. We further focus on changes within a single country rather than differences across countries.

## Competing Views on Socioeconomic Status and Environmental Concern

On one side, value orientations are argued to play a central role in individual expressions of environmental concerns, with these orientations being shaped primarily through early childhood socialization experiences. Articulated by Inglehart (1990, 1995), environmental concerns manifest themselves primarily through “postmaterial values” that emphasize higher-order, aesthetic needs. Such value orientations, he argues, more often characterize individuals socialized in times of relative abundance and security, such as the postwar generations in more affluent nations. Other “postmaterial,” quality-of-life issues include gender, sexual, and racial equality. Earlier cohorts, on the other hand, having experienced war and economic hardship in their childhood years, emphasize “material” values resting on meeting core physical and physiological necessities (Inglehart 1995).<sup>1</sup> As related more broadly to cultural change, Inglehart argues (1977, 1990) that as postwar generations began to dominate culture and politics, their value priorities came to shape social dialogue and political movements through, for example, a rise in environmentalism, feminism and civil rights activism.

The postmaterialist perspective engages socioeconomic status through its emphasis on security and prosperity, particularly in childhood years (Abramson and Inglehart 1997). And while the hypothesized association plays out at the individual-level as outlined above, at the aggregate scale, countries with relatively postmaterialist publics tend to rank highly overall in willingness to make financial sacrifices based on environmental concern (Abramson 1997; Kidd and Lee 1997; Inglehart 1995). The argument mostly clearly specifies an effect of post-materialism on environmental concern but is also consistent with an influence of SES on environmental concern via post-materialism.

A related argument makes a similar prediction of positive association between socioeconomic status and environmental concern although specifying a different mechanism. This “affluence” hypothesis treats environmental quality as an amenity good that high-income individuals can more readily afford relative to low-income individuals (Franzen and Meyer 2010). As opposed to focusing on socialization processes and value orientations, however, this perspective maintains that a positive association between SES

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<sup>1</sup>Inglehart and Baker (2000) more recently define two main dimensions of value differentiation. Traditional values versus secular-rational values relate to religion, importance of parent-child ties, and respect for authority, while survival values versus self-expression values relate to levels of post-materialism and environmentalism.

and environmental concern can emerge without adoption of postmaterialist values, particularly when environmental action has behavioral and monetary costs (Diekmann and Preisendörfer 2003; Meyer and Liebe 2010). Based on the elasticity of demand for environmental quality, here we would anticipate an affluence effect separate from value orientation.

In support of these perspectives, numerous studies document positive, individual-level associations between socioeconomic status (and/or its component characteristics) and expressions of environmental concern (e.g., Franzen and Meyer 2010; Gelissen 2007). For example, a recent comparison across 19 advanced industrial and former Communist nations demonstrates consistently positive effects of education, and generally positive effects of income, on pro-environmental attitudes and behaviors (Marquart-Pyatt 2008). Considered in the aggregate and congruent with the postmaterialist and affluence perspectives, greater representation of highly educated and affluent individuals in high-income nations should, then, produce higher mean levels of environmental concern. Indeed, several studies demonstrate such a macro-level association (Diekmann and Franzen 1999; Franzen 2003; Kimmelmeier, Król, and Kim 2002; Kidd and Lee 1997). Franzen and Meyer (2010), for example, make use of the International Social Survey Programme (ISSP) data for 1993 and 2000 to reveal higher levels of environmental concern among the wealthiest of the included 26 nations.

Taking a different theoretical approach, several environmental sociologists have argued head-on with the post-materialist thesis, contending that environmental concern is not a privilege restricted for the secure and affluent. Instead, they argue that a “global environmentalism” has emerged which includes environmental concern as expressed by socioeconomically disadvantaged populations within relatively poor nations (Brechin 1999). Three key strands of evidence buttress their argument.

First, some scholars argue that disadvantaged individuals often depend more directly on local environments and have greater exposure to environmental ills. As such, they have substantial motivation for environmental conservation, as evidenced by vibrant grassroots environmentalism in many less developed settings (e.g. Brechin 1994, 1999; Dunlap and Mertig 1995). Research in multiple sites, and at multiple scales, has demonstrated socioeconomic inequalities in environmental exposure and negative impacts due to environmental degradation – with disadvantaged groups more likely to experience adverse environmental conditions (see Brulle and Pellow [2006] for a review). Conversely, relatively advantaged groups and nations can better afford to protect themselves from myriad environmental insults (Adeola 2004; Brechin and Kempton 1994; Uyeke and Holland 2000). In this way, objective environmental problems faced by less advantaged individuals may compel environmental engagement and could logically be positively associated with socioeconomic disadvantage, a finding identified through the World Values Survey by Givens and Jorgensen (2011). Indeed, Inglehart himself noted the potential for “objective problems,” such as pollution and resource degradation, to result in concern with environmental conditions. The intensification of grassroots environmental movements in less developed settings provides additional evidence of “environmentalism of the poor” (Gerber 2010:30). This aggregate disadvantage results in macro-level pro-environment sentiment within relatively poorer nations (Brechin 1994).

Second and related, a review of the evidence reveals many cases where SES relates negatively to environmental concern, particularly at the national level (Brechin 1999; Dunlap and Mertig 1995, 1997; Dunlap and York 2008; Dunlap and Jones 2002; van Liere and Dunlap 1981). Indeed, research on “global environmentalism” reveals a broad global base of environmental concern, beginning with studies by Dunlap, Gallup, and Gallup

(1992), extended by Brechin and Kempton (1994, 1997) and Brechin (1999), and defended by Dunlap and York (2008). More recently, Givens and Jorgensen (2010) undertook a multi-level analysis of individual-level data from the World Values Survey, combined with national-level data reflecting GDP and environmental quality. They find that residents of wealthier nations, in the aggregate, express lower levels of environmental concern.

At the individual level, however, conflicting results have emerged. Contrary to the aggregate results noted above, Givens and Jorgensen's analysis (2011) of the World Values Survey reveals that individuals ranking more highly on a self-assessed social class measure are more likely to believe in the importance of "looking after the environment." However, environmental concern relating to local environmental problems and risk perceptions appears strong among traditionally low SES minorities (Adeola 2004; Kahn 2002; Whittaker, Segura and Bowler 2005) as well as foreign born in the U.S. (Adeola 2007; Hunter 2000), and residents in specific lower-income settings such as rural Ghana (White and Hunter 2009) and South Africa (Hunter, Strife, and Twine 2010).

