I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17795

For the Future of Our Grandchildren: Grandparenthood and Climate Change Concerns

Lieke Voorintholt
Gerard J. van den Berg
Adriaan R. Soetevent

MARCH 2025

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 17795

For the Future of Our Grandchildren: Grandparenthood and Climate Change Concerns

Lieke Voorintholt
University of Groningen

Gerard J. van den Berg
University of Groningen, University Medical Center Groningen and IZA

Adriaan R. Soetevent
University of Groningen

MARCH 2025

ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

For the Future of Our Grandchildren: Grandparenthood and Climate Change Concerns*

Concerns about offspring's life quality are often cited as a motivation for caring about climate change. This paper investigates the hypothesized causal effect of grandparenthood on climate change worries, using panel data surveys among British families. Specifically, we study whether becoming a grandparent increases these worries. We employ two different study designs to deal with endogeneity of grandparenthood. The assumptions required to identify causal effects differ and are non-nested. However, results based on the two approaches are remarkably congruent. We find no empirical support for a relationship between grandparental status and concerns about climate change.

JEL Classification: D64, J13, Q51

Keywords: global warming, intergenerational altruism, offspring, anticipation, future climate

Corresponding author:
Lieke Voorintholt
Faculty of Economics and Business
Nettelbosje 2, 9747
AE Groningen
The Netherlands
E-mail: l.voorintholt@rug.nl

* We thank Viola Angelini, Lavinia Kinne, Alynda Kok, Giulio Zanella, and the participants at the 6th International Conference on European Economics and Politics and a PhD conference in Groningen for helpful comments and suggestions. We also thank Giulio Zanella for kindly providing us with the data and code of his study.

1 Introduction

In recent years, grandparental climate activist groups and initiatives have emerged worldwide. These groups, consisting of grandparents who are concerned about the world they will leave behind for their grandchildren, advocate for urgent action on climate change.[1] Similarly, reports, books, and speeches frequently refer to "the future of our children and grandchildren" to highlight the importance of addressing climate change (e.g., United Nations Development Programme, 2008; Hansen, 2009; Macron, 2018). Yet, it has never been studied whether becoming a grandparent actually increases climate change concerns.

The intergenerational appeal makes intuitive sense, as younger citizens will experience more adverse effects of climate change than older generations (Thiery et al., 2021). While existing research suggests that older individuals believe less in climate change and are less concerned about it than the young and middle-aged (Andor, Schmidt, and Sommer, 2018; Geys, Heggedal, and Sørensen, 2020; Milfont, Zubielevitch, Milojev, and Sibley, 2021), a change in grandparental status may impact the initial attitudes, for instance, through a channel of intergenerational altruism (Galperti and Strulovici, 2017).

The present paper examines grandparenthood as a determinant of climate change worries. We use survey data from the UK Understanding Society survey (University of Essex; Institute for Social and Economic Research, 2023), which is a representative longitudinal study of a large sample of households. Our outcome variable is respondents' agreement with the statement that the effects of climate change are too far in the future to worry them. The corresponding survey question was included in the 2012-2014 and the 2018-2020 wave.[2] From the respondents who answered both questions, we select those aged 40-79 years with a child who is at least fourteen years old.

To identify a causal effect we need to address selectivity of grandparental status due to unobserved confounders. For example, a family in which discounting is high may display a lack of climate change worries as well as a high fertility rate. To proceed, we employ two different approaches that rely on different and non-nested assumptions.

First, we use the sex of an individual's first child as an instrumental variable (IV) for grandparental status. The idea is that, on average, women have children at lower ages than men, so if the first child is female then at any age the parent is more likely to have at least one grandchild. Note that for all intents and purposes, the sex of the first child of the parent is random. The IV analysis requires an exclusion restriction to be valid, namely that the sex of the first child does not have a direct causal effect on climate change worries. Notice that the birth of the children usually took place long before climate change concerns became prevalent and that those concerns, if present, are only measured at grandparental ages when the children tend to already have left the grandparental household. The usage of the sex of the first child as an IV for grandparental status was

[1] Examples are Extinction Rebellion Grandparents, Elders Climate Action, and European Grandparents for Climate.

[2] Waves 4 and 10, respectively. Data collection for each wave took place over multiple years.

introduced by Rupert and Zanella (2018), in a study of the effect of grandparental status on old-age labor supply. It has recently become a rather popular IV; see e.g. Backhaus and Barslund (2021) for another study on old-age labor supply and Eibich and Zai (2024) for usage in a study of the effect of grandparental childcare provision on health.

The second empirical approach employs a fixed effects (FE) panel data model. This effectively exploits within-individual variation over time in having grandchildren. More specifically, it exploits variation in becoming a grandparent in the six years in-between the two relevant waves of the panel, while absorbing time-invariant unobserved individual heterogeneity. Since becoming a grandparent depends on the decisions of individuals' children rather than their own decisions, conditional exogeneity is more likely to be satisfied than in studies on parenthood and environmental attitudes (Thomas, Fisher, Whitmarsh, Milfont, and Poortinga, 2017; Milfont, Poortinga, and Sibley, 2020).

The two approaches require different sets of assumptions and exploit different data features. IV essentially identifies an average effect in a subpopulation: the local average treatment effect (LATE) among the so-called compliers; that is, among those for whom a switch in the sex of the first child from male to female unambiguously leads to a switch from zero to at least one grandchild at the time of the survey interview in which the climate change question was asked. As this feature is based on a counterfactual outcome, the corresponding subpopulation is not straightforwardly identified, and the IV results do not necessarily generalize to families where the sex of the first child does not affect his or her fertility decisions. By contrast, FE approaches essentially identify an average treatment effect on the treated within the relevant observation window. This is a more straightforwardly understood subpopulation; however, this comes at a cost, namely the necessity to adopt the restrictive and unjustifiable assumption that unobserved confounders are additive to the grandparental status and other covariates, in their effects on the outcome. In addition, it requires that secular changes in-between the two waves are identical in the population.

Because of the complementarity of the two approaches, findings that are in mutual agreement lend credence to the conclusions derived from those findings. Moreover, triangulating the results from both approaches is informative on the methodological value of either of the approaches.[3]

As it turns out, the results based on the two approaches are remarkably congruent in that they both lead to the conclusion that there is no effect of grandparenthood on climate change worries. The observed cross-sectional association between being a grandparent and having climate change worries is somewhat negative but this does not translate into a causal effect that differs from zero. The analyses do confirm that the sex of the first child affects the grandparental status (i.e., the IV is informative). Indeed, the results of the first

[3]For example, a strong mutual agreement confirms that the sex of the first child can be a useful source of instrumental variation in grandparental status at any advanced age. Moreover, common results for IV and FE analyses allow for an extrapolation of effects among compliers in the IV setting to other segments of the population.

stage of the IV approach are close to those in Rupert and Zanella (2018) and Backhaus and Barslund (2021).

