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Too Worried about the Environment to Have Children? Or More Worried about the Environment After Having Children?

The Reciprocal Relationship Between Environmental Concerns and Fertility

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Abstract

Climate change is one of the central challenges for contemporary societies. It is widely discussed as triggering “climate anxiety,” and as dampening the desire to reproduce, particularly among young people. Conversely, parenthood could affect people’s attitudes and behaviors toward the environment. Empirically, however, little is known about this potentially reciprocal relationship due to the lack of longitudinal data of sufficient temporal scope. Our study extends this debate using unique data from the German Socio-Economic Panel Study (GSOEP), which contains both full fertility histories and yearly measures of environmental concerns (1984 to 2020). We follow individuals born between 1965 and 2000 through time and investigate a) whether environmental concerns predict first birth quantum and timing, and b) whether environmental concern trajectories vary between eventual parents and the childless. Results show no significant relationship between environmental concerns early in or throughout the life course and first birth timing or quantum, except for individuals born before 1970, who delayed parenthood if they had substantial environmental concerns. Moreover, while some differences in environmental concern trajectories between eventual parents and the childless are found, they seem to be largely rooted in unobserved heterogeneity.

Keywords: Fertility, Environmental Concerns, Climate Change

Introduction

Climate change has been an issue of increasing concern for several decades. As the growth of human populations and their consumption levels are closely intertwined with greenhouse gas emissions, global warming is an important theme in demography (van Dalen & Henkens, 2021). However, while there is ample demographic research on the morbidity- and mortality-inducing effects of climate change (Lutz et al., 2014; Zagheni et al., 2016), and on climate-induced migration (Hoffmann et al., 2020), research on the impact of climate change on fertility is still scarce (Grace, 2017). Even less is known about the potential linkages between peoples' environmental concerns and their fertility behavior.

Only recently have demographers started to speculate about the potential role of climate change concerns in the transition to parenthood, including with regard to recent fertility declines in Scandinavia (Rotkirch, 2020). If young couples worry about future environmental degradation or environmentally-induced conflict, they may be reluctant to procreate out of concern that their potential offspring will experience hardship. A related strand of research investigates whether climate change concerns are affecting fertility preferences, motivations, and intentions (Arnocky et al., 2012; De Rose & Testa, 2015). Some studies examine linkages between climate change concerns and fertility motivations (Schneider-Mayerson & Leong, 2020), or environmental attitudes and desired number of children (Rackin et al., 2022). Empirical research on the question of whether concerns about the environment or climate change affect realized fertility, such as the transition to parenthood, is still in its infancy.

One complicating aspect of studying the association between environmental concerns and reproductive decision-making is that environmental concerns are unlikely to remain static throughout life. Indeed, undergoing important life course transitions, such as couple formation or the transition to parenthood, may influence people's attitudes, concerns, and behaviors toward the environment (Jamieson, 2016; Thomas et al., 2018). Psychological distance in space and time might limit people's willingness to reflect on the environment and to engage in pro-environmental behavior. Moreover, motherhood or fatherhood might affect the felt distance to climate change due to the sense of responsibility parents have for their children's future (Spence et al., 2012).

A major obstacle to investigating the hypothesized reciprocal relationship between environmental concerns and fertility behavior is the need for sufficiently long panel data. Until now, time series on environmental concern have been scarce, and those that exist have been relatively short. The longest time series that have been used to study the impact of parenthood on environmental concerns include just seven years of data (Milfont et al., 2020). This time span is too short for investigating the long-term impacts of parenthood on environmental concerns, especially because these concerns might not arise until parents have moved past

the “rush hour of life,” and their adolescent children have started advocating actively on behalf of the environment (Lawson et al., 2019). Our study extends this literature. We examine the prospective effect of environmental concerns on the timing of the transition to parenthood and the quantum of births, and investigate whether environmental concerns change after parenthood.

In this study, we overcome previous data limitations by using unique longitudinal data from the German Socio-Economic Panel (GSOEP), which contains full fertility histories and yearly measurements of environmental concerns in all available waves (1984-2020). Therefore, GSOEP data are ideally suited to answer our research questions of whether environmental concerns predict the transition to parenthood, and whether becoming a parent affects environmental concerns. Our analyses on the prospective association between environmental concerns and fertility are based on several methodological approaches. First, we examine the extent to which environmental concerns in younger adulthood (16-23 years) predict parenthood by age 40. Second, we run piecewise-constant hazard models to look at the fertility risks over time depending on time-varying environmental concerns. To examine whether environmental concerns influence first-birth timing, we run additional analyses including interactions between environmental concerns and time. Trajectories of environmental concerns over time are analyzed using fixed-effects logit regression models, stratified by parental status and age at first childbirth.

To our knowledge, this is the first study that examines the association between environmental concerns and fertility using longitudinal data that include complete fertility and environmental concern trajectories. While not all birth cohorts in our sample were exposed to the climate change debate during their childbearing years, our findings shed valuable light on the environmental concerns-fertility nexus, and on how climate change concerns may affect childbearing in contemporary and future societies.

Background

Environmental concerns over time in Germany

While global concentrations of atmospheric CO_2 have been rising constantly over the past 60 years, subjective concerns about climate change, or about the environment, have been subject to strong volatility, including in Germany (Hartmann & Preisendörfer, 2021). In the early years of GSOEP (1984-1989), many respondents reported having environmental concerns, as the accumulated damage to forests due to air pollution and subsequent acid rain received considerable attention and contributed to strong environmental awareness throughout

Germany (OECD, 2000; Fowler et al., 2020). In 1986, the Chernobyl disaster further contributed to growing environmental concerns, although the effect was only short-lived (Berger, 2010). The share of GSOEP respondents who reported having major environmental concerns reached an all-time high in 1989 (62%). Following German reunification, the proportion of respondents reporting major concerns decreased substantially. By the end of the 1990s, the proportion indicating that were very concerned had fallen to 23% (Hartmann & Preisendörfer, 2021). During the early 2000s, environmental concerns stabilized at relatively low levels (around 30%), or increased very slightly (Hartmann & Preisendörfer, 2021). A surge in concern reported in 2007 may be partly explained by the release of the documentary "An Inconvenient Truth," which triggered an intensified debate about climate change in Germany (Schipperges, 2020). Similar to Chernobyl, the 2011 Fukushima disaster led to a temporary increase in environmental concerns before political interventions were announced (Goebel et al., 2015). However, levels of concern about the environment have recently risen again in Germany (46% in 2019, Hartmann & Preisendörfer, 2021), and have stayed high despite the Covid-19 pandemic competing for public attention (Gellrich et al., 2021).

Theoretical framework and hypotheses

Part 1: Ideational Influences on Childbearing

Our focus on fertility in relation to environmental concerns calls for a careful conceptualization of the reproductive decision-making process. In the psychological and family-demographic literature, this complex process from fertility desires via intentions to realizations is usually framed within either the "Theory of Planned Behaviour" (Ajzen, 1991), the "Traits-Desires-Intentions-Behaviour" (Miller, 1994, 2011), or the "Cognitive-Social Model of Fertility Intentions" (Bachrach & Morgan, 2013) model. While none of these theories explicitly considers environmental concerns, Miller's appears to be the most promising for the purposes of our study, as it clearly defines and distinguishes the theoretical concepts that are key to our research: childbearing motives (dispositions to react favorably or unfavorably to various consequences of childbearing), childbearing desires (the wish to have a child), and childbearing intentions (an actual, committed plan to have a child). Moreover, the model applies a procedural perspective to childbearing choices, describing the evolution of desires over the life course. Most importantly, however, it recognizes that "fears and worries of parenthood" (Miller, 1995, p. 476), including various concerns related to the child's future, can affect childbearing outcomes in positive or negative ways. Our research builds upon this framework by examining environmental concerns as potential factors motivating fertility behavior.

The theoretical role of fertility preferences in behaviors has been debated among demographers and in other related research fields (Miller, 2011); and efforts to find empirical support for it have not been straightforward. As Toulemon and Testa (2005) pointed out in reference to French data, uncertainty-inducing socioeconomic conditions need to be accounted for when considering the role of intentions in fertility outcomes. Particularly over short time periods, intentions can be bad predictors of realizations. However, the relevance of intentions increases when looking at the relationship from a life-course perspective, which indicates the importance of relying on longer time series, such as those used in the present study. Similar discrepancies between preferences and behaviors were found by Cleland et al. (2020) in an analysis of longitudinal data from 28 Asian and African countries. However, the difficulties people in these contexts face in implementing their fertility preferences, such as the lack of suitable contraception, might play a smaller role in the German context, particularly among the most recent cohorts. At the same time, Yeatman et al. (2020) found that fertility timing desires were highly predictive of future pregnancy in Malawi. In summary, while the relationship between fertility motivations and fertility behavior is complex, fertility intentions are still among the strongest predictors in fertility research.

Recently, another kind of ideation has been gaining traction as a potential factor in family formation processes (Helm et al., 2021). Particularly on (social) media, there has been much discussion about the effects of climate anxiety on childbearing. However, despite the popularity of movements such as #*birthstrike*, the findings of the few quantitative studies that have investigated linkages between climate change concerns and fertility motivations have been mixed. Arnocky et al. (2012) observed a negative relationship between concerns about the natural environment and fertility intentions among a cross-section of Canadian students. De Rose and Testa (2015), focusing on a European sample, found that individuals' concerns about climate change were not significantly related to their intended number of children. By contrast, another study showed that U.S. students reported lower fertility desires if they wanted political action to protect the environment (Rackin et al., 2022). Similarly, Schneider-Mayerson and Ling Leong (2020) found that almost 60% of U.S. respondents aged 27-45 were concerned about the carbon footprint of reproduction, while almost 97% were concerned about the future well-being of their existing or hypothetical offspring. Overall, these studies were limited in their analytical and sampling strategy, either because they investigated highly selected populations, or because they lacked the longitudinal information needed to clearly operationalize the dynamic nature of fertility intentions and potential environmental concerns (De Rose & Testa, 2015).

Studies on the relationship between environmental concerns and fertility realizations are even harder to find. One exception is the recent discussion paper by Lockwood et al. (2022), which

used longitudinal data from the UK. Their results showed that environmentally-unconcerned people were roughly 60% more likely than environmentally-concerned people to become parents over the next six years. However, the individual time series they used were not long enough to rule out heterogeneity in postponement between environmentally more or less concerned individuals. The important additional question about the potential impact of environmental concerns on fertility timing therefore remains unanswered.

Despite these inconsistencies in previous research, there are theoretical reasons why environmentally-concerned people might be inclined to remain childless, particularly as the pace of climate change accelerates: first, because they want to spare their children a life in agony in a future world that no longer provides the full range of ecosystem services necessary to maintain today's quality of life (Schneider-Mayerson & Leong, 2020); and, second, because children are additional consumers who negatively contribute to global warming (Wynes & Nicholas, 2017). Having fewer children, particularly in wealthy consumerist societies, may be part of the solution to many of the problems posed by climate change. Assuming that having environmental concerns might weaken people's fertility desires and intentions relative to other life motivations (e.g., preserving energy, reducing one's carbon footprint, dedicating more time to environmental activism), we hypothesize a negative association between environmental concerns and fertility:

Hypothesis 1a: Environmentally-concerned individuals are less likely to enter parenthood.

There is also a timing-related question that should be asked here. Environmentally-concerned individuals might be less sure about their childbearing desires, or feel more obliged to pursue competing goals (e.g., producing the smallest possible carbon footprint), though they may change their fertility preferences later in life, possibly in response to their biological clock (Wagner et al., 2019). In general, however, we expect individuals with major environmental concerns to have lower fertility risks over time. Moreover, it has been shown that compared to men, women are more likely to perceive risk (Olofsson & Rashid, 2011) and are generally less likely to deny evidence of climate change (McCright & Dunlap, 2011). The common explanation for this pattern is social dominance orientation, which makes men feel more empowered and able to act upon potential threats than women because they are part of a more powerful group within the social hierarchy (Jylhä et al., 2016). In accordance with this literature, we hypothesize that the fertility behavior of women will be more affected by environmental concerns than that of men:

Hypothesis 1b: Environmentally-concerned individuals have lower first birth risks over time, and these associations are stronger among women than among men.

Part 2: The Role of Parenthood in Environmental Concerns

The carbon cost of childbearing is generally thought to be positive and sizable (Wynes & Nicholas, 2017). However, there are reasons to believe that parenthood could contribute to climate change mitigation. One of those reasons is related to psychological distance, which, according to Liberman and Trope (2008), can be found in four different dimensions: temporal, spatial, social, and hypothetical. In the climate change domain, hypothetical distance relates to the uncertainty of future environmental problems and their consequences (Spence et al., 2012). Social distance arises from the dissimilarity between the people perceiving climate change and those actually experiencing the impacts (McDonald et al., 2015). This social distance is usually closely linked to spatial distance (Busse & Menzel, 2014), which describes the phenomenon that many members of today's low-fertility societies in the developed world perceive that climate change impacts are occurring in geographically-distant places. Finally, temporal distance relates to the feeling that the negative effects of climate change will not emerge until sometime in the distant future (Fesenfeld & Rinscheid, 2021).

This last dimension of temporal psychological distance may play a key role in the relationship between environmental concerns and fertility, since environmental problems may be passed on to future generations. While for people without children, these future generations do not contain descendants, the situation is different for parents, as they are spatially close to potential future victims of climate change impacts, and are therefore more likely to engage in pro-environmental behaviors, and even to be held accountable by their adolescent offspring (Lawson et al., 2019). A second reason for why psychological distance to climate change might be smaller within families can be explained by the so-called "legacy hypothesis" (Thomas et al., 2018). Similar to parents trying to endow their children with the necessary financial means to secure a good quality of life beyond their own lifetime, parents might want to leave their child(ren) a high-quality environment. Consequently, having children might increase levels of environmental concern.

Nonetheless, existing research on the potential linkages between fertility ideations and realizations on the one hand and shifts in levels of environmental concern and in potentially pro-environmental behaviors on the other remains scarce. The few such studies that have been conducted were either constrained by their small cross-sectional samples (e.g., Grønhøj

& Thøgersen, 2017; Lawson et al., 2019), or, if they used longitudinal data for a fixed group of individuals, looked at only a relatively short time span in the lives of young parents (Milfont et al., 2020; Thomas et al., 2018). The problem with the first kind of research is that the researchers could not account for parents' concerns and behaviors prior to becoming parents. Thus, the characteristics that selected parents into parenthood remained unaccounted for, including those may be correlated with environmental concerns (or the lack thereof). While Thomas et al. (2018) used longitudinal data to follow individuals during the transition to parenthood and beyond, the data covered only 24 months, which may be too narrow a time frame for most parents to have shifted their attention away from their new life situation and toward a more long-term oriented focus on the environment. In the period immediately after they assume their parental duties, parents tend to prioritize the well-being of their child, which might even increase their carbon footprint. However, both the direction and the size of the effects of parenthood could change over the long run. In a more recent study based on a slightly longer panel (2009-2015), Milfont et al. (2020) found that while parenthood made people more aware of climate change, it did not affect their environmental attitudes. In the present study, we want to test the legacy hypothesis using longitudinal data covering a much longer time span than any previous study on the subject:

Hypothesis 2a: Parents are more likely to be concerned about the environment than non-parents.

Previous research has also argued that parenthood may affect people's environmental concerns differently depending on their gender. Women may care more about the health of their children, while fathers may be more concerned about their financial wealth (Blocker & Eckberg, 1997; Davidson & Freudenburg, 1996). Thus, mothers are expected to have greater environmental concerns after entering parenthood, while fathers are expected to retain their previous level of environmental concern, or even to become less concerned about the environment, as their economic concerns increase (Blocker & Eckberg, 1997; Davidson & Freudenburg, 1996):

Hypothesis 2b: Environmental concerns increase among mothers (compared to non-mothers), but do not change or even decrease among fathers (compared to non-fathers).