Third, related to the above inconsistent results, scholars have argued that environmental concern is simply too complex, multi-dimensional, and context-specific to consistently relate to economic security and postmaterialism – concepts that are themselves complex and multidimensional (Brechin 1999; Dietz, Fitzgerald, and Shwom 2005; Marquart-Pyatt 2008; Xiao and Dunlap 2007). Advocates of the postmaterialism and affluence hypotheses generally favor measures of environmental concern reflecting "willingness-to-pay" for environmental improvement (Gelissen 2007; Kidd and Lee 1997; Meyer and Liebe 2010), arguing that the embedded trade-off yields a measure of deep-seated beliefs – more so than a general, and costless, environmentalist expression (Inglehart 1995). Yet, others argue that items focused more on localized issues of pollution, sustainability, and natural resources, for example, better reflect the environmental concerns more common among disadvantaged groups and nations (Brechin 1999).

The conflation of research across scales and using of a variety of measurements may be, in part, to blame for the stalemate in answering the question posed at the onset: Does higher socioeconomic status lead to greater environmental concern? Associations have been explored at the individual, regional, and national levels making use of a variety of measures of both socioeconomic status and environmental concern. Macro-level positive associations between affluence and environmental concern would imply an aggregate of similar individual-level associations. But scholarship has not consistently borne this out, possibly giving evidence of an ecological fallacy of asserting conclusions across scales. Of course, in the midst of the lack of consensus, middle theoretical ground has also not been sought.

## Cohort Diffusion of Environmental Concern

Inglehart is a widely-cited and influential political scientist and his ruminations on cohorts and postmaterialism were part of a broader agenda to explore cultural change. But the cohort perspective is certainly not unique to political science. Demographers have long emphasized the importance of cohorts in producing societal change (Ryder 1965), and several sociological studies have highlighted their importance for environmental concern more specifically (Buttel 1979; Kanagy, Humphrey and Firebaugh 1994; Lowry 2009; Mohai and Twilight 1987). Although cohort has a variety of meanings, we refer specifically to birth cohort or persons born in the same year or adjacent years who experience a particular historical environment and events during their formative years as adolescents and young adults. The unique location in the stream of history of each cohort (Ryder 1965) shapes values, attitudes, and beliefs that persist to varying degrees over the remaining life course. Social change thus occurs as older cohorts raised in earlier periods and holding views that

were common decades ago die out and are replaced by younger cohorts raised more recently and holding more current views.

Besides its theoretical importance, attention to cohorts has value in helping to capture changes over an extended period of time. Although studies find stable and weak relationships of SES and environmental concern in recent decades (Jones and Dunlap 1992), the initial impetus for environmental protection may have come substantially earlier. Yet examination of longer-term temporal trends is hindered by the lack of surveys on environmental attitudes before the 1970s.<sup>2</sup> A workaround presents itself in creation of cohorts from age data within longitudinal data collection efforts – indeed, surveys from the 1970s included older persons born early in the 1900s and more recent surveys include respondents born in the 1980s. To the extent that cohorts form attitudes during the historical period of their transition to adulthood, these cohorts will reflect the evolution of views over a near century. In developing attitudes before, during, and after the emergence of environmentalism, varying cohorts provide the contrast needed to identify long-term changes in environmental concern.

We argue that consideration of current understanding of processes of innovation diffusion may identify potential bridges between the divergent perspectives and findings described above. Key to the analyses presented here is that along with influencing the overall level of environmental concern, cohort membership may also shape the nature of the relationship between socioeconomic status and environmental concern.

Montgomery and Casterline (1993) define diffusion as the influence of adoption of innovative ideas and behaviors by some individuals on the likelihood of adoption by others. Diffusion often first occurs horizontally within classes, predominantly among higher socioeconomic groups who tend to be most innovative and have the requisite communication networks (Strang and Meyer 1993). Vertical diffusion often follows, as groups ranked lower socioeconomically adopt the practices and ideas of more prestigious groups (Fischer 1978; Strang and Soule 1998; Wejnert 2002). The relative advantage of adoption (Rogers 2003:229) plays a role in the diffusion theory. Consistent with global environmentalism arguments, the benefits to low SES groups of improving the environmental degradation they face encourage adoption once the ideas make their way into public consciousness. Other social mechanisms are important in explaining vertical diffusion. Groups may follow innovators, both in behaviors as well as values, through processes of class emulation and social learning (Weber 1958; Bourdieu 1984). In addition to these mimetic influences, socialization may be an important mechanism: New groups are socialized into environmentalism as attitudes become institutionalized in education and the media. Moreover, acceptance of new ideas may become self-sustaining after a critical mass of adoption is reached (Casterline 2001; Rogers 2003:343). Such a threshold indicates that further adoption entails less risk and, actually, resistance to increasingly popular ideas becomes more difficult, especially when innovations come to receive media, policy, and legal support. Considering the process as a whole, the gap between innovative high SES adopters and others first expands and then narrows, since early innovation exacerbates class distinctions while later adoption then levels the field (Fischer and Hout 2006:217).

Clearly, overall trends in public environmental opinion provide an important foundation for the analyses presented here. Environmental issues emerged on the national political agenda in the late 1960s and the widespread celebration of Earth Day 1970 is often attributed with

<sup>2</sup>As Dunlap and York (2008:551) contend, “Explanations highlighting the role of the new class and their postmaterialist values may have been useful for explaining the emergence of modern environmentalism in North America and Europe.” The emergence of this movement precedes the initial surveys done on environmentalism in the 1970s.



signifying the beginning of a broad-based, modern American environmental movement (Dunlap 1989; Dunlap and Mertig 1992; Szasz 1994). Social survey research soon after began measuring environmental concern (Dunlap and Jones 2002), providing evidence of waxing and waning public prioritization of environmental issues through the past several decades (Dunlap 1992). During the 1980s, environmental issues had taken on a new level of importance among the American public, although the upward trend in public support for environmental protection leveled out somewhat during Reagan's second term (1984–1988). Still, it clearly increased again toward the end of the 1980s and, by the late 1980s, some argue that the environment had become a “consensual” issue (Dunlap 1991: 15). Even so, public opinion polls over the subsequent two decades showed a gradual decline in concern with environmental problems. Today, although some issues, such as species extinction and climate change, garner fairly low levels of concern, nearly half of Americans express a “great deal” of concern with water pollution and toxic waste (Jones 2010).