Our study fits into the literature on the effects of representation within the family on individual behavior. Notably, Washington (2008) and Borrell-Porta, Costa-Font, and Philipp (2019) find that the parenting of daughters can influence fathers' norms and behaviors toward less traditional gender roles. Ronchi and Smith (2024) show that following the birth of a manager's first daughter, women's earnings and employment increase. Research in political economics established that electorate age is associated with spending priorities (e.g., Cattaneo and Wolter, 2009; Rattsø and Sørensen, 2010). Using Swiss data, Cattaneo and Wolter (2009) show that people with younger children have a higher willingness to raise education expenditures, whilst the effect of electorate age remains even when controlling for parental status. Similarly, Rattsø and Sørensen (2010) find that Norwegian young and middle-aged voters are more in favor of increased expenditures on child care and schooling when having children, but do not comparably prioritize old-age care when having elderly family members in the community.

Research on the specific relationship between family representation and climate change attitudes is limited to the effect of parenthood and parenting. Thomas et al. (2017) and Milfont et al. (2020) estimate the effect of becoming a parent on environmental attitudes and behaviors using a fixed effects model applied to survey data from the UK Household Longitudinal Study (Understanding Society) and the New Zealand Attitudes and Values Study, respectively. Their findings do not indicate a clear effect of parenthood on environmentalism, but their analysis may suffer from the endogeneity of parenthood that remains undiscussed. Gazmararian (2024) uses American panel data to study the effect of becoming a parent on climate policy preferences and concludes that parenthood increases climate policy support by, among other things, lengthening time horizons.

Lawson et al. (2019) set up a field experiment in a US middle school and find that – especially male and conservative – parents increase their climate change concerns following a child-to-parent educational intervention.[4] Jaime, Salazar, Alpizar, and Carlsson (2023) find no effect on the behavior of parents of fourth-grade children in Chile following an educational program on the consumption and disposal of plastics. Other experimental studies show that, respectively, priming death or activating legacy concerns boosts individuals' intergenerational or farmers' environmental decisions (Wade-Benzoni, Tost, Hernandez, and Larrick, 2012; Grolleau, Mzoughi, Napoléone, and Pellegrin, 2020). More specifically, Palomo-Vélez, Buczny, and Van Vugt (2020) find that prompting participants to think about the environmental impact on their children results in greater pro-environmental intentions compared to participants who were prompted to think about the impact on the planet. They attribute this effect to the activation of a parental care motive.

Clearly, our study extends this literature by determining the effect of grandparenthood (rather than parenthood) on climate change worries, as well as by

[4] A climate change curriculum specifically designed for intergenerational learning, consisting of multiple classroom activities, a local service-learning project, and an interview with parents.

examining the various approaches for causal inference. Given the ageing population and the low level of climate change concerns among the current elderly population (Andor et al., 2018), it is important to explore how important life events in old age, such as becoming a grandparent, influence these concerns. Our main finding is relevant for the study of kinship-related primes on environmental attitudes (Wade-Benzoni et al., 2012; Palomo-Vélez et al., 2020; Gazmararian, 2024). Furthermore, our research adds to the literature on grandparenthood, which currently does not consider the effect of being or becoming a grandparent on individuals' perspectives on global and intergenerational issues (Hank, Cavrini, Di Gessa, and Tomassini, 2018).

The remainder of the paper is structured as follows. Section 2 presents our data including some descriptive statistics, while Section 3 discusses our two empirical strategies. Section 4 shows the results and includes additional findings to place them in context. Section 5 evaluates the results and concludes.

2 Data

We use panel data from Understanding Society, the "UK Household Longitudinal Study" (University of Essex; Institute for Social and Economic Research, 2023). Starting from 2009, this study samples around 40,000 households representative of the UK population. Tracking them for as long as possible, it surveys the household members on characteristics including demographics, attitudes, and behavior.[5] Understanding Society is one of the very few representative survey datasets that contain individual-level information on grandparenthood as well as climate change concerns.[6]

We derive our outcome from a unique question in this survey where respondents are asked how much they agree with the statement: "The effects of climate change are too far in the future to really worry me." Answer options range from 1 (*totally agree*) to 5 (*totally disagree*). For ease of reference, we will denote this as the "climate change worries" score, with a higher score indicating a higher worry level. The question appeared in rotating "self-completion" modules in waves 4 and 10 with respective data collection in the years 2012-2014 and 2018-2020.

Our indicator for grandparenthood is primarily based on a question in the individual questionnaire that asks respondents whether they have grandchildren living outside the household. Since this question is only included in oddly numbered waves, we combine the information from waves 3 and 5 and from waves 9 and 11 to determine grandparental status in waves 4 and 10, respectively.[7] Additionally, we use a data file

[5]Understanding Society is the successor of the British Household Panel Survey. For more information on the study, see www.understandingsociety.ac.uk.

[6]The German Socio-Economic Panel (SOEP) similarly includes two waves with both types of information. Since the SOEP's sample size per wave is smaller and the range of its measurement of climate change concern is narrower, the SOEP data offers insufficient variation that we can exploit to answer our research question.

[7]We have to drop the observations of respondents whose grandparental status changes between waves 3 and 5 and between waves 9 and 11, since in those cases the status during waves 4 and 10 is unclear.

with all household members to filter out the grandparents who live in the same household as any of their grandchildren (<50 observations in our estimation sample). Finally, we use so-called "natural children" data files that contain information on the sex and birth year of the respondents' children to construct our instrumental variable about the sex of the respondent's first child.

Our estimation sample consists of respondents aged 40-79 years[8] who are the parents of a child of at least fourteen years old in wave 4. To end up with a balanced panel, we exclude respondents with missing values for any of the variables in our main specifications in waves 4 or 10. Less than 0.01% of respondents who face the climate change worry question in wave 4 or 10 answer "don't know", refuse to answer, or have missing values for other reasons.[9] Finally, we omit the 65 respondents who report being a grandparent in wave 4 but not in wave 10, as it is unclear whether this is a measurement error or implies the loss of all grandchildren, an effect we do not wish to capture in our estimates. Note that due to these restrictions, the no-grandparent group can be interpreted as potential grandparents, implying that they can still become grandparents in the waves to come.

Table 1 reports summary statistics of the complete estimation sample of 6216 individuals split by grandparental status per wave. 562 respondents became grandparents between waves 4 and 10. Still, the differences in the reported demographics and household characteristics between the grandparent and no-grandparent groups remain similar across both waves. Because UKHLS is a household survey, a large share (around 31%) of the estimation sample consists of respondents living in the same household as another member of the estimation sample.

[8]The choice of this age bracket matches existing literature on causal grandparenthood effects (e.g., Rupert and Zanella, 2018; Eibich and Zai, 2024).

[9]In contrast, the number of respondents with missing values because they do not face the corresponding survey question is much higher. Moreover, this number is unbalanced between the waves due to the gradual shift from face-to-face to web interviews between waves 4 and 10. Since the face-to-face interviews provided respondents with the choice to opt out of the self-completion part of the questionnaire (including the "climate change worries" question) and automatically excluded the self-completion part for proxy respondents, the number of missings is much higher in wave 4. As the contents of the self-completion part were not disclosed before answering, we have limited concerns about self-selection but still include interview mode dummies as controls to limit a potential bias.