Data and Methods

To overcome the problems related to short time series, we base our analyses on data from the German Socio-Economic Panel (GSOEP). GSOEP has been conducted annually since 1984, with the waves before 1991 including only West Germans. The latest data available are from 2020. Each year, approximately 30,000 individuals from around 14,000 households participate (Siegers et al., 2019). Apart from demographic information – e.g., age, sex, socioeconomic characteristics, timing and quantum of fertility – GSOEP covers a variety of attitudinal items. Most importantly for our purposes, GSOEP has collected information on people's environmental concerns since its launch in 1984 (Goebel et al., 2019)[1].

Since we aim to study the reciprocal relationship between environmental concerns and fertility, we use these data to conduct two separate kinds of analyses: (#1) We explore whether environmental concerns may predict childbearing. This question can be approached empirically in various ways. We examine (#1a) the prospective association between environmental concerns measured in young adulthood (ages 16-23) and parental status by age 40, and (#1b) the longitudinal association between environmental concerns and fertility over time. (#2) We are also interested in investigating the environmental concern trajectories of individuals over their reproductive lifespan. Here, we look at differential concerns by parental status, as well as over the parental lifespan.

Sample

The size and membership of our sample differs depending on the type of analysis. Analyses on parenthood by age 40 are based on a sample that has been observed for at least 20 waves since age 20 or younger (#1a), with information on environmental concerns being taken from young adulthood. 833 respondents have been observed until age 40 or higher. Childbearing after age 40 was relatively rare in our sample. The vast majority of first childbirths happened by age 35 (88.20%). Only 1.17% of the participants entered parenthood after age 40. This is line with previous research showing that fertility rates do not change much after age 40 for both genders (Nisén et al., 2014). Additional analyses using the sample that experienced parenthood by age 35 (1,302 individuals that were observed until age 35 and higher) revealed patterns similar to those obtained from our initial sample.

[1] Attitudes toward the environment have been collected in GSOEP via several measures. We use concerns about the state of the environment, since this survey item has been included without interruptions or modifications throughout the entire 1984-2020 period.

We are interested not only in the link between early-life environmental concerns and the probability that they entered parenthood by age 40, but also in the potential impact of individuals' changing environmental concerns on their first birth risks over time (#1b). The analytical sample for (#1b) consists of 6,730 initially childless individuals who were followed from age 20 or younger until the birth of their first child (1,476 first births were recorded between 1986-2020)[2], age 40 (assumed end of the reproductive lifespan), or the last observation – whichever comes first. This amounts to a total of 71,312 observations. To identify possible discontinuities over time, we stratify our sample (#1b) by birth cohort. Robustness checks in which the reproductive lifespan was extended to age 50 generated very similar results.

The longitudinal analyses described under (#2) above are again based on the sample consisting of individuals who were aged 20 or younger when they first participated in the survey. Respondents were followed for at least 20 waves of GSOEP, leading to a total of 33,148 observations over time. However, we do not restrict the sample to participants who were at least 40 years old at last observation. This leaves us with an analytical sample of 1,302 individuals (instead of 833 from above).

Environmental Concerns

Environmental concerns are a key variable in our analyses. First, they are included as the main explanatory variable in our fertility models (probability of entering parenthood, childbearing risks over time). Second, environmental concerns form the dependent variable for our analyses predicting attitudinal changes in relation to fertility. The survey item on environmental concerns belongs to a battery of concerns about several social problems that are captured in GSOEP, such as concerns about the general economic development or crime rates in Germany. These items were asked one after the other, and respondents could report being either "very concerned," "somewhat concerned," or "not concerned at all". The item on environmental concerns did not change over the entire observation period.

For our analyses on both fertility risks and environmental trajectories, we dichotomize this variable for two reasons. First, social psychology research suggests that the strength of an attitude (here, environmental concerns) is important for predicting different outcomes (Ajzen, 2001; Howe & Krosnick, 2017). Therefore, it appears reasonable to differentiate between some

[2] Environmental concerns have been collected since 1984, but the information for rural or urban region (one explanatory) is not available before 1985. Since we additionally use lagged variables in order to predict childbearing, the first observed childbirth could have happened in 1986.

and major concerns. Second, the number of respondents who reported having “no concerns” was rather small in all years. Thus, we combine this group with individuals who reported having only some concerns and obtain a dummy variable for environmental concerns (0 “no/some concerns,” 1 “big concerns”).

Subjective measures, such as those of environmental concerns, tend to be sensitive to specific events that can suddenly break a time trend and cause outliers in individual years (for instance, the Chernobyl catastrophe in 1986 or the release of “An Inconvenient Truth” in 2007). Moreover, much like subjective values and identities, concerns tend to be volatile during the formative years (Pöge, 2020; Striessnig & Lutz, 2016). Therefore, relying on the answer from just a single year to identify an individual as being either concerned or not concerned could introduce bias and/or misrepresent the person’s level of concern during young adulthood. Since this is our main variable in predicting the probability of entering parenthood by age 40, for the prospective analysis (#1a), we derive a more robust measure of environmental concern by calculating the mode from age 16 (when the youngest participants entered GSOEP) to age 23. This rather wide window gives us at least a few observations for those individuals who first joined the survey at age 20. To test the sensitivity of this window, we tried alternative age intervals (e.g., ages 20-25). The results were similar. When analyzing the influence of environmental concerns on childbearing over time (#1b), we allow environmental concerns to vary across years. To prevent bias in concerns due to known pregnancies or experienced births, we lag time-varying environmental concerns by one year.

Control Variables

In our cross-sectional analysis of parenthood by age 40 (#1a), we control for several covariates. We include gender (“female,” “male”) and region (“east,” “west”) as dummy variables. Highest educational attainment (“inadequate,” “general elementary,” “middle vocational,” “vocational + Abi,” “higher vocational,” “higher education”) is provided by GSOEP according to the International Standard Classification of Education (ISCED, version of 1997), and we took this information from the last available observation. Civil status (“single,” “cohabiting,” “married,” “divorced/widowed”) provides information on partnership and marital status, which plays an essential role in childbearing. Type of residence (“rural,” “urban”) has been generated according to the definitions by the Federal Office for Building and Regional Planning (SOEP-IS Group, 2021). While the results presented here are based on the last available observation for each individual, we also conducted robustness checks based on information from the first observation. The results show similar patterns, and can be provided upon request.

Analyses of fertility risks over time (#1b) additionally control for the participant's birth year (1965-1979), age at baseline (in months), and income (standardized logarithm of individual gross income in the previous year). Education (as above, but including "in school"), civil status, income, region, and type of residence are now allowed to vary over time. In order to avoid biases due to pregnancies that were ongoing at the time of the survey (these may, for example, determine civil status), we take information on these variables from the previous year (time-lagged). Given that we consider information from year t-1, and that type of residence ("rural," "urban") is not available before 1985, we are restricted here to first childbirths from 1986 onward.

Part (#2) of our analysis is dedicated to trajectories of environmental concerns, and also controls for gender, highest educational attainment, region, and type of residence. Additionally, we control for parental status in a given year ("no parenthood (yet)," "parenthood"), calendar year (in five-year groups), and age (in years).

Models

To answer the question of whether early-life environmental concerns predict future childbearing (#1a), we run logistic regression models relating the "initial" level of concern (statistical mode between ages 16 and 23) to the "eventual" level of fertility measured at age 40. The logistic regression model can formally be described as:

$$ln\left(\frac{P_i}{1-P_i}\right) = a + b_1 env_{mode} + b_2 gender + b_3 edu + b_4 civil + b_5 resid + b_6 region \quad (1),$$

and including an interaction effect between environmental concerns and gender as:

$$ln\left(\frac{P_i}{1-P_i}\right) = a + b_1 env_{mode} * b_2 gender + b_3 edu + b_4 civil + b_5 resid + b_6 region \quad (2)$$

where the log odds of being a parent by age 40 are the sum of the model intercept *a* and the set of explanatories, which are multiplied by the corresponding coefficients $b_1 \ldots b_6$. The variable *env* represents the mode of dichotomized environmental concern between ages 16 and 23. Furthermore, we control for the respondent's *gender*, highest educational attainment (*edu*), partnership status (*civil*), type of residence (*resid*), and *region* (East or West Germany).

To study the impact of concerns on fertility risks (#1b), we employ piecewise-constant hazard models, a type of event-history analysis used particularly in fertility research (e.g. Bengtsson and Dribe 2014; Mussino and Strozza 2012). These models take the form of:

$$h_{ij}(t|x_i) = \lambda_j exp(b_1 env_{t-1} + b_2 gender + b_3 edu_{t-1} + b_4 civil_{t-1} + b_5 resid_{t-1} + b_6 region_{t-1} + b_7 birthyear + b_8 age\_baseline + b_9 income_{t-1}) \quad (3),$$

and including an interaction between environmental concerns and gender:

$$h_{ij}(t|x_i) = \lambda_j exp(b_1 env_{t-1} * b_2 gender + b_3 edu_{t-1} + b_4 civil_{t-1} + b_5 resid_{t-1} + b_6 region_{t-1} + b_7 birthyear + b_8 age\_baseline + b_9 income_{t-1}) \quad (4)$$

The hazard *h* for each individual *i* within time interval *j* depends on time *t* and the set of explanatories *x*. The factor λ represents the period-specific baseline hazard. It is multiplied by the exponentiated sum of explanatories that are multiplied by the coefficients $b_1 \ldots b_9$. The explanatories are identical to those in equation (1) but extended by the factors *birthyear* (year of birth of respondent), *age at baseline* (in months), and *income* (standardized logarithm). Environmental concerns, education, civil status, type of residence, region, and income are time-varying and lagged by one year. Equations (2) and (4) provide us with insights on gender-specific findings – in line with hypothesis 1b).

To study the drivers of environmental concerns over time (#2), we again rely on logit models. We apply both random- and fixed-effects models. According to the Hausman test, fixed-effects models controlling for unobserved heterogeneity within individuals over time are more appropriate for our data (Table A1). The explanatory variables are time-varying.

$$ln\left(\frac{P_i}{1-P_i}\right) = a + b_1 parenthood_{i,t} * b_2 age_{i,t} + b_3 edu_{i,t} + b_4 year_{i,t} + b_5 resid_{i,t} + b_6 region_{i,t} + \alpha_i \quad (5)$$

The structure of equation (5) is similar to equations (1) and (2) (logit models) but expanded by the factor α, which represents the unobserved time-constant variables for each individual *i*. The model from equation (5) was also run for males and females separately in order to address our hypothesis 2b). In this manuscript, we only show estimates from fixed-effects analyses but results from random-effects models can be found in the appendix. As additional robustness checks, we ran ordered logit models with fixed-effects and linear regression models using the original variable on environmental concerns without dichotomization ("very concerned," (1),

"somewhat concerned," (2) or "not concerned at all" (3)). The results support those obtained from logit models (estimates available upon request).

Results

Descriptive Statistics

Table 1 shows absolute and relative frequencies for all variables used in the fertility analyses. The left-hand side displays statistics for the sample consisting of 833 individuals used in analysis (#1a) on parenthood by age 40. Roughly 60% of respondents in this sample reported having major concerns most frequently when they were aged 16-23. Almost half of the sample had obtained middle vocational education (48.02%) by the last observation, and the majority (57.26%) were not living with a partner.

On the right-hand side, Table 1 shows univariate statistics for the sample used for the event-history analyses described in (#1b). This sample contains 6,730 individuals with 71,312 observations. Descriptive statistics are reported at baseline when individuals first entered the survey, irrespective of the survey time. Most individuals in this sample were relatively young (210 months on average), not cohabiting with a partner (95.75%), and either in school (19.55%) or had attained general elementary (46.15%) or middle vocational education (29.90%).

Table 1: Descriptive statistics fertility analyses

Logit models, at last observation		
Variable	**N**	**%**
Envir. Concerns (Mode 16-23 years)		
No/Some	335	40.22
Big	498	59.78
Gender		
Females	440	52.82
Males	393	47.18
Education (at last observation)		
Inadequately	10	1.20
General Elemantary	64	7.68
Middle Vocational	400	48.02
Vocational + Abi	71	8.52
Higher Vocational	98	11.76
Higher Education	190	22.81
Civil Status		
Single	477	57.26
Cohabited	70	8.40
Married	251	30.13
Divorced/Widowed	35	4.20
Residence		
Urban	562	67.47
Rural	271	32.53
Total	833	100

Event-history analyses, at baseline			
Variable	**N**	**%**	
Environmental Concerns			
No/Some	4,502	66.89	
Big	2,228	33.11	
Gender			
Females	3,303	49.08	
Males	3,427	50.92	
Education			
In School	1,316	19.55	
Inadequately	120	1.78	
General Elemantary	3,106	46.15	
Middle Vocational	2,012	29.90	
Vocational + Abi	38	0.56	
Higher Vocational	19	0.28	
Higher Education	119	1.77	
Civil Status			
Single	6,444	95.75	
Cohabited	237	3.52	
Married	44	0.65	
Divorced/Widowed	5	0.07	
Residence			
Urban	4,328	64.31	
Rural	2,402	35.69	
Region			
West	5,321	79.06	
East	1,409	20.94	
	Mean	**Std. dev.**	**Min**
Age (months)	210.77	12.30	170
Income (log)	7.61	1.15	2.56
Total	6,730	100	

Table 2 shows descriptive statistics for sample (#2), which was used to examine environmental trajectories over fertility history. The left-hand panel of the table shows characteristics from the first observation at young ages, while the right-hand panel refers to the last observation at least

20 years later. Of the 1,302 respondents, 52.76% were female and the urban-rural distribution remained relatively stable over time (about two-thirds from urban areas). While 97.77% did not have children at first observation, 71.81% were parents at last observation. Changes in the respondents' educational attainment can also be detected: at baseline, 33.87% were in school and 47.31% had obtained a general elementary school degree as highest education; while at last observation, the majority had reached either middle vocational (44.78%) or higher (tertiary) education (25.65%).

Table 2: Descriptive statistics environmental trajectories

Baseline			**Last observation**		
Variable	%	N	Variable	%	N
Gender			*Gender*		
Males	47.24	615	Males	47.24	615
Females	52.76	687	Females	52.76	687
Education			*Education*		
In School	33.87	441	In School	0.46	6
Inadequately	5.07	66	Inadequately	0.92	12
General Elemantary	47.31	616	General Elemantary	8.76	114
Middle Vocational	13.06	170	Middle Vocational	44.78	583
Vocational + Abi	0.46	6	Vocational + Abi	8.53	111
Higher Vocational	-	-	Higher Vocational	10.91	142
Higher Education	0.23	3	Higher Education	25.65	334
Residence			*Residence*		
Urban	67.74	882	Urban	69.59	906
Rural	32.26	420	Rural	30.41	396
Parenthood			*Parenthood*		
No	97.77	1,273	No	28.19	367
Yes	2.23	29	Yes	71.81	935
	Mean	**Std. Err.**		**Mean**	**Std. Err.**
Age in years	17.67	1.73	*Age in years*	43.05	5.39
Total	100	1,302	Total	100	1,302

Descriptive statistics on environmental concerns over time reveal different patterns across ages and birth cohorts (Figure 1). Since there were only a few respondents aged 15 and 16, in Figure 1 we show the environmental concerns of individuals aged 17 or older. Members of

the oldest birth cohorts (<1970) reported having major environmental concerns quite frequently at younger ages. Of these individuals, the share who said they were very concerned was around 60% at ages 18-25, but had decreased to approximately 20% at age 35. Thereafter, this share was relatively stable at around 35%, before increasing again in the more recent observations when the respondents were over age 50.

Individuals born in the 1970s also reported having major concerns at younger ages. Again, around 60% of them said they were very concerned at age 17. However, unlike in the earlier birth cohorts, this proportion decreased from ages 17-28 to around 30%, where it remained until the end of the observation window. The differences in age profiles between the pre-1970 and post-1970 birth cohorts may point to period effects (forest damage, Chernobyl) during the 1980s. The age profiles for the youngest birth cohorts look markedly different. The share of individuals who reported having major environmental concerns was stable at around 30% across the younger ages for the birth cohorts from 1980 onward. This proportion increased by mid-adulthood (ages 39/40) to around 45%, which may be due to current debates around climate change.