## Hypotheses

As opposed to a shift in political and cultural power at the national level, à la postmaterialist generational change, an adaptation of diffusion theory offers a lens through which to consider how the process of change may unfold differently for high and low SES groups. Consider how environmental diffusion might reshape the social distribution of environmental concern.

According to diffusion of innovation theory, early stages of increasing environmental concern should be most apparent in the attitudes of individuals of relatively high socioeconomic status (Fischer and Hout 2006). At later stages of change, environmentalism should diffuse vertically from higher SES innovators to lower SES groups (Buttel and Flinn 1978; Morrison 1986; Uyecki and Holland 2000). In this way, as low SES groups come to adopt attitudes similar to the more innovative, higher SES groups, the association between socioeconomic status and environmental concern may weaken, and perhaps reverse direction. As ideas about the importance of protecting the environment become more widespread, disadvantaged individuals may come to better recognize social inequalities in objective environmental problems and adopt strong pro-environmental views than higher SES groups. In short, the research hypothesis can be stated as follows: *The effects of SES on environmental concern are non-linear across cohorts, with effects increasing for those born early in the twentieth century and weakening for those born later.* Equivalently, we anticipate socioeconomic status differences in environmental concern to first diverge, then converge, and perhaps start to diverge again. In specifying a nonlinear interaction between SES and cohort, this prediction defines an original, specific, and falsifiable hypothesis.

The alternative hypothesis can take several forms. One version is that the effects of socioeconomic status – strongly positive according to the post-materialism/affluence arguments or weak, often negative according to global environmentalism arguments – remain largely stable across cohorts. Another version is that SES effects may exhibit linear change across cohorts by either steadily weakening or strengthening. Here, the effects may weaken as individuals within lower socioeconomic strata come to adopt post-materialist values and desires for amenities much like those of higher SES; or the effects may steadily strengthen as the divide widens between post-materialists and materialists or between relatively advantaged groups protected from negative environmental exposure as compared to disadvantaged groups most exposed. In all, the alternative hypotheses represent plausible outcomes distinct from the hypothesized non-linear, diffusion-based change.

While our hypothesis refers to socioeconomic status generally, we consider three components – education, occupation, and income – each of which may have independent

influences on environmental concern. Education has particular importance in adoption of innovation (Rogers 2003), as it reflects a modern scientific orientation, openness to change, and possession of the cognitive skills necessary to understand new practices. Also, since education is primarily determined early in life, it nicely reflects the past experiences of cohorts. Basically, education measured at age 75 likely differs little from education if it were measured 50 years earlier at age 25 – thereby reflecting an individual's state earlier in life. At the same time, however, education has the limitation of conflating cognitive skills and knowledge with social position. In this way, current occupation or income are useful measures in that they relate more directly to arguments about affluence and experience of pollution, although they have the limitation of changing with age. Occupation and income for members of the oldest cohorts will have changed from decades ago when environmental attitudes were shaped. We control for age and period effects to help adjust for these changes, but the lack of occupational and income data for individuals' formative young-adult years likely weakens our ability to detect interactions. As such, we test the non-linear interaction hypotheses with the three components of SES.

## Methods

Testing the research hypothesis requires decades of data on environmental views, representing cohorts born over an even longer period. The General Social Survey (GSS) meets these requirements. A series of consecutive cross-sectional surveys, the GSS is based, except for some early years, on full probability samples of the non-institutional, U.S. adult population (Davis, Smith, and Marsden 2009).

With questions about support for environmental spending included regularly from 1973 to 2008, the GSS has environmental attitude data for 26 surveys over 36 years, and for cohorts born from before 1900 through 1982. The cohorts entered adulthood during periods of widely varying degrees of economic prosperity, environmental concern, and government action on behalf of the environment; they range from those raised well before the rise of the environmental movement, with its symbolic start of Earth Day 1970, to those raised in the context of widespread acceptance of environmental goals. With variation across the three-plus decades of surveys and across all adult ages, the pooled data allow for estimation of cohort differences in support for environmental spending with controls for both year and age. To measure SES meaningfully, however, we include only persons 25 and older in the analyses.

## Measures

In all but a few survey years, the GSS asked the following question:

“We are faced with many problems in this country, none of which can be solved easily or inexpensively. I'm going to name some of these problems, and for each one I'd like you to tell me whether you think we're spending too much money on it, too little money, or about the right amount. Are we spending too much, too little, or about the right amount on improving and protecting the environment?”

Related questions were asked about space exploration; improving and protecting the nation's health; solving problems of big cities; halting rising crime rates; dealing with drug addiction; improving the nation's education system; improving the condition of blacks; military, armaments, and defense; foreign aid; and welfare.<sup>3</sup> For all items, spending too much is

<sup>3</sup>The GSS added items on roads, social security, mass transit, and national parks in 1984, and items on childcare and science in 2000. Because the late year truncates the range of cohorts available for the analyses presented here, these more recently added items are not used.

coded as 1, spending about the right amount is coded as 2, and spending too little is coded as 3.<sup>4</sup>

To best capture commitment to environmentalism, we need to examine the priority respondents place on environmental spending relative to other spending. Otherwise, support for environmental spending may be conflated with general preferences for national spending. We therefore treat environmental spending support (ESS, for short) as a ratio to the mean support for spending across all items. Values above 1 indicate higher support for environmental spending than for other spending priorities, and values below 1 indicate lower support. The measure thus adjusts scores downward for persons who support environmental spending largely because they favor high spending on national problems generally rather than because of a specific concern with environmental issues.<sup>5</sup>

The lack of measures of other forms of environmental concern over the full period prevents the creation of a multi-item scale, or comparing outcomes for conceptually distinct components of environmental concern. However, previous studies have used the single item to describe trends (Jones and Dunlap 1992; Kanagy, Humphrey, and Firebaugh 1994), and the trend in support for environmental spending parallels trends in other indicators of environmental concern (Dunlap 1992). Moreover, the ESS measure has advantages over some other measures of environmental concern. Critics say that items measuring willingness to pay higher taxes, pay higher prices, and accept a lower standard of living in order to protect the environment overstate environmental concern among high income groups for the simple reason that they can afford to pay more. In contrast, the GSS item refers to spending in the country rather than personal spending. By not requiring a commitment to greater personal, out-of-pocket expenses, support for national environmental spending can potentially elicit similar support from all SES groups and appropriately capture the environmentalism of those within lower socioeconomic strata. In support of this claim, Dietz, Stern, and Guagnano (1998) demonstrate with the 1993 GSS that the national spending item does not load on a willingness-to-pay scale. At the same time, support for spending would seem to involve more than lip service to a non-controversial environmental ideal but instead reflects a concrete preference for government action.