Table 1: Selection of summary statistics and t-test results, split by wave

	Is grandparent in Wave 4			Is grandparent in Wave 10		
	No Mean (SD)	Yes Mean (SD)	Δ (t)	No Mean (SD)	Yes Mean (SD)	Δ (t)
Female	0.60	0.65	-0.05***	0.59	0.64	-0.05***
	(0.49)	(0.48)	(-4.08)	(0.49)	(0.48)	(-3.61)
Current age	52.75	62.46	-9.71***	57.97	67.51	-9.54***
	(7.55)	(7.20)	(-51.52)	(7.49)	(7.57)	(-47.06)
Age became parent	28.57	24.14	4.43***	28.91	24.57	4.34***
	(5.05)	(4.12)	(38.05)	(5.07)	(4.35)	(35.13)
Total nr. of children	2.04	2.50	-0.46***	1.96	2.48	-0.51***
	(0.87)	(1.00)	(-19.04)	(0.84)	(1.00)	(-20.13)
Highly educated	0.45	0.28	0.18***	0.48	0.30	0.18***
	(0.50)	(0.45)	(14.88)	(0.50)	(0.46)	(14.03)
White	0.91	0.97	-0.06***	0.90	0.97	-0.07***
	(0.29)	(0.17)	(-10.68)	(0.30)	(0.18)	(-11.21)
First child is female	0.46	0.52	-0.06***	0.46	0.51	-0.05***
	(0.50)	(0.50)	(-4.43)	(0.50)	(0.50)	(-3.84)
General health	3.46	3.20	0.25***	3.27	3.01	0.26***
	(1.07)	(1.08)	(9.22)	(1.02)	(1.03)	(9.50)
Cohabiting with spouse	0.66	0.69	-0.03**	0.65	0.66	-0.00
	(0.47)	(0.46)	(-2.64)	(0.48)	(0.48)	(-0.12)
Partner also in sample	0.25	0.37	-0.12***	0.22	0.35	-0.13***
	(0.43)	(0.48)	(-10.00)	(0.42)	(0.48)	(-10.72)
Is working	0.73	0.38	0.36***	0.65	0.26	0.39***
	(0.44)	(0.48)	(29.84)	(0.48)	(0.44)	(31.98)
Climate change worries	3.56	3.36	0.20***	3.87	3.60	0.27***
	(0.97)	(1.01)	(7.89)	(0.93)	(0.98)	(10.46)
Observations	2649	3567	6216	2087	4129	6216

Notes: Climate change worries and general health (self-reported) are measured on a scale from 1-5. Highly educated indicates whether the respondent has a higher degree at the moment of the interview (ranging from doctoral to higher national certificate) as opposed to reporting A-levels, GCSE, or other or no qualifications as their highest qualification. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Furthermore, the statistics in Table 1 show that the average current age of grandparents is almost ten years older than that of potential grandparents. Due to the higher life expectancy of females, this age gap is in line with the larger female majority in the grandparent group. Furthermore, the higher average age of the grandparent group means that they belong to older cohorts, which may correlate with factors such as educational attainment and fertility norms. Indeed, Table 1 highlights the differences between grandparents and potential grandparents in higher education, the age at which someone became a parent, and the total number of children. Importantly, these variables are potentially also direct predictors of grandparenthood, particularly through intergenerational fertility preferences and socioeconomic status. Therefore, differences in these factors between the two groups may be due to self-selection, which is why we use

identification strategies that address this.

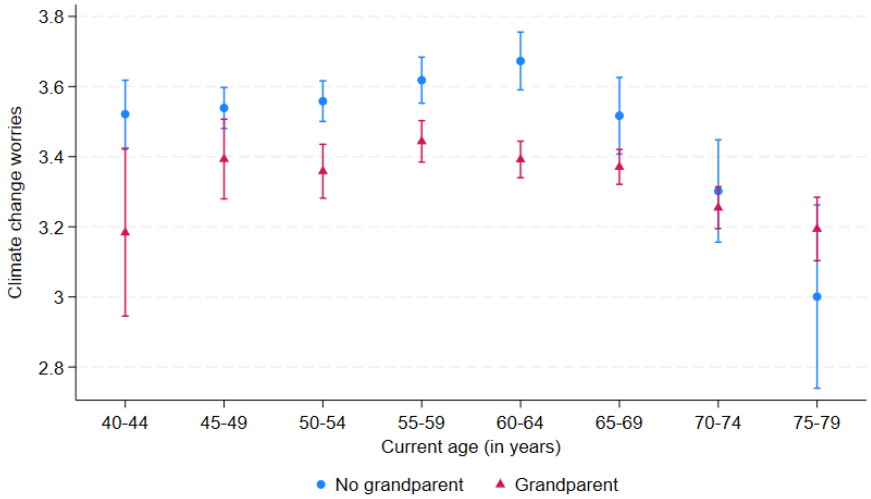

Figure 1: Average climate change worries at different age brackets for grandparents and non-grandparents in our estimation sample

Notes: Climate change worries are measured on a scale from 1 to 5. The average worry level per age bracket is based on a regression of climate change worries on the age bracket dummies, which includes two observations (six years apart) per respondent in our estimation sample. The regression takes into account wave fixed effects.

Figure 1 shows the average "climate change worries" score for each 5-year age bracket in our sample, split by grandparental status. Note that due to compositional changes in the two groups over time, Figure 1 is not suitable to show trends within a group. Instead, it provides an overview of the gross differences between the two groups at a given age interval. We see that for age brackets ranging from 50 to about 65 years, grandparenthood is associated with lower climate change worries (around 0.2 on a 5-point scale). This descriptive statistic does not seem in line with the presented hypothesis.

3 Empirical strategies

For expositional reasons, we start the discussion of empirical strategies with the FE panel data approach in Subsection 3.1. Next, in Subsection 3.2, we examine the IV approach. We repeat this ordering in the presentation of the results in the subsequent section.

3.1 FE strategy

The fixed effects panel data approach is based on the following regression specification:

$$Y_{it} = \delta_t + \beta \text{GP}_{it} + \gamma(\text{GP}_{it} \times d_i) + \theta \mathbf{x}_{it} + \chi_i + \varepsilon_{it}, \tag{1}$$

where Y_{it} is our outcome climate change worries (1-5),[10] δ_t are time fixed effects (a single dummy for wave 10 in our two-period setting), β estimates the effect of the grandparental

[10] As discussed later in the paper, we also estimate a model with climate change worries as a binary variable, yielding similar results.

status of individual i in wave t as measured by the binary indicator GP_{it}, γ captures heterogeneity in the effect of grandparenthood across a time-invariant characteristic d_i, θ is a vector of coefficient estimates for the set of relevant time-variant variables $\mathbf{x}_{it}$, χ_i are individual fixed effects, and ε_{it} are errors clustered at the individual level.[11]