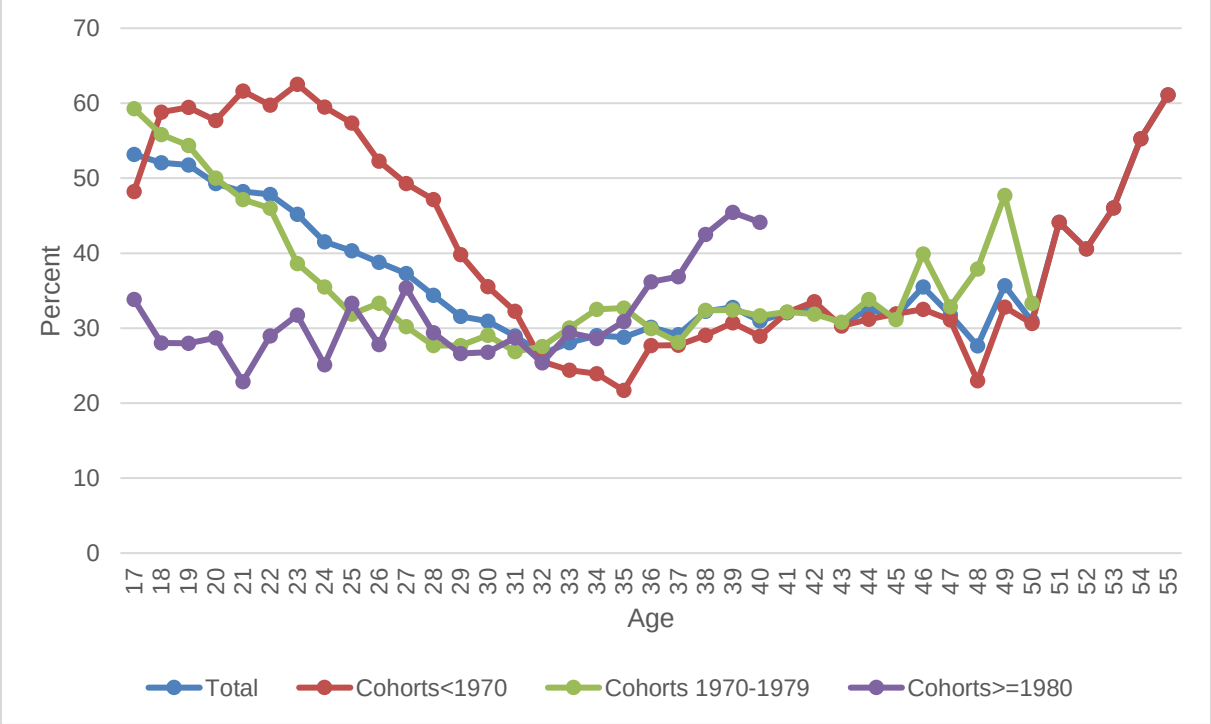

Figure 1: Environmental concerns over age and birth cohorts
Note: Descriptive statistics showing percentages reporting major environmental concerns; bivariate analyses without any control variables, SOEP data (1984-2020).

Fertility analyses

In a first step of the multivariate analyses (#1a), we examine whether environmental concerns in the early life stage (statistical mode between ages 16 and 23) may predict parenthood by mid-adulthood (age 40). Figure 2 below refers to predictive margins on being a parent by age 40 for both women and men. Findings suggest that women were more likely than men to have transitioned to parenthood. But for both women and men, having major concerns about the environment at younger ages did not significantly affect the likelihood of becoming a parent. While the predicted probabilities are slightly higher among those reporting major concerns during young adulthood (vs. no/some concerns), the statistical uncertainty is relatively large. Further analyses based on the contrasts of margins reveal that the point estimates of reporting major concerns do not differ significantly from the reference group (no/some concerns) for both genders (Figure A1). Point estimates and confidence intervals for the other covariates of the model are shown in Table A2 of the appendix. Robustness checks using the statistical mode of environmental concerns for ages 20-25 (Figure A2) and on fertility by age 35 (Figure A3) support our findings.

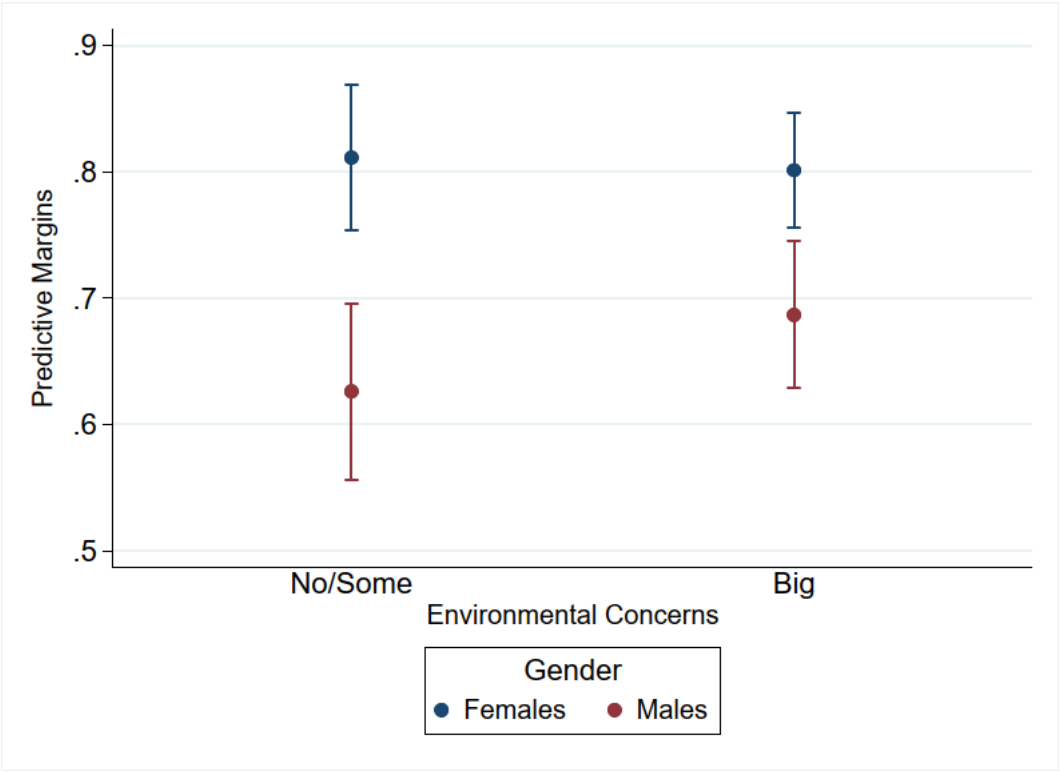

Figure 2: Impact of environmental concerns on parenthood by age 40
Note: Logit models controlling for highest level of educational attainment, civil status, type of residence, and region; the dependent variable is the mode of environmental concern between ages 16 and 23.

As a second step, we examine whether environmental concerns were associated with the first-birth transition rate over the reproductive life span using piecewise-constant hazard models (#1b). Figure 3 below shows the hazard ratios of having major concerns about the environment (compared to no or some concerns). The first-birth transition rate was approximately 7% lower for people reporting major concerns than for those reporting no/some concerns. However, as the confidence interval includes zero, this finding is not statistically significant. Looking at gender differences in the first-birth transition rate, we find only a negligible effect of major environmental concerns for women, but a roughly 15% lower likelihood of entering fatherhood for men with major concerns compared to men with some or no concerns. Estimates and confidence intervals for further covariates, as well as results stratified by gender, are shown in Table A3 of the appendix.

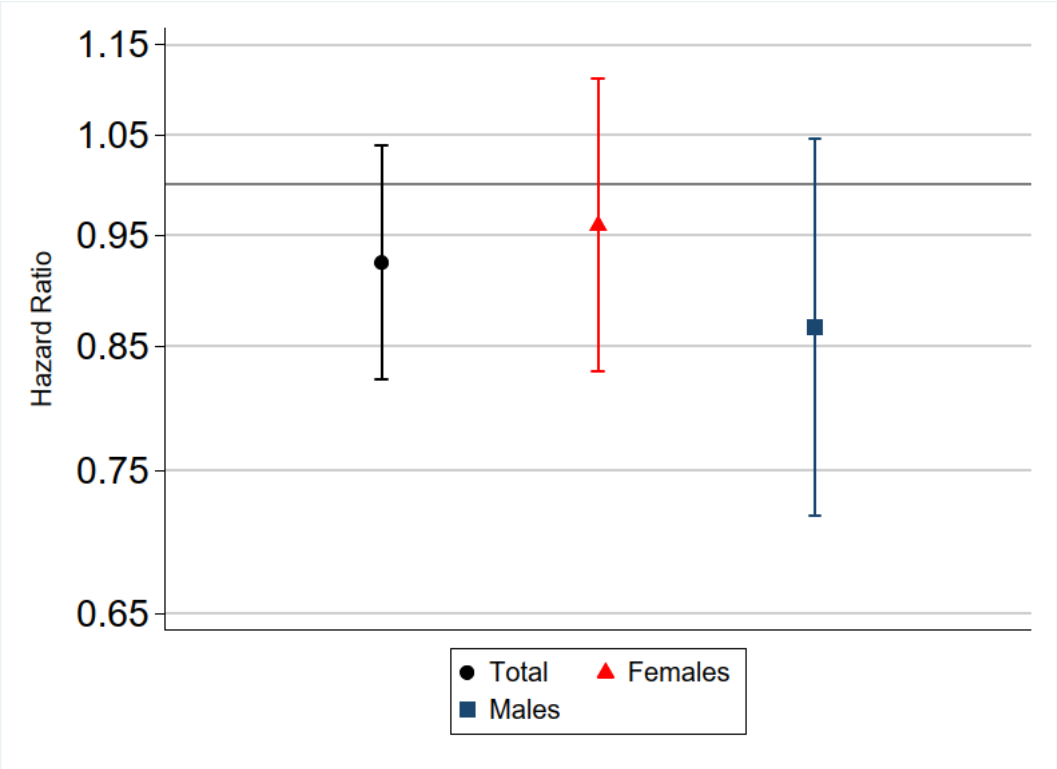

Figure 3: Hazard ratios (major environmental concerns vs. no/some concerns) for first-birth transitions by gender
Note: Piecewise-constant hazard models controlling for highest level of educational attainment (lagged), birth year, civil status (lagged), income (lagged), type of residence, and region. In the "total" sample we also control for gender. Environmental concerns included as a lagged dummy variable.

Furthermore, we examine whether the link between environmental concerns and childbearing varies across birth cohorts. As outlined in the introduction, the older birth cohorts in GSOEP (e.g., those born before 1970) may have an active memory of certain environmental catastrophes, and might have been active participants in important social movements (e.g.,

the student revolts of the 1970s that led to the creation of the Green Party) during their formative years, whereas the younger cohorts (e.g., those born after 1980) were still in their infancy during this period. Findings from piecewise-constant hazard models stratified by birth cohort groups are displayed in Figure 4 below. Results suggest that individuals born before 1970 who reported major environmental concerns had lower first-birth hazard rates than their less concerned peers (hazard ratio: 0.73). We do not observe similar differences among the cohorts born after 1970, as the first-birth transition rates in these cohorts did not differ between levels of concern. Hazard ratios and confidence intervals with respect to covariates are shown in Table A3 of the appendix. Additionally, we run more stratified models including smaller birth cohort groups (<1970, 1970-1979, 1980-1989, >=1990). Estimates are shown in Figure A4 of the appendix. With the exception of the cohorts born before 1970, the birth cohort groups do not differ significantly. However, it appears that among the most recent cohorts (1990 onward), who experienced the contemporary climate change debates in their formative years, there are positive associations between environmental concerns and fertility. Confidence intervals are relatively large due to small observation numbers results, but a reversal of the correlation between environmental concerns and fertility may be indicated.

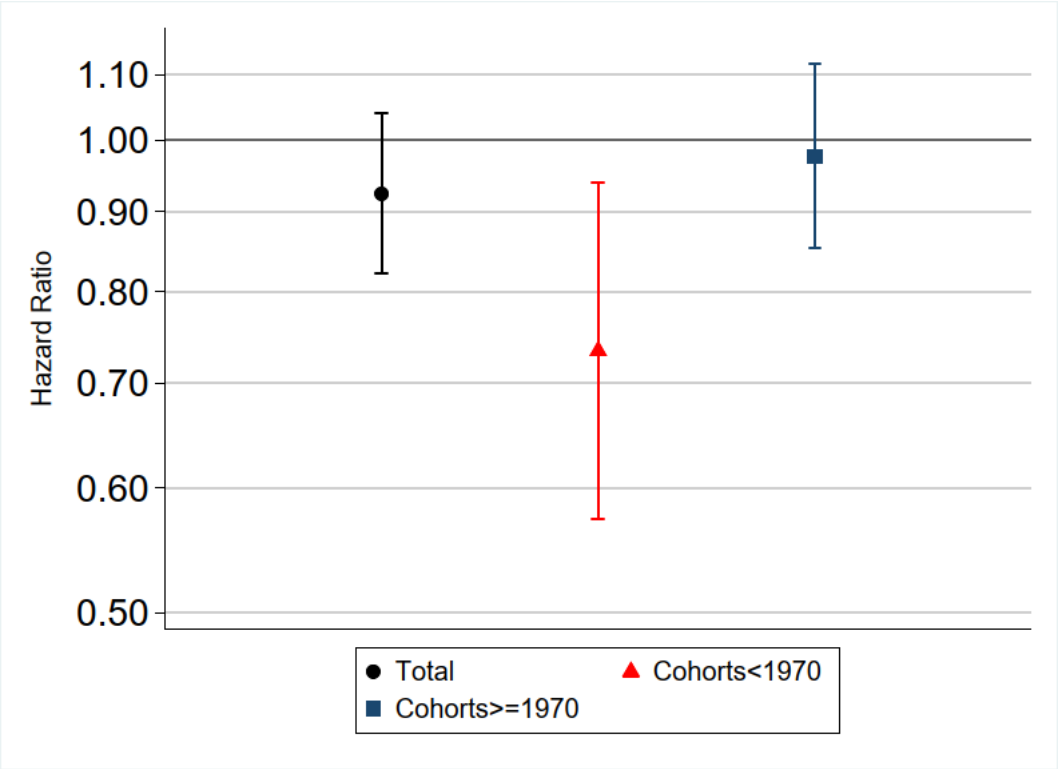

Figure 4: Hazard ratios (major environmental concerns vs. no/some concerns) for first-birth transitions by birth cohorts
Note: Piecewise-constant hazard models controlling for gender, highest level of educational attainment (lagged), civil status (lagged), income (lagged), type of residence, and region; total sample also controls for birth year; environmental concerns included as a lagged dummy variable.

Major environmental concerns were not associated with parenthood by age 40 according to our logit models (#1a), or with fertility risks over time among the total sample, except for the cohorts born before 1970 (#1b). However, environmental concerns may determine the timing of the first childbirth in the life course. Therefore, we estimate first-birth hazard models including an interaction between environmental concerns and time for each gender separately. Results are shown in Figure 5. We find no clear differences between the environmental concern groups across age for either gender.