Turning to the predictors, cohort measures single years of birth, excepting the first category of 1900 or earlier and the last category of 1982 or later. The models treat cohort effects as a quadratic, but for interpretation ease, we transform units into decades since 1900 (from 0.0 for 1900 to 8.2 for 1982). Based on BIC statistics, two quadratic cohort terms perform better than a set of 9 dummy variables for 10-year cohorts, and a set of 16 dummy variables for 5-year cohorts. Although the results are similar to the dummy variable models, the quadratic terms require fewer interactions to test the hypothesis.

To control for year and age, single years and 5-year age categories (25–29, 30–34 ... 75–79, 80+) serve as random variables in a cross-classified multilevel design described below. In addition, as Brooks and Bolzendahl (2004) note, life course measures of family, work, and income partly capture the effects of age while avoiding redundancy with cohort and year.

<sup>4</sup>Another version of the spending questions (form Y) is used for a split sample from 1984 to 2008. The alternative version uses a terse description of the programs, asking, for example, about spending for the environment rather than for protecting and improving the environment. Combining this version for the later years with the original version for all years adds another 15,369 cases. However, Smith (1984) finds that the wording can affect priorities. In this case, the combined samples answering both versions of the question give essentially the same results as the sample answering a single version. To be safe, the analysis still uses the standard items available in exactly the same form for all years from 1973 to 2008.

<sup>5</sup>The absolute measure with three categories has a correlation of .855 with the relative measure and produces much the same results when used in the models. However, given the conflation of the absolute measure of environmental concern with general preferences for national spending, the tables present results only for the relative measure.



The other sociodemographic determinants fall into two categories. One category relates to largely stable characteristics determined at birth or by early adulthood. Regardless of the age at which they are measured, gender, race, and education (over age 25) generally reflect the position of persons when younger and likely contribute to formation of values in youth and young adulthood that shape environmental views throughout the later life course. Gender takes the form of a dummy variable with males coded one, and race takes the form of two dummy variables for African Americans and others (with whites as the referent). Education equals completed years of schooling (divided by 10) and ranges from 0 (no formal schooling) to 2.0 (20 years of schooling or 8 years of college).<sup>6</sup>

We also measure education in relative terms. Due to expansion of the educational system over the past century, completing the same years of schooling may come to have different meaning across time. For example, education might have less influence when access to advanced schooling is less selective and high levels of schooling are less distinctive. To adjust for these changes, we center respondents' education relative to the mean of their cohort (i.e., the cohort-specific means equal zero). Positive scores indicate that respondents have attained schooling above the average of those born in the same year. Because the relative measure captures only within-cohort differences, not between-cohort differences, it controls for cohort-based changes in access to schooling.

The second category of predictors provides little direct information on early life experiences. Collected at the time of a survey, current marital status, occupational prestige, family income, residence, and the like often have changed greatly over the life course. These variables still have value, however. Although current sociodemographic characteristics may say little about characteristics during a cohort's formative years, they likely will influence current views on environmentalism and, as suggested by the diffusion theory, their influence may differ across cohorts. As an example, equivalent income in adulthood may translate into varying levels of support for environmental spending between cohorts raised during different stages of the diffusion of environmental concern.

Region of residence takes the form of eight dummy variables created from categories of similarly located states. The size of city of residence is based on GSS-defined categories that range from 1) open country to 10) city with population greater than 250,000. A dummy variable measures married versus other categories, and a continuous variable reflects the respondent's number of children (up to eight or more). A dummy variable indicates those who are working or in school (coded one) compared to those who are unemployed, keeping house, retired, or otherwise not working. Prestige of current or former occupation is coded on the basis of a scale constructed from ratings of the general social standing of occupations (Davis, Smith, and Marsden 2009) but is divided by ten for ease of interpretation. A separate dummy variable complements the prestige score; it equals zero for those with no information on current or former occupation (5 percent of the sample) and one for all others.<sup>7</sup> Current family income in dollars is derived from categories ranging from under \$1000 to over \$150,000, with the values recoded to the respective category's midpoint and adjusted for inflation. The midpoints used for the top open-ended categories come from Hout (2004), who computes values that downwardly adjust the usual Pareto-formula estimates.

<sup>6</sup>Other GSS measures of characteristics during a respondent's youth include self-reported family income at age 16, birth in the United States, father's prestige at age 16, and residence at age 16. However, examination of the effects of these variables shows that they have little influence and do little to change the effects of other variables.

<sup>7</sup>Let D equal a dummy variable with those reporting no occupation equal to zero and let O equal a centered variable for occupational prestige, with those not reporting coded to the mean of zero. The equation  $Y = a + b_1 * D + b_2 * O$  reduces to  $Y = a$  for those still studying. Then  $b_1$  represents the average difference in Y between those with and without an occupation, and  $b_2$  represents the effect of schooling for those with an occupation.

Ideally, we would have a measure of post-materialism (either the 4 or 12-item version developed by Inglehart). The GSS lacks such a measure, and we focus on SES measures.