The specification allows for some heterogeneity in the treatment effect by way of the γ parameters. The most basic version does not include an interaction effect, so $d_i \equiv 1$. Next, we take d_i to be a binary indicator for the sex of the potential grandparent (male=1). As the observed gap in climate change worries between male and female respondents may be driven by gendered social norms and psychological factors, their response to grandparenthood events could be as well. Moreover, both Rupert and Zanella (2018) and Backhaus and Barslund (2021) find a gender-specific labor supply response following grandparenthood. Next, we take d_i to be a binary indicator for membership of a recent birth cohort. This is motivated by the age variation observed in the literature and our sample and the potentially heterogeneous effect of grandparenthood by remaining life expectancy. We define *older* as the older half of our sample of incoming grandparents based on their birth year.[12]

This simple identification strategy exploits the panel dimension of our dataset. As noted in Section 1, key assumptions are that unobserved confounders χ_i act additively on the outcome variable and that the calendar time trend as represented by δ_t is common across individuals. In addition, we need to assume that there are no relevant omitted time-varying covariates, i.e. that there are no unobservable time-varying factors correlated with both grandparental status and climate change worries. Though we can control for a relevant observable such as personal health, which is included in $\mathbf{x}_{it}$, a possible unobserved factor could be the general anxiety level of a potential grandparent and their child, the potential parent. If this level remains constant over time in the observation window then the FE estimates are not affected.

3.2 IV strategy

As noted in Section 1, and as inspired by Rupert and Zanella (2018), we instrument respondents' grandparental status with the sex of their first child. In the UK in the 20th century, the sex of the first child was plausibly random and unlikely to directly affect worries about climate change. At the same time, it predicts the likelihood of being a grandparent at any given age via a timing mechanism. There is an approximate three-year gap in the age of becoming a father and becoming a mother in England and Wales (Office for National Statistics, 2022). Table A4 also shows significant differences between males and females in the age of becoming a first-time parent among the generations of

[11] We do expect correlation across couples, but decide to cluster on the smallest possible level. The errors are nearly identical when clustering on the household level (see Appendix A.1).

[12] The median birth year of the group of respondents becoming a grandparent in-between waves 4 and 10 is 1957. Therefore, *older* refers to the group of respondents born between 1939 and 1956 ($d_i = 1$), in contrast to the younger group born between 1957 and 1972 ($d_i = 0$).

potential grandparents in our dataset.[13] As a result, parents of first-born daughters are expected to become grandparents at an earlier age than parents of first-born sons.

The outcome equation is now specified as

$$Y_{it} = \delta_t + \beta \mathrm{GP}_{it} + \gamma \mathrm{Age}_{it} + \theta \mathbf{x}_{it} + \varepsilon_{it}, \tag{2}$$

where the only change relative to our FE model of Equation (1) is the deletion of the individual fixed effects χ_i and the interaction term $(\mathrm{GP}_{it} \times \mathrm{d}_i)$ and the addition of $\gamma \mathrm{Age}_{it}$. Age_{it} contains a set of age dummies, which flexibly controls for cohort and age effects, and needs to be included to exploit the timing channel of our instrument. The vector with controls $\mathbf{x}_{it}$ now not only includes time-varying variables, but also the age when the individual had their first child, and dummies for female, white, and having a higher education degree. We estimate our model using two-stage least squares (2SLS).

Grandparenthood GP_{it} is instrumented by the time-invariant z_i:

$$z_i = \begin{cases} 1 & \text{if the first child of individual } i \text{ is female,} \\ 0 & \text{if the first child of individual } i \text{ is male.} \end{cases}$$

In the remainder of this section, we discuss the conditions for the validity of z_i as an IV, namely instrument relevance and the exclusion restriction. To begin, Table 2 presents first-stage estimates of the effect of the instrument z_i on grandparental status GP_{it}.[14] The significant positive coefficients indicate that having a first-born daughter increases the probability of being a grandparent at any age by, on average, around 5 percentage points. The corresponding F-statistics suggest that the instrument is sufficiently strong.[15] Though the standard errors have approximately the same size as those reported by Rupert and Zanella (2018) and Backhaus and Barslund (2021), the coefficients are, especially for the model with controls, smaller than theirs. Table A7 in Appendix A.2 shows that the first-stage estimates split by wave vary more than the pooled estimates.

Notice that the IV approach as well as the FE approach restrict attention to the population of potential grandparents who do have children, so elderly individuals without children are not in the control group and are excluded from the samples we use. Next, Figure 2 shows that the fraction of grandparents at any given age is higher among respondents whose first child was a daughter compared to those who had a son. This effect spans the entire age range of our sample, suggesting that the mechanism through which our instrument influences grandparenthood is robust and satisfies the monotonicity assumption.

[13] This pattern seems relatively constant over time based on some older cohorts of respondents. The younger cohorts' statistics are, by construction, only based on relatively young parents and are therefore not suitable to determine the overall trend in the timing of parenthood (gaps).

[14] As an exception, we report three decimal places in Tables 2 and 3 since the third decimal place is particularly relevant.

[15] Estimated Anderson-Rubin confidence intervals for the effect of interest are comparable to conventional intervals, further limiting weak instrument concerns.

Table 2: First-stage estimates

	Is grandparent	
	(1)	(2)
First child is female	0.054***	0.048***
	(0.010)	(0.008)
Controls	No	Yes
F excl. instrument	31.51	35.03
Observations	12432	12432

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

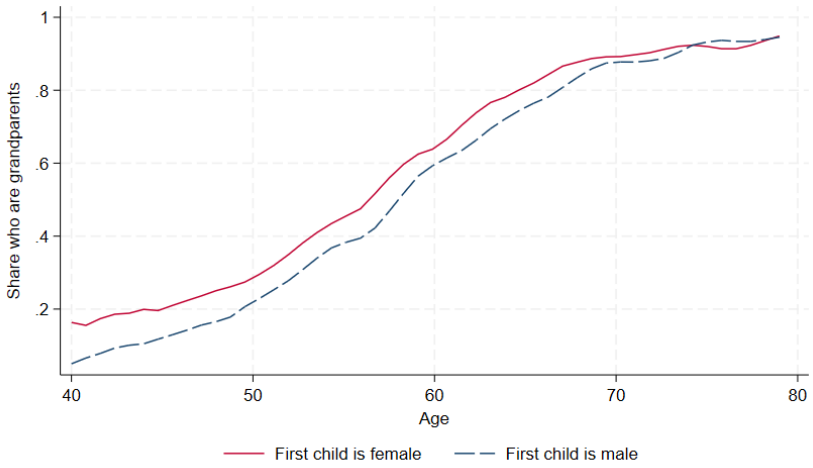

Figure 2: Share of individuals who are grandparents at a given age, by sex of first child

We now turn towards a discussion of the exclusion restriction that the candidate instrument should satisfy. One identifying assumption is that the sex of one's first child does not influence climate change worries through some other channel than the timing of grandparenthood or some joint determinant. To obtain some feeling for the relation between the instrument and individual characteristics, we regress respondent-specific average values of nine potentially relevant characteristics on the indicator for having a female first child (FC female) and present the results in Table 3. None of the characteristics female, white, age became a parent, number of children, living with a spouse, health status, being highly educated, mental wellbeing score, and being born in the UK are significantly related ($\alpha = 0.10$) to our instrument.