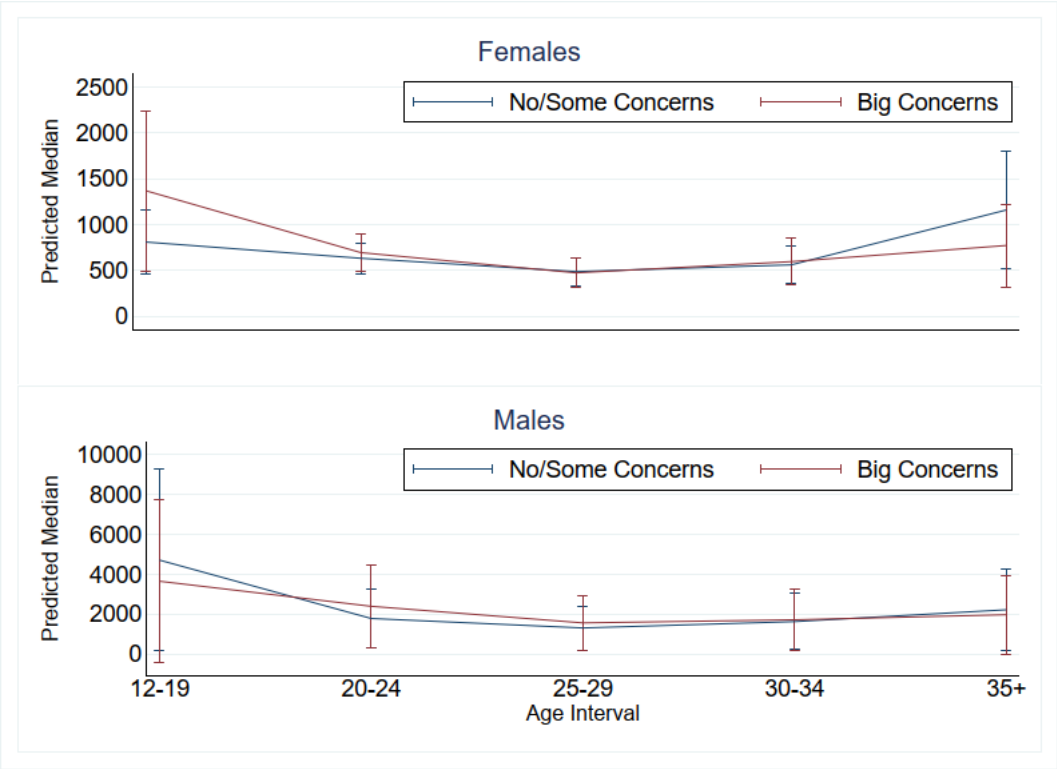

Figure 5: Hazard ratios (major environmental concerns vs. no/some concerns) for first-birth transitions by gender (based on interactions between environmental concerns and time)
Note: Piecewise-constant hazard models controlling for highest level of educational attainment (lagged), birth year, civil status (lagged), income (lagged), type of residence, and region. Environmental concerns included as a lagged dummy variable.

Environmental trajectories

Furthermore, we examine whether parenthood is linked with environmental trajectories (#2). Figure 6 shows the predictive margins of having major concerns over the life course derived from fixed-effects logit models according to parental status. Both parents and non-parents show decreasing probabilities of having major concerns with age starting from similar levels at age 20. For instance, a 20-year-old who had not entered parenthood (yet) was 34% more likely to have major concerns than some or no concerns (keeping all remaining covariates constant). Among those who remained childless, this probability declined to approximately 9% at age 45. Among the respondents who entered parenthood, the probability of having major concerns at age 20 was slightly lower (32%), and reached 11% by age 45. Statistical uncertainty is, however, quite high. Point estimates and confidence intervals for the other covariates are listed in Table A4 (M1) of the appendix. Results from the random-effects model indicate similar patterns, although the steepness of the decline with age is lower compared to the FE model, as Figure A5 shows.

Additional analyses comparing individuals who were childless and those who had children by age 40 show similar patterns (see Figure A6). As a further robustness check, we ran linear regression models on numeric environmental concerns (1 “no concerns,” 2 “some concerns,” 3 “big concerns”). These models support the findings from the logit models that the probability of reporting major environmental concerns decreased more among non-parents than among parents (see Figure A7 in the appendix).

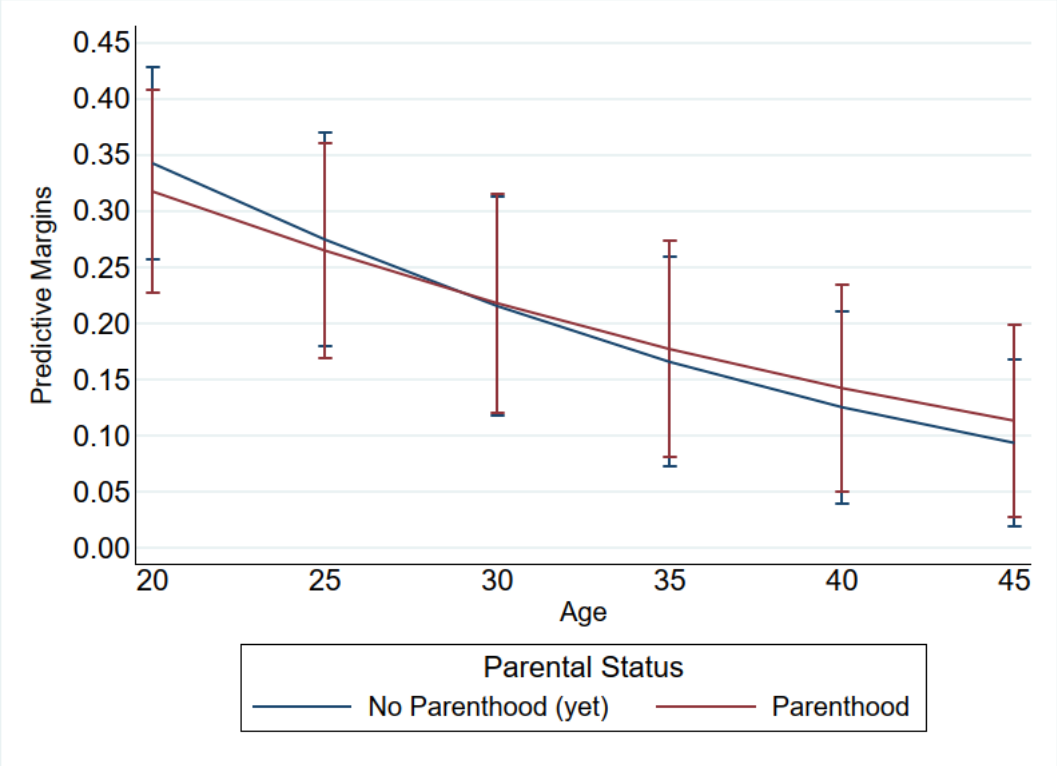

Figure 6: Probability of major environmental concerns by parental status
Note: Fixed-effects logit models controlling for highest level of educational attainment, calendar year, type of residence, and region.

Figure 7 below shows the predictive margins on the probability of reporting major environmental concerns by parental status and gender. However, no clear differences between genders and parental statuses emerge (all estimates around 25%), and statistical uncertainties are large. Estimates for the other covariates from this model are shown in Table A4 (M2). Findings from random-effects models are shown in Figure A8. Gender differences among non-parents appear, but they are likely rooted in unobserved differences between the groups (since fixed-effects models show no differences).

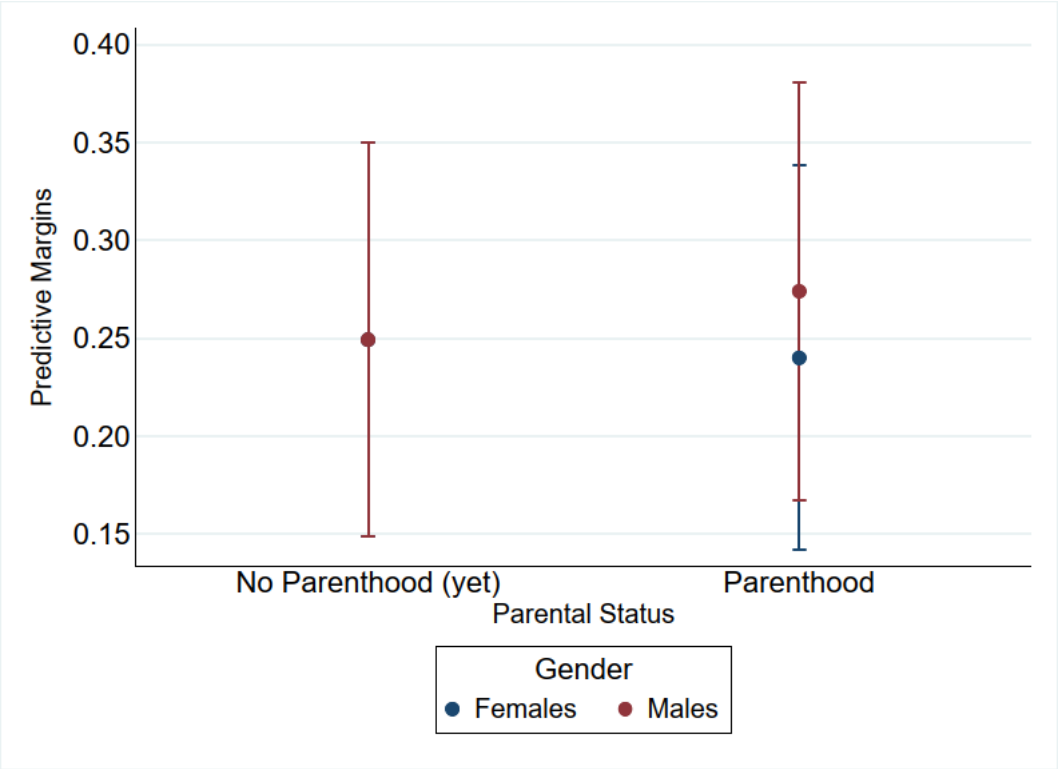

Figure 7: Probability of major environmental concerns by parental status and gender
Note: Fixed-effects logit models controlling for age, level of educational attainment, calendar year, type of residence, and region.

To examine whether the timing of childbearing affects the probability of reporting major environmental concerns, we run further models stratified by age at first childbirth on sample (#2). The biggest differences are found between early childbearers (first childbirth before age 25) and individuals who were childless at age 40. According to Figure 8, both groups showed decreasing probabilities of reporting major environmental concerns with age. However, individuals who entered parenthood relatively early had higher probabilities of reporting major concerns (compared to no/some concerns) at any age throughout their life course than people who remained childless. For instance, at age 20, early childbearers were about 42% more likely to report major environmental concerns (compared to no/some concerns), while this likelihood for childless individuals was 35%. These probabilities decreased to 17% and 10% by age 45, respectively. The differences between these groups are statistically significant according to contrasts of margins (Figure A9). Corresponding estimates for other subgroups (parenthood between age 25 and 40, childless individuals) are shown in Figure A10 in the appendix. Specific point estimates are listed in Table A5. Findings from random-effects models are displayed in Figure A11.

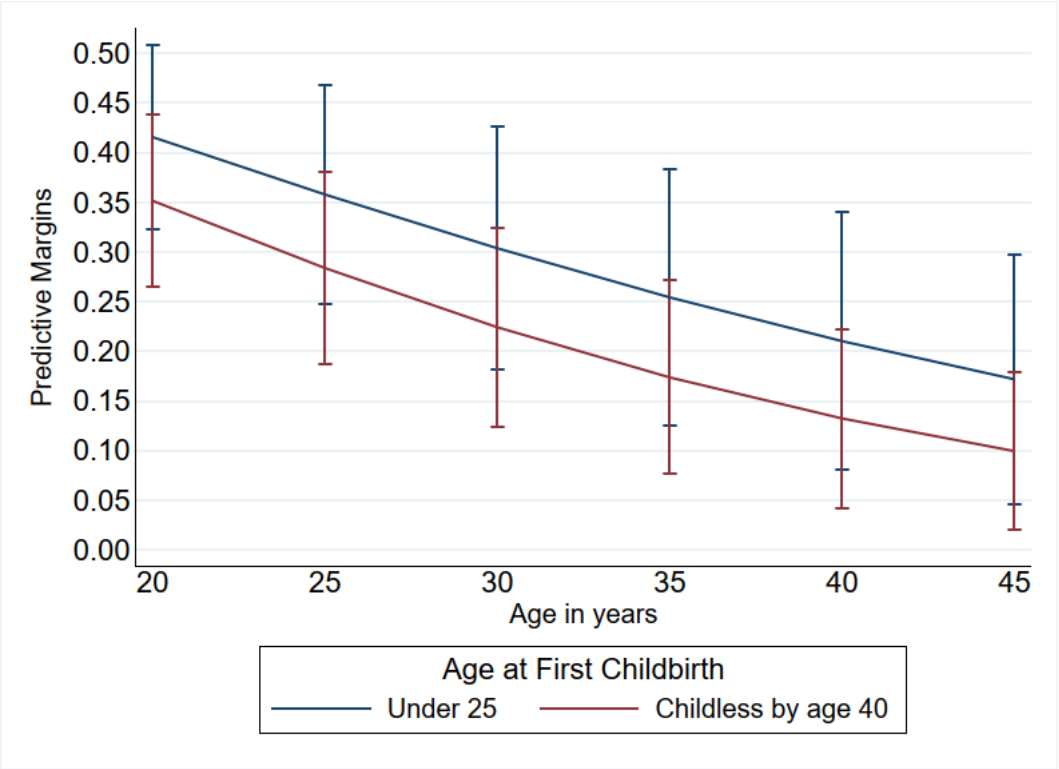

Figure 8: Probability of major environmental concerns by age at first childbirth (early childbearers vs. childless by age 40)
Note: Fixed-effects logit models controlling for age, level of educational attainment, calendar year, type of residence, and region.

Discussion

Our study contributes to the existing demographic research on the climate change-fertility nexus in several ways. First, while previous research predominantly focused on this important relationship in the high-fertility contexts of the Global South (Grace, 2017; Sellers & Gray, 2019), we looked at the low-fertility context of Germany, where fertility postponement has been strong for many decades. Second, while previous research mostly relied on "hard" measures of global warming, such as extreme temperatures (Barreca et al., 2018) or drought impacts (Berlemann & Wenzel, 2015), we took a sociological perspective by investigating environmental attitudes and their association with fertility behavior. The aim was to provide a better understanding of fertility decisions and to explore the likely role of environmental concerns in family formation.

One of the greatest strengths of our study lies in its use of longitudinal data on environmental concerns spanning complete fertility histories of decades of birth cohorts (mid-1960s to mid-1980s). Environmental concerns have been measured by GSOEP annually from 1984 onward, allowing us to follow individuals' environmental concerns from their early life stages for 20

years or more. To our knowledge, no existing study on either of the two relationships that we studied here was able to exploit such a wealth of longitudinal data.

Nevertheless, our data source and resulting analyses are not without limitations. First and foremost, environmental concerns do not necessarily reflect concerns about climate change, although the two phenomena are closely related (Franzen & Vogl, 2013; Peisker, 2023). While climate change concerns are also measured in GSOEP, this item is available only from 2009 onward, which did not allow us to observe individuals over their prime childbearing ages. However, additional analyses suggest that the two types of concerns are strongly positively related (see Figure A12). The relationship between climate change concerns and childbearing should be addressed in future research when longer time series are available.

Another potential problem with the GSOEP survey item on environmental concerns arises from the volatility in people's response behavior. As Hartmann and Preisendörfer (2021) emphasized, concerns about environment and climate change are heavily affected by period effects. In our first set of analyses, we tried to get this volatility under control by taking the mode over several survey waves rather than just a single year's answer, thereby reducing the potential effect of anomalous years. In our longitudinal analyses, we control for period fixed effects.

Another issue is that respondents were not allowed to specify the exact source of their concern (e.g., local environment or global developments) in the GSOEP measure. Rather, they were asked to choose one of only three rather broad response options ("no," "some," "major concerns") that might cover differences in environmental concern levels within these groups. This leads to the vast majority of respondents reporting having "major concerns." Since the "no concerns" group was relatively small in our analytical sample, we were forced to combine it with the "some concerns" group, thus reducing the informational content of the resulting variable in our statistical analyses.

Using a more refined scale, such as the GSOEP item on satisfaction with the local environment (0-10), would certainly be preferable, as it could capture more variation in people's response behavior. However, this survey item was available for a much more limited time period (1990-2003). Nevertheless, initial analyses based on this measure point to interesting differences by gender, as shown in the appendix (Figure A13). Women who reported being more satisfied with the local environment appeared to be more likely to enter motherhood. This association could not be detected among males (negative relationship if at all).

Additionally, there are important steps in the theorized pathways that we did not measure. For instance, fertility desires or intentions may be important mediators in the relationship between environmental concerns and fertility behavior (Rackin et al., 2022; Schneider-Mayerson &

Leong, 2020). However, this kind of information was either missing or of poor quality in our data.