## Models

A mixed-model approach to the analysis of age, period, and cohort effects (Yang and Land 2006) is well suited to testing hypotheses about cohort changes in SES effects. The model treats cohort and cohort-squared, SES measures, and control variables as determinants of the outcome measures of environmental spending support (ESS). Individual data are nested within cells created by the cross-classification of period and age. The use of a cohort quadratic with 5-year age groups and single years eliminates the dependency of cohort on age and period. Following Yang and Land (2006) and using education as an illustration, the level-1 or within-cell model takes the following form:

$$ESS_{ijk} = \beta_{0jk} + \beta_1 * Cohort_{ijk} + \beta_2 * Cohort^2_{ijk} + \beta_3 * Education_{ijk} + \beta_4 * Cohort_{ijk} * Education_{ijk} + \beta_5 * Cohort^2_{ijk} * Education_{ijk} + \sum \beta_m * X_{mijk} + e_{ijk},$$

where  $i$  refers to individuals within  $j$  age groups and  $k$  years,  $X$  to  $m$  control variables, and  $e$  to a normally distributed error with a mean of zero and variance of  $\sigma^2$ . The product terms allow for nonlinear changes across cohorts in the effect of the level of education. Occupational prestige and income serve as control variables in the model illustrated here but can be switched with education to provide further tests of SES effects. With the intercept assumed to vary randomly, the level-2 or between-cell model takes the following form:

$$\beta_{0jk} = \gamma_0 + u_{0j} + v_{0k},$$

where  $\gamma_0$  is the model intercept or adjusted mean outcome;  $u_{0j}$  is the residual random effect of age group  $j$  on  $\beta_{0jk}$  averaged over all periods, which is assumed to be normally distributed with mean 0 and variance  $\tau_u$ ; and  $v_{0k}$  is the residual random effect of period  $k$  on  $\beta_{0jk}$  averaged over all ages, which is assumed to be normally distributed with mean 0 and variance  $\tau_v$ . The model thus allows for estimation of cohort effects on ESS with random effect controls for age group and period. The slope coefficients  $\beta_1$  through  $\beta_m$  are treated as fixed. With all variables centered, the crossed random-effects estimates come from xtmixed in Stata 11.0.<sup>8</sup>

The hypotheses translate into predictions about the multilevel coefficients. The post-materialism and affluence arguments predict positive effects of the SES variables ( $\beta_3 > 0$ ), while the counterarguments predict weak or negative effects ( $\beta_3 \leq 0$ ). The diffusion hypothesis makes predictions about the interaction terms. Reflecting the initial strengthening of the effect of SES across older cohorts, the SES by cohort coefficients  $\beta_4$  should be positive. Reflecting the weakening effect of SES across new cohorts, the SES by cohort squared coefficients  $\beta_5$  should be negative.

## Results

Table 1 presents descriptive statistics for the included variables. The average relative ESS equals 1.15, meaning that the public generally supports environmental spending more than spending on the other categories queried. The components of relative ESS are presented in the next two rows of the tables. The mean absolute ESS of 2.50 exceeds the mean for all

<sup>8</sup>This version of xtmixed does not allow for use of weights, but checks using regression models show that weighting does little to change the results.

items combined (2.17). Comparing means across four cohort groups indicates that relative ESS rises from 1.10 in the oldest cohorts to 1.18 in the youngest cohorts. In addition, absolute ESS increases more across cohorts than support for all spending. Figure 1a graphs the mean relative ESS values by cohort and illustrates the steady increase from cohorts born around 1900 to those born in the 1980s.

The overall trend in relative support by year, regardless of cohort, fluctuates much more (see Figure 1b). The cyclical decline during the 1970s, rise during the 1980s, decline during the 1990s, and rise during the 2000s correspond roughly to Democratic and Republican administrations and may indicate responsiveness of public views to government policies and current events. Across the fluctuations, there is only weak evidence of increasing support.

Table 1 also presents descriptive statistics overall and by cohort for the predictor variables. Occupational prestige and income rise across most cohorts, but income is lower for the youngest cohorts not yet established in their careers. As would be anticipated, having many children and being married are more common among older cohorts, while the means for employed/in school and city size are higher among younger cohorts.

Table 2 examines the effects of the level-1 additive determinants of relative ESS (net of random-effect controls for age group and year). The models use the 23,614 cases with valid data on the spending variables and all predictors. The equations first include only the category of variables determined early in life (gender, race, cohort, and education). In this equation, women and whites show higher relative ESS than men and minorities. Although not opposed to environmental spending, African Americans and other non-whites appear to support spending in others arenas more than whites.<sup>9</sup> Cohort has a largely positive effect, with only a weak squared term and limited evidence of a slowdown in the rate of growth in relative ESS. On average, across all cohorts, education has a positive effect.

Including the contemporaneous variables modestly reduces the effect of education on relative ESS – from .032 to .018 – but the effect remains significant. To summarize the results for these control variables, being married and having many children reduce ESS, while living in a large city increases ESS. For other SES measures, occupational prestige and reporting and occupation raise relative ESS but family income lowers it.<sup>10</sup>

The remaining equations in Table 2 replace education with cohort-centered education. Despite controlling for the average level of completed schooling across cohorts, relative education has effects that remain positive, significant, and comparable in size to the previous models.

To test the hypotheses about the changing influence of education, Table 3 lists coefficients for interaction terms of four SES measures – education, cohort-centered education, occupational prestige, and income – by cohort and cohort squared. Note that the interaction terms have the hypothesized signs and, with one exception, reach statistical significance.<sup>11</sup> The positive signs of the coefficients for SES by cohort mean that the effects of education, cohort-centered education, occupation prestige, and income increase across cohorts, at least initially. The negative signs for the SES by cohort squared coefficients mean that the positive effects increasingly level off and reverse for cohorts born in later years. In short, SES differences in relative ESS first widen and then narrow.

<sup>9</sup>Results from the absolute ESS measure show higher support for environmental spending among both minority groups than whites.

<sup>10</sup>The estimated random effects for year exhibit a pattern similar to that in Figure 1b, but the age random effects are small and reveal little pattern.

<sup>11</sup>Models controlling for fixed effects of age group and year rather than using random effects give the same result.

To illustrate, Figure 2 graphs the predicted slopes for each SES measure on relative ESS across all cohorts. First, for cohorts born near the turn of the century, the influence of education is near zero. The slopes initially grow in size, peaking at 0.037 for the cohort born in 1938 (i.e., those reaching college age around 1957). The slopes then steadily decline and fall below zero for cohorts born in the 1970s and 1980s. Among the oldest cohorts, near zero coefficients reflect low relative ESS across all educational levels; for cohorts born in the 1930s and 1940s, positive coefficients mean that ESS is stronger among higher education groups than low education groups; and among the younger cohorts, the negative coefficients mean that relative ESS is higher among low education groups. The evidence clearly shows a reversal in the direction of the relationships between education and relative ESS.