Table 3: Relation between instrument and individual characteristics

	Female	White	Age bec. par.	Nr. kids	
FC female	-0.005	0.009	-0.151	0.009	
	(0.012)	(0.006)	(0.128)	(0.025)	
	Spouse HH	Health	High educ.	SWEMWBS	UK born
FC female	-0.006	0.017	-0.018	0.002	-0.004
	(0.011)	(0.024)	(0.012)	(0.097)	(0.007)
N	6216	6216	6216	6216	6176

Notes: The estimates are based on regression of respondent-specific average values from waves 4 and 10. Self-reported general health status ranges from 1 (poor) to 5 (excellent). SCWEMWBS stands for the Short Warwick-Edinburgh Mental Wellbeing Scale, which is a validated measure of mental wellbeing ranging from 1 to 35. Age became parent and total number of kids are discrete numbers, whereas all remaining outcomes are binary.

Next, we zoom in on the relationship between the sex of the first child and the age of becoming a parent for the first time, which is negative on average but insignificant in Table 3. Figure A1 illustrates that a potentially negative relationship is driven by a low fraction of first-born girls among respondents becoming a parent in their early thirties. Specifically, the sex ratio of newborns displays an outlier at the parental age of 33. This outlier is actually visible both in the subsample of fathers and in the subsample of mothers although among mothers the fraction is already low at age 30. Life science studies suggest that parental age does not biologically influence the child sex ratio to any substantial extent (e.g., Ein-Mor, Mankuta, Hochner-Celnikier, Hurwitz, and Haimov-Kochman, 2010; Rueness, Vatten, and Eskild, 2011). Usually, a Bernoulli distribution is assumed for sex of the first child, with a mean of around 0.48. Meanwhile, the estimates in Table 3 show that migrant status is unrelated to having a first-born daughter. This is in line with British findings that immigrant-specific sex-selective abortion is not prominent at the level of the first-born child (Dubuc and Coleman, 2007). Applying the replication packages provided by Rupert and Zanella (2018) for the American PSID data and Backhaus and Barslund (2021) for the European SHARE data, we do not find a similar sex ratio imbalance at any age of parenthood in those data. This suggests that our data contain an idiosyncratic coincidental outlier at the parental age of 33.

Another potential violation of the exclusion restriction would be that the sex of the first child has a direct impact on the climate change worries of a parent, although it is not obvious what channel would cause such an effect. We attempt to inspect its potential presence by investigating the climate change worries of parents of children who are less than fourteen years old, i.e., parents who are not yet potential grandparents in our data. Table A5 shows the estimates of climate change worries regressed on the dummy for a female first child. Both the model with and without control variables report an insignificant negative estimate of around –0.05, suggesting that a firstborn

daughter does not drive her parents' climate change concerns. Admittedly, the number of observations we are able to use for this exercise is rather small.[16]

We also need to rule out reverse causation, meaning that changes in potential grandparents' climate change worries do not affect their children's parental status. A violation of this might occur in the presence of both an intergenerational spillover of changes in climate change worry levels and a causal effect of potential parents' climate change worries on their decision to have children. As yet it is unclear whether this intricate pathway is quantitatively relevant.

4 Results and robustness

4.1 FE estimates

Table 4 displays the estimates of fixed effects models for climate change worries. The estimates for grandparenthood are small and insignificant, which does not support the hypothesized effect of becoming a grandparent on worries about the future effects of climate change. The inclusion of time-invariant controls in Model (2) does not change the estimate.

[16]Interestingly, in this sample, the fraction of female first children appears hump-shaped as a function of the mother's age at the birth of the first child. Note that this concerns relatively recently born children. It might be that this pattern reflects recent changes in the prominence of sex-specific abortions at certain motherhood ages. To the extent that the usage of this is related to climate change worries, this might be of importance for the usage of our IV for grandparenthood in future studies where the currently prime-aged mothers reach the age of grandparenthood.

Table 4: FE estimates for the effect of grandparenthood on climate change worries

	Climate change worries			
	(1)	(2)	(3)	(4)
Is grandparent	0.03	0.03	0.08	0.13**
	(0.04)	(0.05)	(0.05)	(0.06)
Is grandparent × Male			-0.12	
			(0.09)	
Is grandparent × Older				-0.20**
				(0.08)
Wave 10 (2018-20)	0.24***	0.23***	0.23***	0.23***
	(0.01)	(0.02)	(0.02)	(0.02)
Controls	No	Yes	Yes	Yes
Observations	12432	12432	12432	12432

Notes: Climate change worries are measured on a scale from 1-5. The omitted wave is wave 4, with data collection in the years 2012-14. Controls include self-reported general health status (scale 1-5), indicators for interview mode (telephone and web, with face-to-face as the omitted category), and an indicator for whether the individual lives with their spouse. Errors are clustered at the individual level but remain identical when clustered at the household level (see Table A1). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Model (3) we include an interaction between the sex of the respondent and grandparental status to see whether the effect of becoming a grandmother differs from the effect of becoming a grandfather. The estimates indicate an insignificant negative interaction between being male and grandparenthood. The overall effects of becoming either a grandfather or grandmother on climate change concerns are insignificant.

The estimates from Model (4) suggest that relatively younger respondents increase their climate change worries by on average 0.13 in response to becoming a grandparent. The negative interaction between grandparental status and Older indicates that this effect is significantly different from the effect on relatively older respondents. The overall effect of becoming a grandparent is insignificant for the latter group.

Table A2 in Appendix A.1 shows that the negative interaction with relative age also holds when we use birth year as a continuous interaction term. Furthermore, we find no significant interaction effects for the variables highly educated (column 2) and skill level corresponding to the father's occupation when the respondent was fourteen years old (column 3). This suggests that socio-economic status does not account for potential heterogeneity in the effect of grandparenthood on climate change worries.

Finally, our estimates show a significant increase in worries over time that is robust across models. This result implies that between wave 4 (2012-14) and wave 10 (2018-2020) of the Understanding Society survey, the average level of climate change worries has increased by approximately 0.23 on a 5-point scale, about one-fourth of its standard deviation. This is in line with polling results indicating that climate change concerns in the UK have increased in the last decade (Ipsos MORI, 2019).

4.2 IV estimates

Before presenting the second-stage estimates in the IV approach, we first consider the so-called reduced-form estimates of the total effect of a first-born girl on climate change worries (see Table 5). The estimate lies around –0.03 and is insignificantly different from zero. The absolute value of the estimate seems rather large given that it essentially equals the product of the LATE and the small first-stage estimate (Angrist and Pischke, 2009). To shed some more light on this we present in Table A5 the results of a regression of climate change worries on having a first-born daughter among prime-aged parents in the data. These results cannot be explained by a grandparenthood channel. Clearly, the estimates are insignificantly different from zero. This is consistent with our reduced-form IV results.