Conclusions

Although several theoretical approaches point to the importance of environmental attitudes for demographic outcomes, evidence on the hypothesized two-way relationship between environmental concerns and fertility remains scarce. Whether childless individuals are prevented from fulfilling their fertility desires (potentially due to higher concerns), or whether realizing their fertility intentions turns to changes in environmental concerns, are still open questions. Moreover, it is unclear whether environmental concerns evolve differently for parents and childless individuals, and, if there is indeed a difference, how soon after a child's birth those trajectories start to diverge.

The present study examined this relationship using longitudinal data from Germany (GSOEP). We applied logit and piecewise-constant hazard models to estimate the quantum and timing of parenthood, and fixed-effects logit models to estimate environmental trajectories over time. We found that levels of environmental concern early in life did not predict either the quantum of parenthood by age 40 or the timing of the transition to parenthood. While environmentally-concerned men had a lower first-birth transition rate than environmentally-concerned women, these differences were not statistically significant. We thus reject our hypotheses 1a and 1b, which assumed that environmentally-concerned individuals, and especially women, would have fewer children and enter parenthood later. Our results do, however, suggest that members of the pre-1970 birth cohorts who had major environmental concerns transitioned to the first birth more slowly, indicating changes in the environmental concern-fertility nexus over historic time.

In a second set of analyses, we examined environmental concern trajectories over the life course. Our findings suggest that while childless individuals were slightly more likely to report major concerns at younger ages, their level of concern decreased more over the life course than it did among parents. At older ages, parents reported having greater environmental concerns than childless individuals. Although this may suggest that parenthood was weakening the age-related decrease in levels environmental concern, the statistical uncertainty was large, and these differences were not statistically significant in the fixed-effects models. Thus, any differences in concern trajectories over the life course between parents and the childless were likely due to other unobserved stable factors among the individuals that were correlated with environmental concerns, and were not a causal effect of parenthood. Additional analyses stratified by age at first childbirth suggested that early childbearers

(parenthood before age 25) were more likely to report major environmental concerns at any age than childless individuals. This finding is consistent with the legacy hypothesis, which claims that parents tend to be more concerned with the environment as their offspring will be forced to live in the environments that they inherit from their parents. In sum, we largely rejected H2a and H2b, albeit with the caveat that those who had children very early in life might indeed be more environmentally concerned. More research on the environmental concern trajectories of people who have children early in life is needed.

Implications and Outlook

Our results have important implications for future research and potential developments in fertility behavior in the era of climate change. As our findings suggest, environmental concerns at younger ages are not generally associated with the probability of entering parenthood by mid-adulthood. Hence, it appears that in the past, environmental concerns did not play a large role in the formation of fertility preferences during early life stages, at least with regard to entering parenthood. However, we were only able to examine the cohorts born between the 1960s and the early 1980s. Birth cohorts whose fertility desires have developed in more recent years presumably have bigger concerns about the future of the planet. If their concerns are indeed much larger, these worries may have a greater influence on their fertility preferences.
In that vein, the negative longitudinal association between environmental concerns and fertility found for older birth cohorts (born before 1970) suggests that experiencing major environmental catastrophes in one's youth, like the 1986 Chernobyl disaster, might have knock-on effects on fertility later in life. These older cohorts were mostly in their teenage years when Chernobyl's radioactive fallout happened, forest damage was discussed very publicly in Germany, and the Green Movement made its way into the parliament. But whereas these developments were relatively short-lived and transitory, climate change concerns among the contemporary youth may be a more lasting phenomenon, particularly if policies do not respond to these concerns in a timely manner. As a consequence, we might see even stronger associations between environmental concerns and childbearing among the more recent cohorts of prospective parents, with potentially less time left to postpone childbearing (Striessnig & Trimarchi, 2023). This could imply that childlessness levels will increase further in the future. While the impact of the recent invasion of Ukraine by Russia, as well as its mediatization, certainly should be considered as an additional stress factor and/or distraction from climate change, more detailed data on both environmental concerns and fertility history are certainly needed to investigate this topic further.

References

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2001). Nature and Operation of Attitudes. *Annual Review of Psychology*, *52*(1), 27–58. https://doi.org/10.1146/annurev.psych.52.1.27

Arnocky, S., Dupuis, D., & Stroink, M. L. (2012). Environmental concern and fertility intentions among Canadian university students. *Population and Environment*, *34*(2), 279–292. https://doi.org/10.1007/s11111-011-0164-y

Bachrach, C. A., & Morgan, S. P. (2013). A Cognitive-Social Model of Fertility Intentions. *Population and Development Review*, *39*(3), 459–485. https://doi.org/10.1111/j.1728-4457.2013.00612.x

Bar, M., Hazan, M., Leukhina, O., Weiss, D., & Zoabi, H. (2018). Why did rich families increase their fertility? Inequality and marketization of child care. *Journal of Economic Growth*, *23*(4), 427–463. https://doi.org/10.1007/s10887-018-9160-8

Barreca, A., Deschenes, O., & Guldi, M. (2018). Maybe Next Month? Temperature Shocks and Dynamic Adjustments in Birth Rates. *Demography*, *55*(4), 1269–1293. https://doi.org/10.1007/s13524-018-0690-7

Bengtsson, T., & Dribe, M. (2014). The historical fertility transition at the micro level: Southern Sweden 1815-1939. *Demographic Research*, *30*, 493–534. https://doi.org/10.4054/DemRes.2014.30.17

Berger, E. M. (2010). The Chernobyl Disaster, Concern about the Environment, and Life Satisfaction. *Kyklos*, *63*(1), 1–8. https://doi.org/10.1111/j.1467-6435.2010.00457.x

Berlemann, M., & Wenzel, D. (2015). Long-Term Growth Effects of Natural Disasters—Empirical Evidence for Droughts. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2701762

Bernardi, L., & Klaerner, A. (2014). Social networks and fertility. *Demographic Research*, *30*, 641–670. https://doi.org/10.4054/DemRes.2014.30.22

Blocker, T. J., & Eckberg, D. L. (1997). Gender and Environmentalism: Results from the 1993 General Social Survey. *Social Science Quarterly*, *78*(4), 841–859.

Busse, M., & Menzel, S. (2014). The role of perceived socio-spatial distance in adolescents' willingness to engage in pro-environmental behavior. *Journal of Environmental Psychology*, *40*, 412–420. https://doi.org/10.1016/j.jenvp.2014.10.002

Cleland, J., Machiyama, K., & Casterline, J. B. (2020). Fertility preferences and subsequent childbearing in Africa and Asia: A synthesis of evidence from longitudinal studies in 28 populations. *Population Studies*, *74*(1), 1–21. https://doi.org/10.1080/00324728.2019.1672880

Dahlberg, J., & Kolk, M. (2018). Explaining Swedish sibling similarity in fertility: Parental fertility behavior vs. social background. *Demographic Research*, *39*, 883–896. https://doi.org/10.4054/DemRes.2018.39.32

Davidson, D. J., & Freudenburg, W. R. (1996). Gender and Environmental Risk Concerns. A Review and Analysis of Available Research. *Environment and Behavior*, *28*(3), 302–339.

De Rose, A., & Testa, M. R. (2015). Climate Change and Reproductive Intentions in Europe. In D. Strangio & G. Sancetta (Eds.), *Italy in a European Context: Research in Business, Economics, and the Environment* (pp. 194–212). Palgrave Macmillan UK. https://doi.org/10.1007/978-1-137-56077-3_9

Fesenfeld, L. P., & Rinscheid, A. (2021). Emphasizing urgency of climate change is insufficient to increase policy support. *One Earth*, *4*(3), 411–424. https://doi.org/10.1016/j.oneear.2021.02.010

Fowler, D., Brimblecombe, P., Burrows, J., Heal, M. R., Grennfelt, P., Stevenson, D. S., Jowett, A., Nemitz, E., Coyle, M., Liu, X., Chang, Y., Fuller, G. W., Sutton, M. A., Klimont, Z., Unsworth, M. H., & Vieno, M. (2020). A chronology of global air quality. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, *378*(2183), 20190314. https://doi.org/10.1098/rsta.2019.0314

Franzen, A., & Vogl, D. (2013). Two decades of measuring environmental attitudes: A comparative analysis of 33 countries. *Global Environmental Change*, *23*(5), 1001–1008. https://doi.org/10.1016/j.gloenvcha.2013.03.009

Gellrich, A., Tews, K., Simon, C., & Seider, S. (2021). *25 Jahre Umweltbewusstseinsforschung im Umweltressort: Langfristige Entwicklungen und aktuelle Ergebnisse*. Umweltbundesamt.

Goebel, J., Grabka, M. M., Liebig, S., Kroh, M., Richter, D., Schröder, C., & Schupp, J. (2019). The German Socio-Economic Panel (SOEP). *Jahrbücher Für Nationalökonomie Und Statistik*, *239*(2), 345–360. https://doi.org/10.1515/jbnst-2018-0022

Goebel, J., Krekel, C., Tiefenbach, T., & Ziebarth, N. R. (2015). How natural disasters can affect environmental concerns, risk aversion, and even politics: Evidence from Fukushima and three European countries. *Journal of Population Economics*, *28*(4), 1137–1180. https://doi.org/10.1007/s00148-015-0558-8

Grace, K. (2017). Considering climate in studies of fertility and reproductive health in poor countries. *Nature Climate Change*, *7*(7), 479–485. https://doi.org/10.1038/nclimate3318

Grønhøj, A., & Thøgersen, J. (2017). Why young people do things for the environment: The role of parenting for adolescents' motivation to engage in pro-environmental behaviour. *Journal of Environmental Psychology*, *54*, 11–19. https://doi.org/10.1016/j.jenvp.2017.09.005

Hartmann, J., & Preisendörfer, P. (2021). Development and Structure of Environmental Worries in Germany 1984–2019. *Zeitschrift Für Soziologie*, *50*(5), 322–337. https://doi.org/10.1515/zfsoz-2021-0022

Helm, S., Kemper, J. A., & White, S. K. (2021). No future, no kids–no kids, no future?: An exploration of motivations to remain childfree in times of climate change. *Population and Environment*, *43*(1), 108. https://doi.org/10.1007/s11111-021-00379-5

Hoffmann, R., Dimitrova, A., Muttarak, R., Crespo Cuaresma, J., & Peisker, J. (2020). A meta-analysis of country-level studies on environmental change and migration. *Nature Climate Change*, *10*(10), 904–912. https://doi.org/10.1038/s41558-020-0898-6

Hopcroft, R. L. (2019). Sex Differences in the Association of Family and Personal Income and Wealth with Fertility in the United States. *Human Nature*, *30*(4), 477–495. https://doi.org/10.1007/s12110-019-09354-4

Howe, L. C., & Krosnick, J. A. (2017). Attitude Strength. *Annual Review of Psychology*, *68*(1), 327–351. https://doi.org/10.1146/annurev-psych-122414-033600

Jamieson, L. (2016). Families, relationships and "environment": (Un)sustainability, climate change and biodiversity loss. *Families, Relationships and Societies*, *5*(3), 335–355. https://doi.org/10.1332/204674316X14758387773007

Jylhä, K. M., Cantal, C., Akrami, N., & Milfont, T. L. (2016). Denial of anthropogenic climate change: Social dominance orientation helps explain the conservative male effect in Brazil and Sweden. *Personality and Individual Differences*, *98*, 184–187. https://doi.org/10.1016/j.paid.2016.04.020

Kramarz, F., Skans, O. N., & Rosenqvist, O. (2019). *Skills, education and fertility* [Working Paper].

Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., L. Strnad, R., & Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, *9*(6), 458–462. https://doi.org/10.1038/s41558-019-0463-3

Liberman, N., & Trope, Y. (2008). The Psychology of Transcending the Here and Now. *Science*, *322*(5905), 1201–1205. https://doi.org/10.1126/science.1161958

Lockwood, B., Powdthavee, N., & Oswald, A. J. (2022). Are Environmental Concerns Deterring People from Having Children? *IZA Discussion Papers*, Article 15620. https://ideas.repec.org//p/iza/izadps/dp15620.html

Lutz, W., Muttarak, R., & Striessnig, E. (2014). Universal education is key to enhanced climate adaptation. *Science*, *346*(6213), 1061–1062. https://doi.org/10.1126/science.1257975

McCright, A. M., & Dunlap, R. E. (2011). Cool dudes: The denial of climate change among conservative white males in the United States. *Global Environmental Change*, *21*(4), 1163–1172. https://doi.org/10.1016/j.gloenvcha.2011.06.003

McDonald, R. I., Chai, H. Y., & Newell, B. R. (2015). Personal experience and the 'psychological distance' of climate change: An integrative review. *Journal of Environmental Psychology*, *44*, 109–118. https://doi.org/10.1016/j.jenvp.2015.10.003

Milfont, T. L., Poortinga, W., & Sibley, C. G. (2020). Does having children increase environmental concern? Testing parenthood effects with longitudinal data from the New Zealand Attitudes and Values Study. *PLOS ONE*, *15*(3), e0230361. https://doi.org/10.1371/journal.pone.0230361

Miller, W. B. (1994). Childbearing motivations, desires, and intentions: A theoretical framework. *Genetic, Social, and General Psychology Monographs*, *120*(2), 223–258.

Miller, W. B. (1995). Childbearing motivation and its measurement. *Journal of Biosocial Science*, *27*(4), 473–487.

Miller, W. B. (2011). Differences between fertility desires and intentions: Implications for theory, research and policy. *Vienna Yearbook of Population Research*, 75–98.

Mussino, E., & Strozza, S. (2012). The fertility of immigrants after arrival: The Italian case. *Demographic Research*, *26*, 99–130. https://doi.org/10.4054/DemRes.2012.26.4

Nisén, J., Martikainen, P., Silventoinen, K., & Myrskylä, M. (2014). Age-specific fertility by educational level in the Finnish male cohort born 1940–1950. *Demographic Research*, *31*, 119–136. https://doi.org/10.4054/DemRes.2014.31.5

OECD. (2000). *OECD Environmental Performance Reviews (1st Cycle): Conclusions and Recommendations 32 Countries (1993-2000)* (pp. 1–299). OECD Working Party on Environmental Performance.

Olofsson, A., & Rashid, S. (2011). The white (male) effect and risk perception: Can equality make a difference? *Risk Analysis*, *31*(6), 1016–1032. https://doi.org/10.1111/j.1539-6924.2010.01566.x

Peisker, J. (2023). Context matters: The drivers of environmental concern in European regions. *Global Environmental Change*, *79*, 102636. https://doi.org/10.1016/j.gloenvcha.2023.102636

Pöge, A. (2020). Stability and change of values during the formative years: Latent state-trait analyses of adolescents in a seven-wave panel study. *Journal of Personality*, *88*(2), 266–286. https://doi.org/10.1111/jopy.12484

Rackin, H. M., Gemmill, A., & Hartnett, C. S. (2022). Environmental attitudes and fertility desires among US adolescents from 2005–2019. *Journal of Marriage and Family*, 1–14. https://doi.org/10.1111/jomf.12885

Rotkirch, A. (2020). The wish for a child. *Vienna Yearbook of Population Research*, *18*, 49–61. https://doi.org/10.1553/populationyearbook2020.deb05

Schipperges, M. (2020). *Umwelteinstellungen in Deutschland von 1971 bis 2019 – Zeitreihenanalyse anhand externer Datenquellen* (pp. 1–69). Federal Environment Agency.

Schneider-Mayerson, M., & Leong, K. L. (2020). Eco-reproductive concerns in the age of climate change. *Climatic Change*, *163*(2), 1007–1023. https://doi.org/10.1007/s10584-020-02923-y

Sellers, S., & Gray, C. (2019). Climate shocks constrain human fertility in Indonesia. *World Development*, *117*, 357–369. https://doi.org/10.1016/j.worlddev.2019.02.003

Siegers, R., Belcheva, V., & Silbermann, T. (2019). SOEP-Core v34—Documentation of Sample Sizes and Panel Attrition in the German Socio-Economic Panel (SOEP) (1984 until 2017). *SOEP Survey Papers 606*.