With some variation, the same patterns hold for the other SES measures. The changes in slopes for cohort-centered education are nearly identical to those for education. The slopes for occupational prestige begin near zero for the oldest cohorts, rise to about 0.007 for the 1930 cohort, and the drop to below zero. Although the curve for occupational prestige does not rise as much as the curve for education (consistent with the insignificant interaction of occupational prestige by cohort in Table 3), it drops significantly. The curves for education and occupational prestige suggests that for the youngest cohorts, those in lower SES positions support environmental spending more than those in more higher SES positions. This result supports arguments that, because of the greater exposure to environmental degradation, low SES groups have high environmental concern. However, the results also suggest that the reversal emerges most clearly among younger cohorts and at later stages of diffusion.

Income also shows a change in slopes that supports the diffusion hypothesis, although the pattern differs in that income's slopes are consistently negative: High-income persons in all cohorts tend to oppose more government spending on the environment. However, much like the other graphs, the curve rises before reversing and declining. The slopes for income become more positive for cohorts born mid-century, much as they do for education and occupational prestige. The slopes for income then become more negative among younger cohorts, again much as they do for education and occupational prestige. Of course, the results are limited by the inability to measure income among older cohorts during their youth and by changes in income during the adult life course. Even so, the pattern of change is consistent with diffusion as well as with the pattern for the other SES measures.

Tests for interactions can prove sensitive to model specification, but the results appear sufficiently consistent across multiple variables so as to lend confidence to the findings. However, it may be that the results are unduly influenced by extreme cohorts, ages, and years. Some additional checks would further demonstrate robustness. We reestimated the model for the education-cohort interaction when deleting the five oldest and five youngest cohorts. The cohort interaction terms decrease only slightly and remain significant. Similarly only small changes occur in the education-cohort interactions when deleting the earliest and latest years and the three youngest and oldest ages. Still further, the results appear similar when using dummy variables for five-year birth-year groups rather than quadratic terms to represent cohort differences.

## Discussion

Based on the analysis of the GSS, the adoption of pro-environment views occurs steadily and persistently across cohorts over the 20th century. Less obviously, the results show that adoption reflects non-linear changes in the influence of SES-based divisions in support for environmental spending. The effects of education, occupational prestige, and family income are stronger among older cohorts during periods characterized by low concern with

environmental issues generally. During these earlier historic periods, higher levels of environmental concern are expressed among high SES groups. Among more recently born cohorts, the effects of SES become weaker, and then negative, as favorable attitudes toward the environment diffuse through the American public and highlight the objective environmental problems faced by low SES groups.

The overall picture is one in which postmaterialism and/or affluence perspectives may explain the public's early recognition of environmental issues, while diffusion processes and concern with objective environmental problems ultimately shape a broader-based public concern. More specifically, consistent with the post-materialism and affluence arguments, high SES, quality-of-life values, and demand for non-material goods likely provided the impetus among older cohorts to adopt pro-environmental views in the 20<sup>th</sup> century's early years. Consistent with the global environmentalism arguments, however, environmental concern in younger cohorts appears to have diffused to the more general population including lower SES groups. The reversal of the SES coefficient further suggests that issues related to environmental inequality, or the unequal social distribution of environmental ills, may indeed play a role in today's relatively higher expressions of environmental concern among socio-economically disadvantaged individuals, a result in line with work on environmental prioritization among today's racial and ethnic minorities and immigrant communities (Adeola 2004 2007; Hunter 2000; Whittaker, Segura and Bowler 2005). In all, despite easily falsifiable predictions that combine both statistical non-linearity and interaction, robust evidence emerges from the 83 cohorts and 36 years of surveys available from the GSS.

Although the literature tends to highlight either the positive or the weak to negative relationships between SES and environmental concern, both kinds of relationships appear to have existed over the last century. Given these results, we argue that theories of post-materialist environmentalism and theories of global environmentalism are incomplete on their own. Indeed, considering the cohort context of environmentalism suggests a broader and more integrative perspective that avoids full acceptance or rejection of either theory. The potential exists to first qualify the scope of each theoretical perspective and usefully combine their insights.

The combined approach fits nicely with a diffusion-of-innovations perspective that treats environmentalism as a set of ideas, values, and beliefs. Much like other innovations, environmentalism emerges and spreads through society on the basis of SES-based divisions. These changes highlight the importance of socioeconomic status as a source of value differences in American society and the diffusion-of-innovations approach provides a broad framework that can link environmentalism to other types of value shifts. As Fischer and Hout (2006) demonstrate, such patterns have similarities to the spread over the past century of other ideas, values, and beliefs relating to fertility, divorce, and gender equality.

Empirically, along with developing integrative predictions from diffusion theory, our efforts to examine differences across cohorts rather than years, model the varying effects of SES by cohort, and test for non-linear interactions extend the literature in new directions. Previous studies based on cross-period comparisons of the GSS tend to find general stability in determinants of support for environmental spending (Jones and Dunlap 1992). Making comparisons across cohorts builds on other studies (Kanagy, Humphrey, and Firebaugh 1994) but more fully exploits the potential for change to occur across groups born and socialized in different historical periods. Further, modeling interactions between cohort and SES captures the diffusion of environmentalism and the importance of cohort sources of social change. A stable measure of SES like education best reflects the cohort-based changes



in the social distribution of environmentalism. However, relationships of occupational prestige and income are also consistent with the arguments.

However, several limitations in the available GSS data used to evaluate the approach suggest the need for additional research. First, the data allow only for the indirect study of diffusion. The patterns of change in SES differences are consistent with initial adoption of environmentalism by innovative post-materialist groups and with the later, more global, diffusion. Yet, other types of data and analyses that directly measure the historical conditions of environmentalism are needed to more fully validate claims about diffusion and cohort change. For example, yearly counts of media stories on the environment, awards of environmental studies degrees, and non-governmental, pro-environment organizations might capture contextual changes that both reflect and influence diffusion.