Table 5: Effect of a first-born girl on climate change worries (reduced-form estimates)

	Climate change worries	
	(1)	(2)
First child is female	-0.03	-0.02
	(0.02)	(0.02)
Wave 10 (2018-20)	0.31***	0.25***
	(0.02)	(0.02)
Controls	No	Yes
Observations	12432	12432

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We next present our second-stage estimates. Table 6 shows the LATE estimates of being a grandparent on climate change worries, which are negative and insignificant for both the model with and without controls. As expected based on the reduced-form and first-stage estimates, the LATE shows a large effect size relative to our descriptives and FE estimates. The wave fixed effect estimate is similar to the one from the FE approach in Table 4.

Table 6: Effect of grandparenthood on climate change worries (second-stage)

	Climate change worries	
	(1)	(2)
Is grandparent	-0.55	-0.46
	(0.38)	(0.42)
Wave 10 (2018-20)	0.27***	0.22***
	(0.03)	(0.03)
Controls	No	Yes
Observations	12432	12432

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In Appendix A.2 we present the first-stage, reduced-form, and second-stage estimates separately by wave. These are in accordance to the findings above. Incidentally, they indicate that wave 4 drives the negative sign of the (insignificant) estimates reported in Table 6.[17] We had no prior reason to rank the usability across waves, but all in all it seems that the separate estimates from wave 10 are most in line with those in the main FE and IV analyses. Finally, we separately estimate the grandparenthood effect for the young and old birth cohorts (as defined in Section 3.1) and find no significant interaction effect between grandparental status and *older*.

4.3 Alternative explanations

Table 7 displays the estimates corresponding to the FE model of Equation (1) with two new outcomes, namely respondents' optimism about the future in the last two weeks and their feelings of calmness and peacefulness in the last four weeks. We choose these outcomes to see if becoming a grandparent results in a decrease in overall worries and stress levels. Such a mechanism might explain why our results do not support the hypothesis that grandparenthood increases worries about the future effects of climate change.

[17]The estimates presented in Table 3 do not noticeably differ when we re-estimate those separately for waves 4 and 10. Moreover, the analogues of Figure A1 are the same by construction. Output is available upon request.

Table 7: FE estimates of the effect of grandparenthood on optimism about the future and having felt calm and peaceful in the last four weeks

	Optimistic about future			Calm and peaceful		
	(1)	(2)	(3)	(4)	(5)	(6)
Is grandparent	0.04	-0.01	0.12**	0.07*	0.10**	0.09
	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)	(0.06)
Is grandparent × Male		0.14*			-0.07	
		(0.08)			(0.08)	
Is grandparent × Older			-0.17**			-0.04
			(0.08)			(0.08)
Wave 10 (2018-20)	0.11***	0.11***	0.11***	0.03	0.03	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12408	12408	12408	12429	12429	12429

Notes: Optimism and calmness & peacefulness are measured on a scale from 1-5. The omitted wave is wave 4, with data collection in the years 2012-14. Controls include self-reported general health status (scale 1-5), indicators for interview mode (telephone and web, with face-to-face as the omitted category), and an indicator for whether the individual lives with their spouse. Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The first column of Table 7 indicates that becoming a grandparent has no statistically significant effect on respondents' optimism about the future. The second column demonstrates a marginally significant interaction with male respondents, which is of similar magnitude but opposite in direction to the insignificant interaction seen in Table 4, Model (3). This suggests that male respondents feel more optimistic about the future once they are grandparents, which could explain why their climate change worries do not increase in response to this event if optimism and worries are negatively related.

However, this explanation does not align with the estimates in the third column, which resemble those in Table 4, Model (4). These estimates imply that older new grandparents become less optimistic about the future compared to younger new grandparents. Since we find that they also become less worried about climate change than younger new grandparents, this suggests that optimism about the future is positively related to climate change worries for this group.

Finally, the estimates in columns 4 and 5 indicate that, after becoming a grandparent, respondents state that they feel slightly more calm and peaceful in the last four weeks. The estimates in columns 5 and 6 suggest that this potential effect is not significantly driven by a specific subgroup.[18]

Next, we investigate whether the relatively large standard errors of our FE and IV

[18]We also consider neuroticism as a personality trait but this does not lead to any statistically significant insights either.

models for climate change worries could be driven by the multinomial nature of our outcome variable. The problem with multinomial outcomes has been illustrated by Bond and Lang (2019) for the happiness literature.[19] Similarly, if the distribution of climate change worries is sensitive to the cut-off points for discrete categories of worry levels, it becomes difficult to identify the effect of grandparenthood.

To examine this sensitivity, we re-estimate our models with a binary version of our outcome. Since the distribution of climate change worries is left-skewed with a median of approximately 3.5, we create a binary climate change concern variable that takes value 0 for the answers strongly agree to neither disagree nor agree (1-3) and value 1 for the answers tend to disagree and strongly disagree (4-5).

The results of this exercise are shown in Tables A3 (FE) and A6 (IV). For the FE model, the binary outcome transformation does not cause a large reduction in standard errors relative to point estimates. The IV model estimates are somewhat affected and turn (marginally) significantly negative in some specifications. Given the large effect size, this seems related to the issues known and discussed for our regular IV estimates. The robustness of our FE null results across the two distributions suggests that these results are not driven by the multinomial nature of climate change worries.

5 Discussion and conclusion

The results in this paper do not confirm the anecdotally inspired hypothesis that there is a positive relationship between grandparenthood and climate change concerns. The FE approach provides small and insignificant estimates, and the IV approach confirms the findings. These results are robust and are also in line with the lack of evidence we find for a possible channel that relates optimism and serenity to grandparenthood.

The alignment of findings based on two different and non-nested empirical approaches lends credence to our conclusions and strongly suggests that the absence of an effect is a population-wide phenomenon. In addition, the alignment confirms the usefulness of the sex of the first child as a potential instrumental variable for grandparenthood. Of course, the exclusion restriction requires justification in every study and for every outcome separately.

Our findings contribute to existing research on the activation of climate change concerns through (emphasizing) the existence of descendants (e.g., Thomas et al., 2017; Lawson et al., 2019; Palomo-Vélez et al., 2020). While previous studies find increased concern levels (Palomo-Vélez et al., 2020) and lengthened time horizons and increased policy support (Gazmararian, 2024) after highlighting the parental role in an experimental setting, our results indicate that the real-life transition to grandparenthood does not alter climate change worries. This finding suggests that becoming a grandparent does not automatically lead to increased valuation of the

[19] Zanella and Bellani (2024) and Zanella (2024) further illustrate the problems with using constructed measures, such as culture, that are based on multinomial variables.

welfare of future generations, which provides input for models that include elderly priorities, for example, those used in political economics (Rattsø and Sørensen, 2010).

Furthermore, our null results raise doubts about whether, outside of an experimental setting, subtle messages or comments about grandchildren are sufficient to stimulate the elderly to support climate change mitigation. Given the downward age trend in climate change concerns reported by Andor et al. (2018) and Geys et al. (2020) and also pictured for our sample in Figure 1, this suggests the need for further research on effective strategies for engaging older generations in climate action. Exploring whether personal incentives offer a stronger motivation than intergenerational ties would be an interesting avenue for future research.