SOEP-IS Group. (2021). SOEP-IS 2019: HBRUTTO: Household-related Gross File [SPSS_de,SPSS_en,Stata_de,Stata_en]. In *SOEP Survey Papers 966: Series D - Variable Descriptions and Coding: Vol. Berlin* (Version 2019, Issue DIW Berlin/SOEP). https://doi.org/10.5684/SOEP.IS.2019

Spence, A., Poortinga, W., & Pidgeon, N. (2012). The Psychological Distance of Climate Change: Psychological Distance of Climate Change. *Risk Analysis*, *32*(6), 957–972. https://doi.org/10.1111/j.1539-6924.2011.01695.x

Striessnig, E., & Lutz, W. (2016). Demographic strengthening of European identity. *Population and Development Review*, *42*(2), 305–311. https://doi.org/10.1111/j.1728-4457.2016.00133.x

Striessnig, E., & Trimarchi, A. (2023). How much time is left? International trends in parenthood expectancy. *Demographic Research*, *48*, 421–438. https://doi.org/10.4054/DemRes.2023.48.16

Thomas, G. O., Fisher, R., Whitmarsh, L., Milfont, T. L., & Poortinga, W. (2018). The impact of parenthood on environmental attitudes and behaviour: A longitudinal investigation of the legacy hypothesis. *Population and Environment*, *39*(3), 261–276. https://doi.org/10.1007/s11111-017-0291-1

Toulemon, L., & Testa, M. R. (2005). Fertility intentions and actual fertility: A complex relationship. *Population and Societies*, *415*, 2003–2006.

van Dalen, H. P., & Henkens, K. (2021). Population and Climate Change: Consensus and Dissensus among Demographers. *European Journal of Population*, *37*(3), 551–567. https://doi.org/10.1007/s10680-021-09580-6

Wagner, M., Huinink, J., & Liefbroer, A. C. (2019). Running out of time? Understanding the consequences of the biological clock for the dynamics of fertility intentions and union formation. *Demographic Research*, *40*, 1–26. https://doi.org/10.4054/DemRes.2019.40.1

Wynes, S., & Nicholas, K. A. (2017). The climate mitigation gap: Education and government recommendations miss the most effective individual actions. *Environmental Research Letters*, *12*(7), 074024. https://doi.org/10.1088/1748-9326/aa7541

Yeatman, S., Trinitapoli, J., & Garver, S. (2020). The Enduring Case for Fertility Desires. *Demography*, *57*(6), 2047–2056. https://doi.org/10.1007/s13524-020-00921-4

Zagheni, E., Muttarak, R., & Striessnig, E. (2016). Differential mortality patterns from hydro-meteorological disasters: Evidence from cause-of-death data by age and sex. *Vienna Yearbook of Population Research*, *13*(2015), 47–70. https://doi.org/10.1553/populationyearbook2015s47

Appendix

Table A1: Hausman test results (comparison between fixed-effects vs. random-effects logit models)

	Coefficients			
	Fixed	*Random*	*Difference*	*Std. err.*
	b	*B*	*b-B*	*sqrt(diag(V_b-V_B))*
Age (in years)	-0.061	-0.031	-0.029	0.007
Observation Year (ref.: 2000-2004)				
1985-1989	0.905	1.436	-0.530	0.108
1990-1994	1.185	1.531	-0.346	0.072
1995-1999	0.421	0.594	-0.173	0.037
2005-2009	0.714	0.552	0.162	0.037
2010-2014	0.980	0.662	0.318	0.073
2015-2020	1.486	1.018	0.468	0.110
Region (ref.: West)				
East	-0.276	-0.378	0.102	0.065
Residence (ref.: Urban)				
Rural	0.302	0.092	0.210	0.045
Parental Status (ref.: No Parent)				
Parent	0.033	0.026	0.007	0.016
Educational Level (ref.: Middle Vocational)				
In School	0.078	0.103	-0.025	0.016
Inadequately	-0.106	-0.393	0.287	0.105
General Elemantary	0.081	0.012	0.069	0.020
Vocational + College	-0.145	-0.080	-0.066	0.034
Higher Vocational	-0.437	-0.298	-0.140	0.039
Higher Education	-0.534	-0.394	-0.140	0.027

Test: Ho: difference in coefficients not systematic
chi2(44) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 36.02
Prob>chi2 = 0.0029

Table A2: Coefficients and 95%-confidence intervals from random-effects logit models (parenthood by age 40)

Variable	Estimate
Envir. Conc. (ref.: No/Some)	
Big concerns	-0.07
	(-0.58; 0.44)
Gender (ref.: Females)	
Males	-1.04
	(-1.57; -0.51)
Env. Conc.#Gender	0.37
	(-0.31; 1.05)
Educational Level (ref.: Middle Vocational)	
Inadequately	0.27
	(-1.37; 1.91)
General Elementary	0.10
	(-0.59; 0.79)
Vocational + High School	-0.34
	(-0.91; 0.23)
Higher Vocational	-0.15
	(-0.70; 0.40)
Higher Education	-0.05
	(-0.47; 0.37)
Civil Status (ref.: Single)	
Cohabited	-0.80
	(-1.33; -0.27)
Married	1.52
	(1.05; 1.98)
Divorced/Widowed	0.47
	(-0.41; 1.34)
Region (ref.: West)	
East	0.48
	(-0.03; 0.98)
Residence (ref.: Urban)	
Rural	0.40
	(0.01; 0.79)

Table A3: Hazard ratios and 95%-confidence intervals from piecewise-constant hazard models

Variables	Total	Females	Males	Cohort<1970	Cohort>=1970
Envir. Conc. (ref.: No/Some)					
Big concerns	0.92	0.96	0.87	0.73	0.98
	(0.82; 1.04)	*(0.83; 1.11)*	*(0.72; 1.05)*	*(0.57; 0.94)*	*(0.85; 1.12)*
Gender (ref.: Females)					
Males	0.63	-	-	0.73	0.60
	(0.56; 0.70)			*(0.58; 0.93)*	*(0.53; 0.69)*
Educational Level (ref.: Middle Vocational)					
In School	0.53	0.54	0.34	<0.01	0.49
	(0.25; 1.13)	*(0.24; 1.23)*	*(0.05; 2.47)*	*(<0.01; <0.01)*	*(0.23; 1.06)*
Inadequately	2.44	2.97	2.04	1.87	2.43
	(1.56; 3.81)	*(1.66; 5.32)*	*(0.99; 4.21)*	*(0.90; 3.90)*	*(1.34; 4.41)*
General Elementary	1.46	1.41	1.59	1.29	1.52
	(1.23; 1.74)	*(1.13; 1.77)*	*(1.22; 2.06)*	*(0.90; 1.85)*	*(1.25; 1.85)*
Vocational + High School	0.84	0.91	0.70	0.68	0.87
	(0.67; 1.04)	*(0.70; 1.20)*	*(0.48; 1.01)*	*(0.44; 1.05)*	*(0.68; 1.12)*
Higher Vocational	0.94	0.98	0.90	1.15	0.95
	(0.73; 1.21)	*(0.73; 1.32)*	*(0.58; 1.40)*	*(0.74; 1.79)*	*(0.69; 1.30)*
Higher Education	1.05	0.97	1.11	0.92	0.98
	(0.90; 1.23)	*(0.79; 1.19)*	*(0.88; 1.42)*	*(0.62; 1.36)*	*(0.83; 1.15)*
Civil Status (ref.: Single)					
Cohabited	3.47	2.92	4.26	2.41	3.78
	(3.02; 3.99)	*(2.45; 3.47)*	*(3.43; 5.29)*	*(1.71; 3.40)*	*(3.24; 4.41)*
Married	7.50	6.70	8.78	5.19	8.78
	(6.38; 8.81)	*(5.48; 8.20)*	*(6.82; 11.30)*	*(3.79; 7.11)*	*(7.30; 10.56)*
Divorced/Widowed	1.73	1.87	1.04	1.13	2.61
	(0.90; 3.30)	*(0.93; 3.78)*	*(0.14; 7.71)*	*(0.48; 2.66)*	*(1.12; 6.09)*
Income (log)	1.70	1.64	1.79	2.03	1.64
	(1.55; 1.86)	*(1.47; 1.84)*	*(1.53; 2.09)*	*(1.61; 2.55)*	*(1.49; 1.81)*
Region (ref.: West)					
East	1.50	1.52	1.50	0.88	1.61
	(1.30; 1.73)	*(1.27; 1.82)*	*(1.19; 1.88)*	*(0.10; 7.72)*	*(1.39; 1.86)*
Residence (ref.: Urban)					
Rural	1.10	1.20	0.95	1.13	1.11
	(0.96; 1.25)	*(1.03; 1.41)*	*(0.78; 1.17)*	*(0.85; 1.48)*	*(0.96; 1.28)*

Note: Estimates of birth year not shown here due to visualization purposes; estimates available on request

Table A4: Coefficients and 95%-confidence intervals from fixed-effects logit models on major environmental concerns

Variable	M1	M2
Parental Status (ref.: No Parent)		
Parenthood	-0.39	-0.05
	(-0.71; -0.07)	*(-0.17; 0.06)*
Age (in years)	-0.07	-0.06
	(-0.09; -0.05)	*(-0.08; -0.04)*
Educational Level (ref.: Middle Vocational)		
In School	0.03	0.07
	(-0.16; 0.22)	*(-0.12; 0.26)*
Inadequately	-0.13	-0.09
	(-0.54; -0.28)	*(-0.50; -0.31)*
General Elementary	0.05	0.07
	(-0.07; 0.17)	*(-0.05; 0.19)*
Vocational + High School	-0.12	-0.15
	(-0.30; 0.06)	*(-0.32; 0.03)*
Higher Vocational	-0.42	-0.44
	(-0.62; -0.23)	*(-0.64; -0.25)*
Higher Education	-0.50	-0.54
	(-0.64; -0.36)	*(-0.69; -0.40)*
Observation Year (ref.: 2000-2004)		
1985-1989	0.88	0.91
	(0.57; 1.19)	*(0.60; 1.22)*
1990-1994	1.17	1.19
	(0.96; 1.39)	*(0.97; 1.40)*
1995-1999	0.42	0.42
	(0.29; 0.56)	*(0.29; 0.56)*
2005-2009	0.71	0.71
	(0.57; 0.85)	*(0.58; 0.85)*
2010-2014	0.96	0.98
	(0.75; 1.18)	*(0.76; 1.20)*
2015-2020	1.46	1.49
	(1.14; 1.77)	*(1.18; 1.80)*
Region (ref.: West)		
East	-0.28	-0.28
	(-0.49; -0.07)	*(-0.49; -0.07)*
Residence (ref.: Urban)		
Rural	0.29	0.30
	(0.14; 0.45)	*(0.15; 0.46)*
Parental Status#Age	0.01	
	(<0.01; 0.02)	
Parental Status#Gender		0.20
		(0.05; 0.34)

Table A5: Coefficients and 95%-confidence intervals from fixed-effects logit models on major environmental concerns (age at first childbirth)

Variable	Estimates
Age at First Childbirth#Age (ref.: Under 25)	
Under 25	-0.05
	(-0.07; -0.03)
25- under 30	-0.06
	(-0.08; -0.04)
30- under 35	-0.07
	(-0.09; -0.04)
35- under 40	-0.06
	(-0.08; -0.03)
Childless by Age 40	-0.07
	(-0.09; -0.05)
Educational Level (ref.: Middle Vocational)	
In School	0.07
	(-0.12; 0.25)
Inadequately	-0.08
	(-0.49; 0.33)
General Elementary	0.07
	(-0.05; 0.20)
Vocational + High School	-0.13
	(-0.31; 0.05)
Higher Vocational	-0.42
	(-0.62; -0.22)
Higher Education	-0.49
	(-0.64; -0.35)
Observation Year (ref.: 2000-2004)	
1985-1989	0.91
	(0.60; 1.22)
1990-1994	1.19
	(0.97; 1.41)
1995-1999	0.42
	(0.29; 0.56)
2005-2009	0.71
	(0.58; 0.85)
2010-2014	0.98
	(0.76; 1.20)
2015-2020	1.49
	(1.18; 1.80)
Region (ref.: West)	
East	-0.28
	(-0.49; -0.07)
Residence (ref.: Urban)	
Rural	0.30
	(0.15; 0.46)

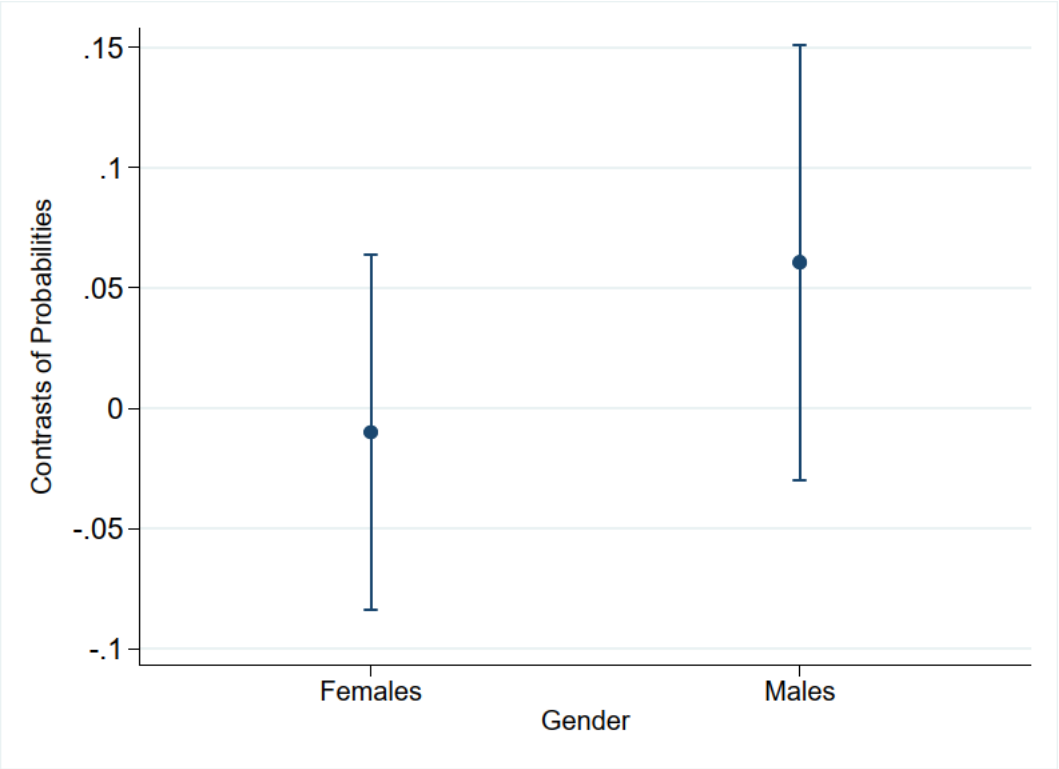

Figure A1: Contrast of margins (major concerns vs. no/some concerns, by gender)
Note: Logit models; controlled for highest educational level, civil status, type of residence, and region marginal effects calculated from logit models (question #1a)

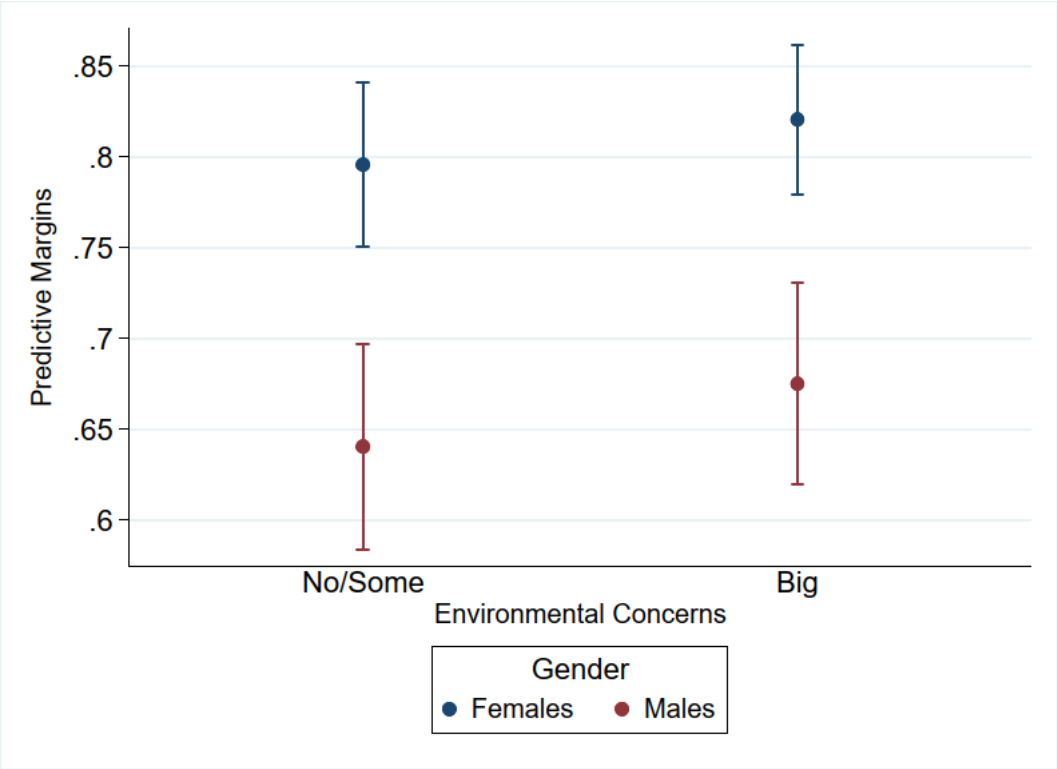

Figure A2: Impact of environmental concerns on parenthood by age 40
Note: Logit models; controlled for highest educational level, civil status, type of residence, and region; mode of environmental concerns between 20-25 and then binary coded.