Second, the results apply to a measure of environmental concern based on a question about support for national spending to improve and protect the environment. Spending-based measures have properties suitable for the analysis of long-term change and, in fact, are the only ones available over several decades. Yet, the literature has noted diverse forms of environmental concern and the value of measuring multiple dimensions of that concern. Although the question used here avoids specifics about willingness-to-pay while being general enough to attract support from individuals with wide-ranging environmental concerns, the spending measure alone allows for only preliminary support of the cohort approach. Developing future data sets that replicate questions for national samples with broad cohort representations, or for countries at earlier stages of economic and social development, can extend these findings.

Third, study of the United States needs to be extended, particular given the efforts to test a “global environmentalism” theory. A cross-national approach might make comparisons across nations at different stages of the adoption of pro-environmental ideas, values, and beliefs. High-income countries might differ from low- and middle-income countries not only in the levels of environmental concern but also in the size of the relationships of environmental concern with SES. As noted by the global environmentalism arguments, low income nations show high environmentalism (Dunlap and York 2008). Cohort differences in the SES distribution of environmental concern would reveal if diffusion has occurred from high to low SES groups as it has in these results for the United States.

Fourth, the data lack a direct measure of post-materialism that would provide a full test of Inglehart’s arguments. Cross-national data such as from the World Values Survey typically include such measures.

Yet the work presented here suggests the potential usefulness of a diffusion-of-innovation perspective in finding middle ground between postmaterialism and global environmentalism perspectives. A clear association is evidenced between three measures of SES across 83 cohorts born from around 1900 to 1982, thereby representing shifting socioeconomic contexts in formative years. Results suggest that environmentalism has related in non-linear ways to cultural context, social structure, and perhaps environmental exposure, across time.

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Figure 1a

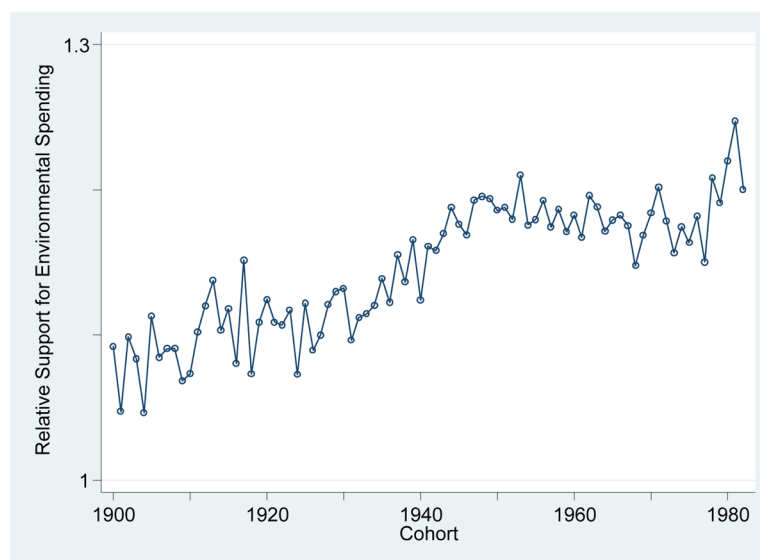


Figure 1b

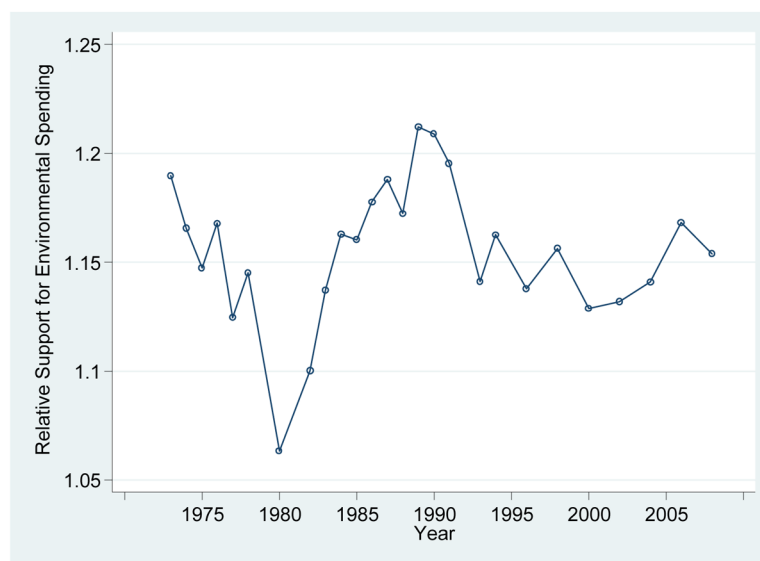
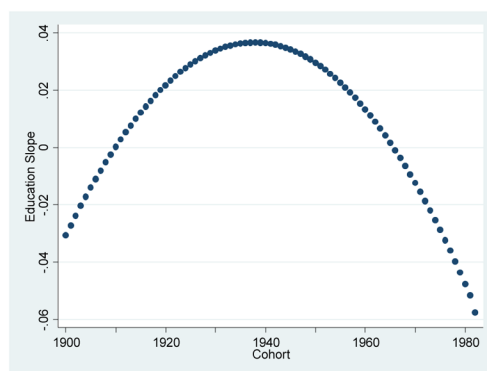
**Figure 1.**

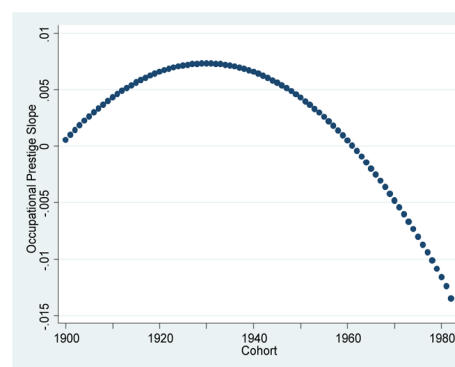
Figure 1a. Cohort Trends in Support for Environmental Spending