We observed in our data that among (potential) grandparents who had their first child around age 33, this child was relatively often male. We cannot attribute this to a systematic cause. Although the main estimates are invariably insignificantly different from zero, this data feature affects the quantitative size of the estimated effect in the IV approach. It would be interesting to see if more evidence can be found for the idiosyncratic nature of this data feature.

We identify a couple of topics for future research. A first topic concerns variation across cohorts. The FE estimates in Table 4 suggest that grandparenthood increases the climate change worries of individuals who become a relatively young grandparent.[20] Given our variable definition and FE model structure, the positive effect for this group might be related to its potentially more recent transition to grandparenthood compared to the older group of respondents. This could be influential if the effect of grandparental status on climate change worries is dynamic rather than static, as had been suggested for the effect on working hours (Rupert and Zanella, 2018). Next to this timing-related channel, cohort-specific social norms or past experiences responsible for baseline differences in climate change worries may affect if and how grandparenthood influences these worries. Alternatively, differences between older and younger grandparents in health, caregiving, or expected length of the grandparental life stage (Leopold and Skopek, 2015) may drive heterogeneity in the effect of grandparenthood. Future research that can better identify any underlying channels is necessary to conclude on the age interaction effect.

A second topic concerns the measurement of the relevant variables. A reliance on self-reported survey data for measuring grandparenthood and variables related to parenthood increases the likelihood of measurement error. In this sense, population register data may be preferable. Similarly, a validation with data from other countries may be interesting. In principle, the German Socio-Economic Panel (SOEP) would allow for a similar analysis, but the size of the relevant subsample is too small for our preferred analyses.

Another potential measurement issue concerns the particularity of the variable on climate change worries. Schultz (2001) shows that environmental concerns can be divided into altruistic, egoistic, and biospheric concerns.[21] The wording of the statement

[20] We cannot precisely observe at what age individuals become grandparents, but know this group comprises respondents who become a grandparent before they are 62 years old, at the very latest.

[21] Steg, Perlaviciute, van der Werff, and Lurvink (2014) later show that next to the three value

"The effects of climate change are too far in the future to really worry me", may be measuring a specific type of environmental concern that is not the type affected by grandparenthood. Inspecting this possibility is beyond the scope of this paper, but would be relevant for a follow-up study. More generally, climate change concern is only one attitude of importance to measure individuals' stances towards climate change and does not necessarily measure behavior. The low-cost hypothesis suggests that the influence of environmental concern on environmental behavior weakens as behavioral costs increase (Diekmann and Preisendörfer, 2003). Still, research shows that climate change concerns correlate with support for climate change mitigation policies among Americans (Stoutenborough, Bromley-Trujillo, and Vedlitz, 2014) and that climate change worries are primarily associated with climate policy support among Europeans (Bouman et al., 2020). Indeed, policies on climate change are often founded on survey insights based on self-reported concerns, so it remains important to understand the determinants of the latter.

categories corresponding to these concern types, hedonic values are also an important predictor of environmentally relevant beliefs, preferences, and actions.

References

Andor, M. A., Schmidt, C. M., and Sommer, S. (2018). Climate change, population ageing and public spending: Evidence on individual preferences. *Ecological Economics*, *151*, 173–183.

Angrist, J. D., and Pischke, J.-S. (2009). Instrumental variables in action: Sometimes you get what you need. In *Mostly Harmless Econometrics: An Empiricist's Companion* (pp. 113–220). Princeton, NJ: Princeton University Press.

Backhaus, A., and Barslund, M. (2021). The effect of grandchildren on grandparental labor supply: Evidence from Europe. *European Economic Review*, *137*.

Bond, T. N., and Lang, K. (2019). The sad truth about happiness scales. *Journal of Political Economy*, *127*(4), 1629-1640.

Borrell-Porta, M., Costa-Font, J., and Philipp, J. (2019). The 'mighty girl' effect: Does parenting daughters alter attitudes towards gender norms? *Oxford Economic Papers*, *71*(1), 25–46.

Bouman, T., Verschoor, M., Albers, C. J., Böhm, G., Fisher, S. D., Poortinga, W., ... Steg, L. (2020). When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Global Environmental Change*, *62*, 102061.

Cattaneo, M. A., and Wolter, S. C. (2009). Are the elderly a threat to educational expenditures? *European Journal of Political Economy*, *25*(2), 225–236.

Diekmann, A., and Preisendörfer, P. (2003). Green and greenback: The behavioral effects of environmental attitudes in low-cost and high-cost situations. *Rationality and Society*, *15*(4), 441-472.

Dubuc, S., and Coleman, D. (2007). An increase in the sex ratio of births to India-born mothers in England and Wales: Evidence for sex-selective abortion. *Population and Development Review*, *33*(2), 383-400.

Eibich, P., and Zai, X. (2024). Are the grandparents alright? The health consequences of grandparental childcare provision. *Journal of Population Economics*, *37*, 71.

Ein-Mor, E., Mankuta, D., Hochner-Celnikier, D., Hurwitz, A., and Haimov-Kochman, R. (2010). Sex ratio is remarkably constant. *Fertility and Sterility*, *93*(6), 1961-1965.

Galperti, S., and Strulovici, B. (2017). A theory of intergenerational altruism. *Econometrica*, *85*(4), 1175–1218.

Gazmararian, A. F. (2024). Valuing the future: Changing time horizons and policy preferences. *Political Behavior*.

Geys, B., Heggedal, T.-R., and Sørensen, R. J. (2020). Popular support for environmental protection: A life-cycle perspective. *British Journal of Political Science*, 1–8.

Grolleau, G., Mzoughi, N., Napoléone, C., and Pellegrin, C. (2020). Do activating legacy concerns make farmers more likely to support conservation programmes? *Journal of Environmental Economics and Policy*, 1–15.

Hank, K., Cavrini, G., Di Gessa, G., and Tomassini, C. (2018). What do we know about grandparents? Insights from current quantitative data and identification of future

data needs. *European Journal of Ageing*, *15*(3), 225–235.

Hansen, J. E. (2009). *Storms of my grandchildren: The truth about the coming climate catastrophe and our last chance to save humanity.* London: Bloomsbury.

Ipsos MORI. (2019). *Climate change and the weather.* Retrieved 22 November 2024, from https://www.ipsos.com/sites/default/files/ct/news/documents/2019-08/climate_change_charts.pdf

Jaime, M., Salazar, C., Alpizar, F., and Carlsson, F. (2023). Can school environmental education programs make children and parents more pro-environmental? *Journal of Development Economics*, *161*, 103032.

Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., L. Strnad, R., and Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, *9*(6), 458–462.

Leopold, T., and Skopek, J. (2015). The demography of grandparenthood: An international profile. *Social Forces*, *94*(2), 801-832.

Macron, E. (2018). *Speech by the President of the Republic, Emmanuel Macron, at the Congress of the United States of America.* Washington. Retrieved 29 July 2024, from https://www.elysee.fr/en/emmanuel-macron/2018/04/25/speech-by-the-president-of-the-republic-emmanuel-macron-at-the-congress-of-the-united-states-of-america

Milfont, T. L., Poortinga, W., and 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), 1–16.