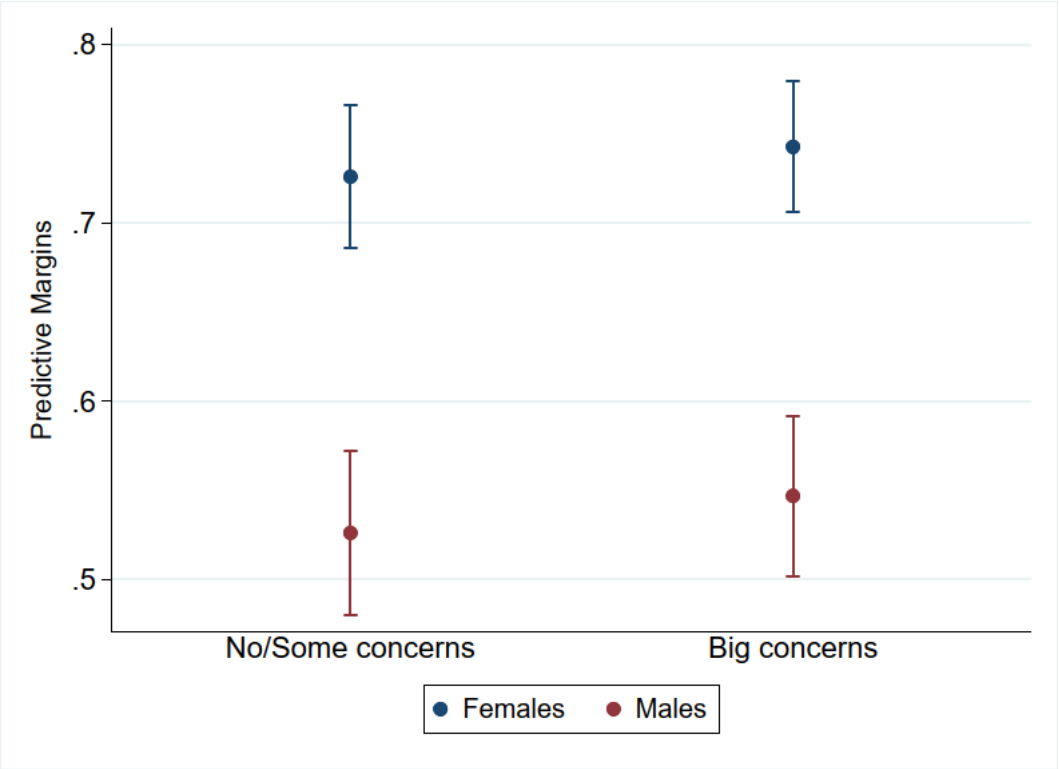

Figure A3: Impact of environmental concerns on parenthood by age 35
Note: Logit models; controlled for highest educational level, civil status, type of residence, and region; mode of environmental concerns between 16-23 and then binary coded.

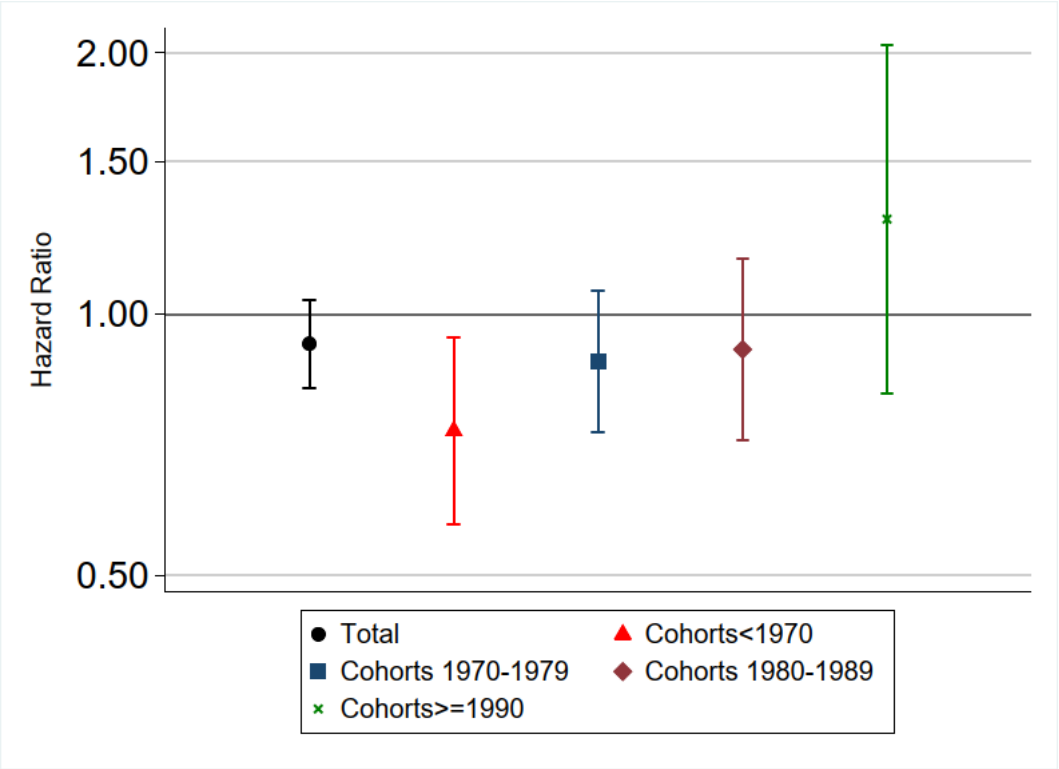

Figure A4: Impact of major environmental concerns on fertility by more stratified birth cohort groups
Note: Piecewise-constant hazard models; controlled for gender, highest educational level (lagged), civil status (lagged), income (lagged), type of residence, and region; total sample controls for birth year, additionally; environmental concerns included as a lagged dummy variable

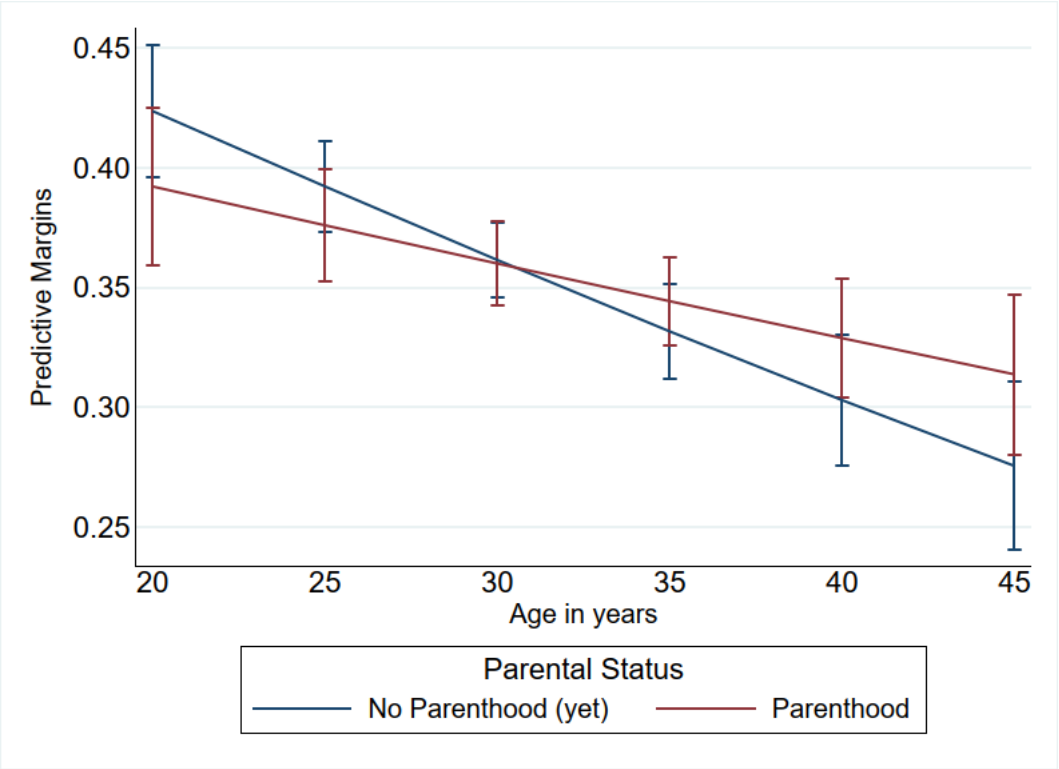

Figure A5: Trajectory probability of major environmental concerns by parental status
Note: Random-effects logit models; controlled for gender, educational level, calendar year, type of residence, and region

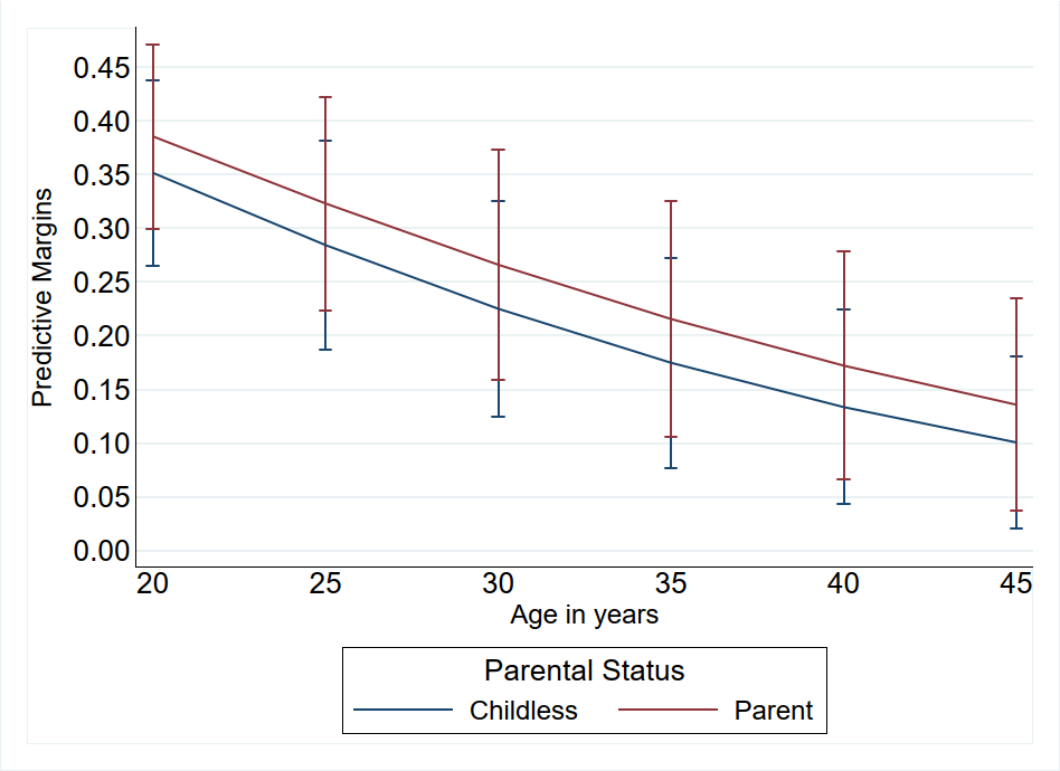

Figure A6: Trajectory probability of major environmental concerns by parental status (childless vs. parents by age 40)
Note: Fixed-effects logit models; controlled for educational level, calendar year, type of residence, and region

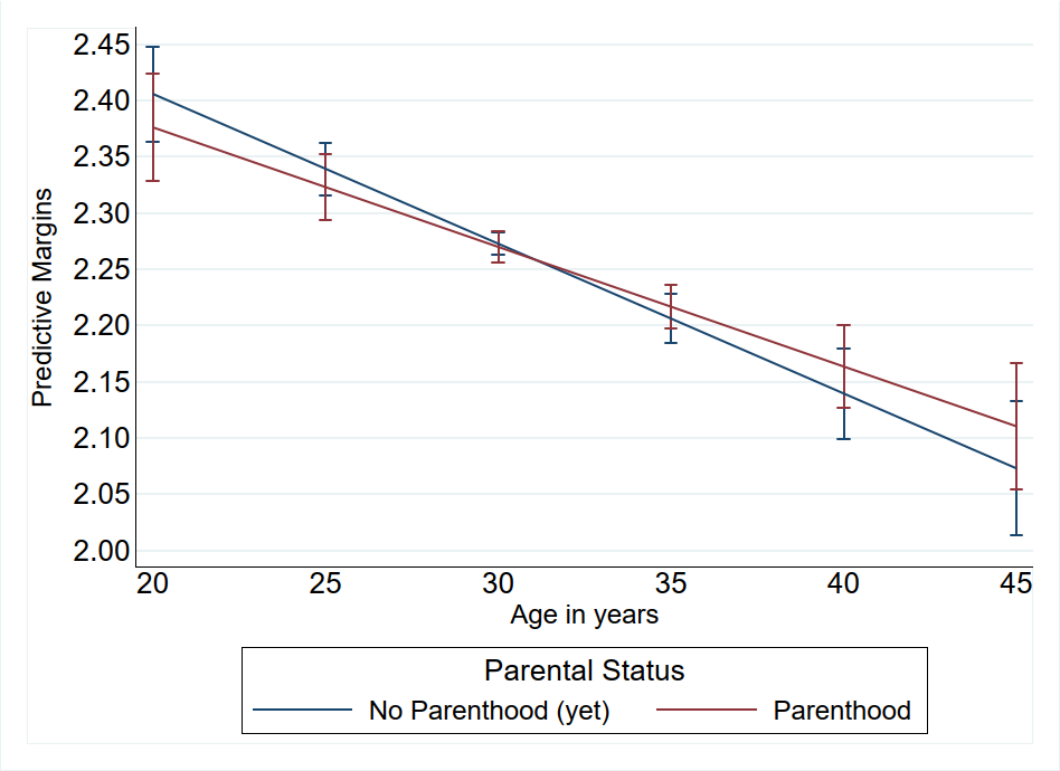

Figure A7: Environmental concerns (3 categories, treated as continuous measure)
Note: Fixed-effects linear regression models; controlled for educational level, calendar year, type of residence, and region