Figure 1b. Year Trends in Support for Environmental Spending

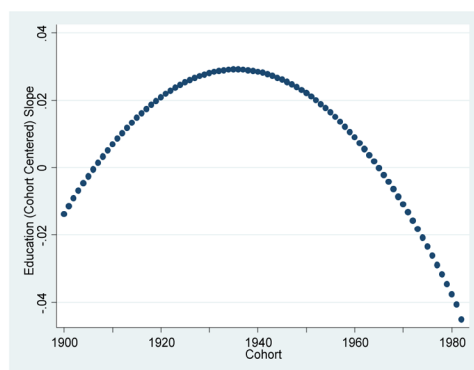
a. Education Slope



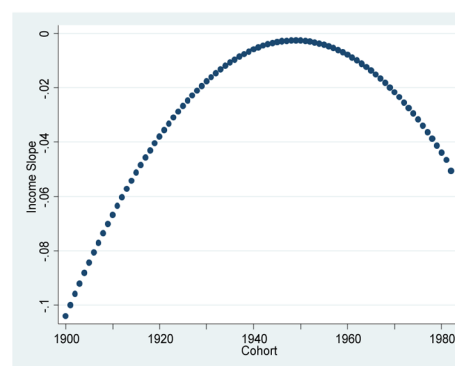
c. Occupational Prestige Slope



b. Education (Cohort Centered) Slope



d. Income Slope



**Figure 2.**  
Changes in Slopes for SES measures on Support for Environmental Spending

Table 1

## Variable Descriptive Statistics

Environmental Spending Variables	All Cohorts				Means by Cohort Groups				
	N	Mean	St. Dev.	Min	Max	1900–1929	1930–1949	1950–1969	1970–1988
Relative Support	26064	1.15	0.29	0.36	2.54	1.10	1.15	1.18	1.18
Absolute Support	26064	2.50	0.66	1	3	2.32	2.51	2.62	2.65
All Spending	27422	2.17	0.31	1	3	2.09	2.17	2.22	2.25
Predictor Variables									
Cohort	46955	1943	18.7	1900	1982	1918	1941	1958	1974
Age	46955	47.6	15.5	25	89	66.01	48.09	37.49	29.51
Year	47146	1991	11	1972	2008	1984	1989	1996	2004
Gender Male	47146	0.45	0.50	0	1	0.45	0.45	0.45	0.46
Race Black <sup>a</sup>	47146	0.12	0.33	0	1	0.11	0.12	0.14	0.14
Race Other <sup>a</sup>	47146	0.05	0.21	0	1	0.01	0.03	0.07	0.16
Years of Education/10	47002	1.27	0.33	0	2	1.10	1.29	1.36	1.37
Married	47127	0.68	0.47	0	1	0.68	0.75	0.64	0.49
No. of Children	46999	2.23	1.80	0	8	2.82	2.58	1.66	1.22
Region	47146	4.85	2.46	1	9	4.63	4.79	4.99	5.17
City size	47146	6.48	2.91	1	10	6.13	6.41	6.72	6.93
Employed/In School	47137	0.63	0.48	0	1	0.32	0.65	0.79	0.80
Occupation Prestige/10	47146	4.23	1.37	1.2	8.6	3.96	4.28	4.35	4.41
Reports Occupation	47146	0.95	0.22	0	1	0.92	0.96	0.97	0.
Family income (\$1,000)	42427	46.26	41.73	0.00	187.50	28.11	47.68	56.17	52.15

<sup>a</sup>Reference group race=white

Unstandardized Coefficients and Z-Values for Additive Multilevel Models of Support for Environmental Spending (N = 23614)

Table 2

Predictors <sup>a</sup>	Relative Support for Environmental Spending					
	b	z	b	z	b	z
Gender Male	-0.010	-2.85 **	-0.012	-3.12 **	-0.010	-2.84 **
Race Black	-0.042	-7.23 ***	-0.048	-7.85 ***	-0.042	-7.26 ***
Race Other	-0.025	-2.42 *	-0.023	-2.16 *	-0.025	-2.43 *
Cohort <sup>b</sup>	0.027	6.81 ***	0.029	7.28 ***	0.032	8.08 ***
Cohort <sup>2</sup>	-0.001	-1.25	-0.001	-1.92	-0.001	-1.91
Education Years/10	0.032	5.28 ***	0.018	2.32 *		
Education (Cohort Centered)					0.031	5.06 ***
Married			-0.011	-2.63 **	0.016	2.06 *
No. of Children			-0.004	-3.14 **	-0.011	-2.64 **
City size			0.002	3.39 ***	-0.004	-3.19 **
Employed/In School			0.005	1.17	0.002	3.41 ***
Occupational Prestige/10			0.003	2.10 *	0.005	1.19
Reports Occupation			0.025	2.71 **	0.004	2.23 *
Family income (\$1,000)			-0.013	-2.13 *	0.025	2.73 **
Constant	1.156		1.156		-0.013	-2.07 *
Variance Component					1.156	
Age	0.005		0.003		0.003	
Year	0.039		0.039		0.039	

<sup>a</sup> All predictors are grand-mean centered; region coefficients not listed

<sup>b</sup> Transformed to equal decades since 1900(birth year minus 1900 and divided by 10)

\* p < .05

\*\* p < .10

\*\*\* p < .01

Unstandardized Coefficients and Z-Values for Interaction Variables in Multilevel Models of Relative Support for Environmental Spending (N = 26542) <sup>a</sup>

Table 3

Predictors	Education Years			Education (Cohort Cent.)			Occupational Prestige			Income		
	b	z		b	z		b	z		b	z	
Cohort <sup>b</sup>	0.032	7.39	***	0.031	7.89	***	0.029	7.08	***	0.037	8.09	***
Cohort <sup>2</sup>	-0.001	-2.16	*	-0.001	-2.20	*	-0.001	-1.65		-0.002	-3.16	**
SES												
Measure	0.019	2.50	*	0.016	2.07	*	0.004	2.16	*	-0.020	-3.07	**
x Cohort	0.036	3.45	***	0.023	2.08	*	0.005	1.69		0.041	3.45	***
x Cohort <sup>2</sup>	-0.005	-3.51	***	-0.003	-2.24	*	-0.001	-2.25	*	-0.004	-3.03	**

<sup>a</sup>Controlling for gender, race, married, children, city size, employed, and region

<sup>b</sup>Transformed to equal decades since 1900(birth year minus 1900 and divided by 10)

\* p < .10

\*\* p < .05

\*\*\* p < .01

\*\*\* p < .01