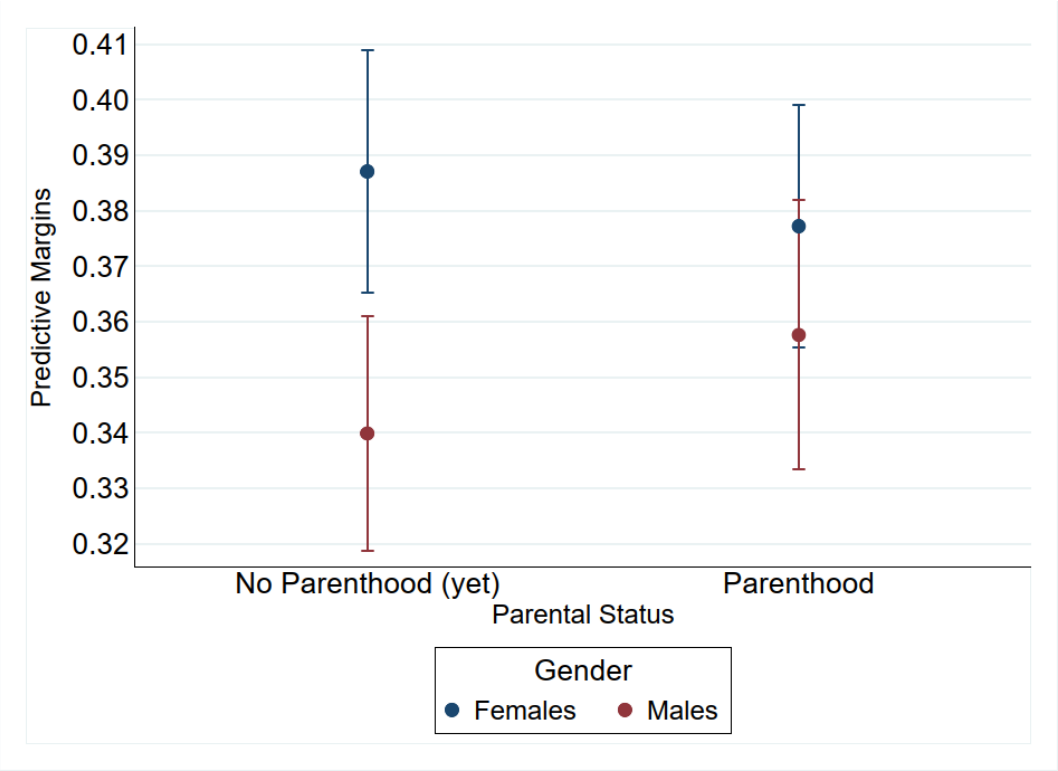

Figure A8: Probability of major environmental concerns by parental status and gender
Note: Random-effects logit models; controlled for age, educational level, calendar year, type of residence, and region

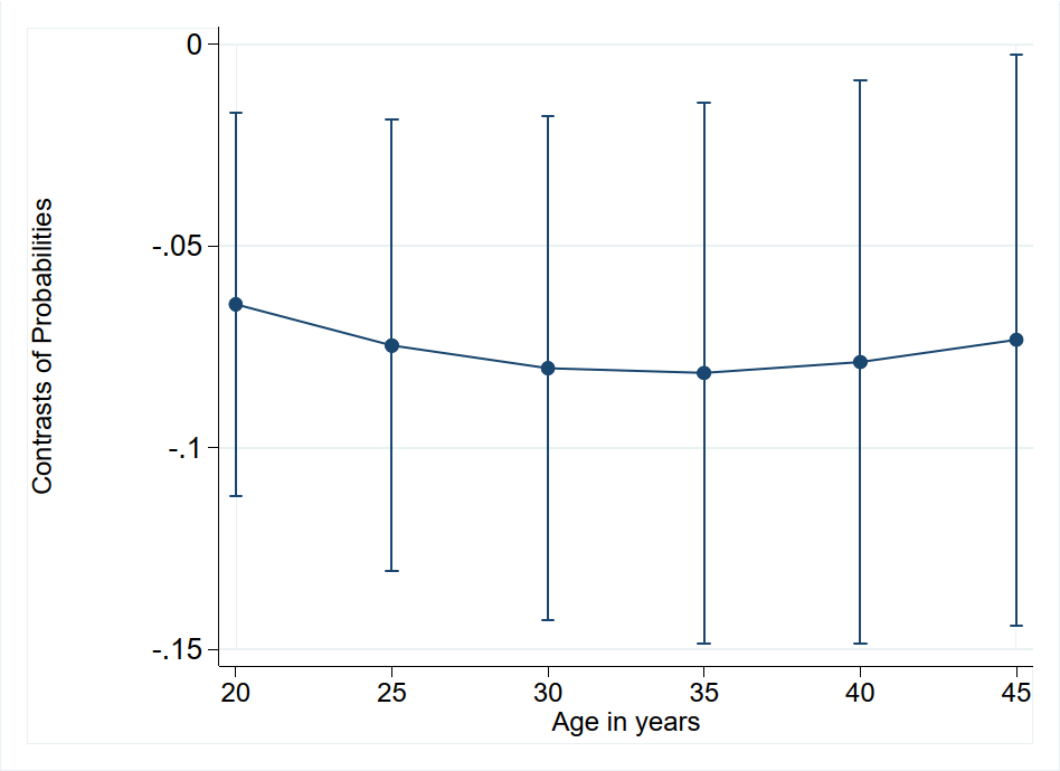

Figure A9: Contrast of margins (first childbirth by age 25 vs. childless by age 40)
Note: Fixed-effects logit models; controlled for age, educational level, calendar year, type of residence, and region

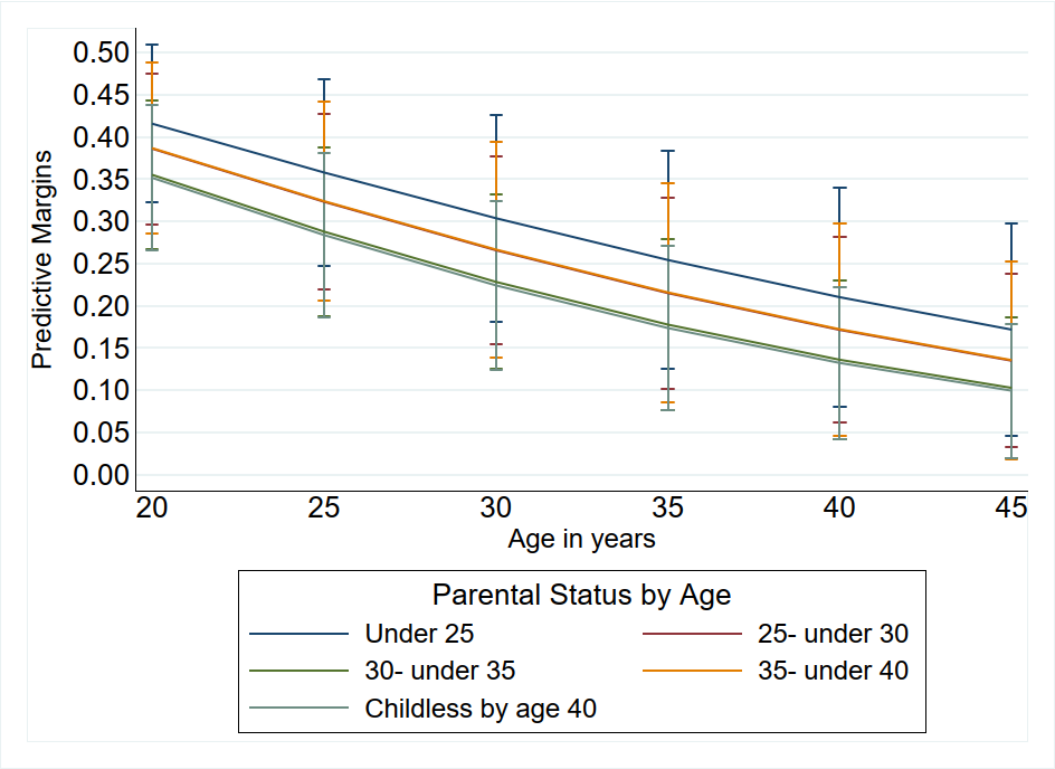

Figure A10: Trajectory probability of major environmental concerns by age at first childbirth
Note: Fixed-effects logit models; controlled for age, educational level, calendar year, type of residence, and region

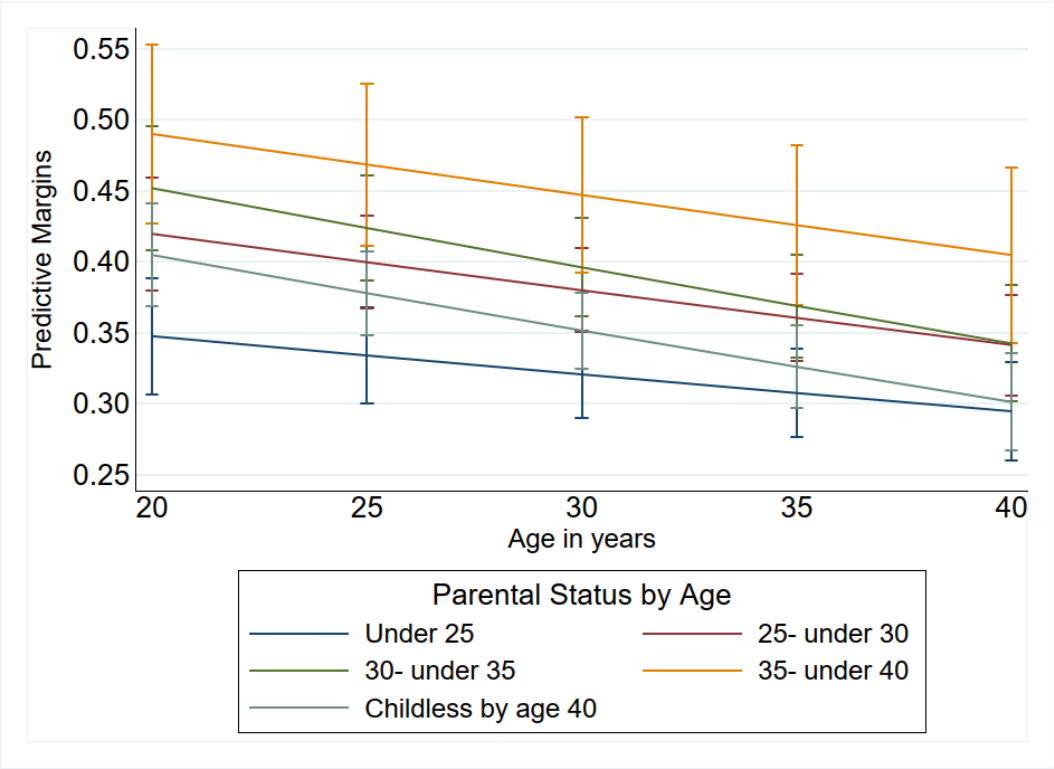

Figure A11: Trajectory probability of major environmental concerns by age at first childbirth
Note: Random-effects logit models; controlled for age, gender, educational level, calendar year, type of residence, and region

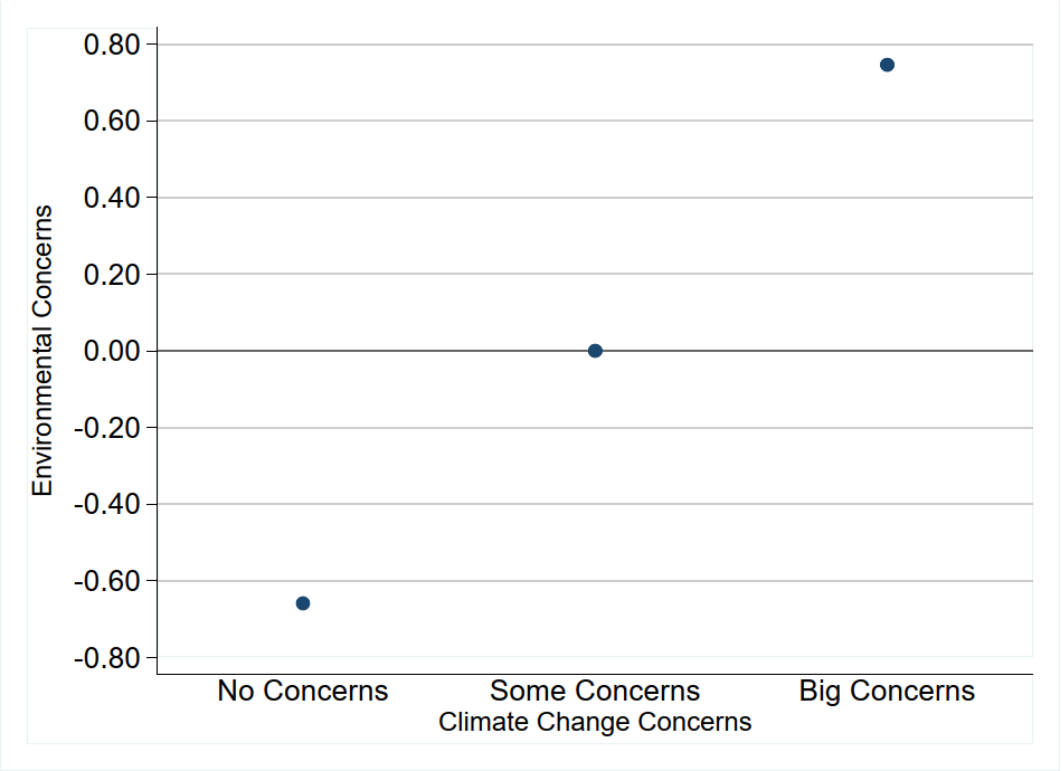

Figure A12: Regression coefficients of climate change concerns on environmental concerns
Note: Linear regression models, no control variables

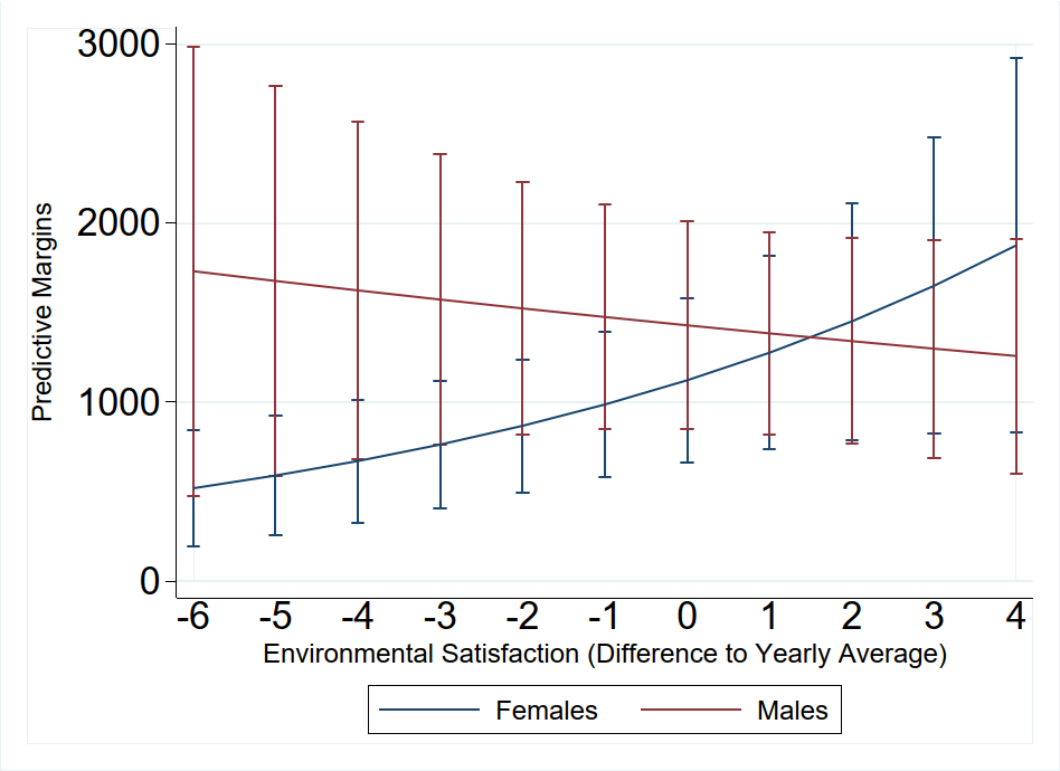

Figure A13: Environmental satisfaction and fertility by gender