Milfont, T. L., Zubielevitch, E., Milojev, P., and Sibley, C. G. (2021). Ten-year panel data confirm generation gap but climate beliefs increase at similar rates across ages. *Nature Communications*, *4038*(12).

Office for National Statistics. (2000). *Standard occupational classification 2000: Volume 1 structure and descriptions of unit groups.* London: The Stationery Office. Retrieved 1 August 2024, from https://www.ons.gov.uk/methodology/classificationsandstandards/standardoccupationalclassificationsoc/socarchive

Office for National Statistics. (2022). *Birth characteristics in England and Wales: 2020.* Statistical Bulletin: ONS website. Retrieved 9 October 2023, from https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/bulletins/birthcharacteristicsinenglandandwales/2020

Palomo-Vélez, G., Buczny, J., and Van Vugt, M. (2020). Encouraging pro-environmental behaviors through children-based appeals: A kin selection perspective. *Sustainability*, *12*(2).

Rattsø, J., and Sørensen, R. J. (2010). Grey power and public budgets: Family altruism helps children, but not the elderly. *European Journal of Political Economy*, *26*(2), 222–234.

Ronchi, M., and Smith, N. (2024). *Daddy's girl: Daughters, managerial decisions, and gender inequality.* Working paper. Retrieved 22 November 2024,

from https://maddalenaronchi.weebly.com/uploads/1/1/7/4/117435661/daddys_girl_ronchi.pdf

Rueness, J., Vatten, L., and Eskild, A. (2011). The human sex ratio: effects of maternal age. *Human Reproduction*, *27*(1), 283-287.

Rupert, P., and Zanella, G. (2018). Grandchildren and their grandparents' labor supply. *Journal of Public Economics*, *159*, 89–103.

Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, *21*(4), 327–339.

Steg, L., Perlaviciute, G., van der Werff, E., and Lurvink, J. (2014). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. *Environment and Behavior*, *46*(2), 163-192.

Stoutenborough, J. W., Bromley-Trujillo, R., and Vedlitz, A. (2014). Public support for climate change policy: Consistency in the influence of values and attitudes over time and across specific policy alternatives. *Review of Policy Research*, *31*(6), 555–583.

Thiery, W., Lange, S., Rogelj, J., Schleussner, C. F., Gudmundsson, L., Seneviratne, S. I., ... Wada, Y. (2021). Intergenerational inequities in exposure to climate extremes. *Science*, *374*(6564), 158–160.

Thomas, G. O., Fisher, R., Whitmarsh, L., Milfont, T. L., and Poortinga, W. (2017). The impact of parenthood on environmental attitudes and behaviour: A longitudinal investigation of the legacy hypothesis. *Population and Environment*, *39*(3), 261–276.

United Nations Development Programme. (2008). Overview: Fighting climate change – human solidarity in a divided world. In *Human Development Report 2007-2008* (p. 1-18). United Nations.

University of Essex; Institute for Social and Economic Research. (2023). *Understanding Society: Waves 1-13, 2009-2022 and Harmonised BHPS: Waves 1-18, 1991-2009.* [data collection]. *18th Edition.* UK Data Service. SN: 6614. Retrieved from http://doi.org/10.5255/UKDA-SN-6614-19

Wade-Benzoni, K. A., Tost, L. P., Hernandez, M., and Larrick, R. P. (2012). It's only a matter of time: Death, legacies, and intergenerational decisions. *Psychological Science*, *23*(7), 704–709.

Washington, E. L. (2008). Female socialization: How daughters affect their legislator fathers' voting on women's issues. *American Economic Review*, *98*(1), 311–332.

Zanella, G. (2024). *The slave trade and the origins of mistrust in Africa: Internal (in)consistency across multiple survey waves.* Working paper. Retrieved 2 November 2024, from https://drive.google.com/open?id=19fk7JRto9ecbhJPKT2wt1z6xBigUzIub

Zanella, G., and Bellani, M. M. (2024). The volatility of survey measures of culture and its consequences. *Economic Inquiry*, *62*(2), 675–697.

A Appendix

A.1 FE strategy

Table A1: FE estimates with errors clustered at the household level

	Climate change worries			
	(1)	(2)	(3)	(4)
Is grandparent	0.03	0.03	0.08	0.13**
	(0.04)	(0.04)	(0.05)	(0.06)
Is grandparent × Male			-0.12	
			(0.09)	
Is grandparent × Older				-0.20**
				(0.09)
Wave 10 (2018-20)	0.24***	0.23***	0.23***	0.23***
	(0.01)	(0.02)	(0.02)	(0.02)
Controls	No	Yes	Yes	Yes
Observations	12432	12432	12432	12432

Notes: Climate change worries are measured on a scale from 1-5. The omitted wave is wave 4, with data collection in the years 2012-14. Controls include self-reported general health status (scale 1-5), indicators for interview mode (telephone and web, with face-to-face as the omitted category), and an indicator for whether the individual lives with their spouse. Errors are clustered at the household level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: FE estimates for the effect of grandparental status on climate change worries

	Climate change worries			
	(1)	(2)	(3)	(4)
Is grandparent	0.29***	0.06	-0.03	0.03
	(0.11)	(0.06)	(0.15)	(0.05)
Is grandparent × Birth year	-0.02***			
	(0.01)			
Is grandparent × High educ.		-0.08		
		(0.08)		
Is grandparent × Dad job lvl			0.03	
			(0.05)	
Wave 10 (2018-20)	0.23***	0.23***	0.22***	0.22***
	(0.02)	(0.02)	(0.03)	(0.03)
Controls	Yes	Yes	Yes	Yes
Observations	12432	12432	10576	10576

Notes: Climate change worries are measured on a scale from 1-5. The omitted wave is wave 4, with data collection in the years 2012-14. Controls include self-reported general health status (scale 1-5), indicators for interview mode (telephone and web, with face-to-face as the omitted category), and an indicator for whether the individual lives with their spouse. highly educated is fixed at the wave 4 level, imposing this on 53 of our 6216 respondents who reported becoming highly educated between these two waves. Job level of the father at age fourteen ranges from 1-4 and is based on Table A10 in Appendix A.3. Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A3: FE estimates for the effect of grandparental status on binary climate change worries

	Binary climate change worries			
	Linear probability model		Logit model (marginal effects)	
Is grandparent	0.02	0.02	0.04	0.04
	(0.02)	(0.02)	(0.04)	(0.04)
Wave 10 (2018-20)	0.10***	0.11***	0.16***	0.16***
	(0.01)	(0.01)	(0.02)	(0.02)
Controls	No	Yes	No	Yes
Observations	12432	12432	3942	3942

Notes: Climate change worries are transformed into a binary variable that takes the value 0 for respondents who report to strongly agree, tend to agree, or neither agree nor disagree with the survey question of our interest and the value 1 for those who tend to disagree or strongly disagree. The omitted wave is wave 4, with data collection in the years 2012-14. For the logit model, the number of observations is restricted to the respondents experiencing a change in their binary climate change worries across the two waves. Controls include self-reported general health status (scale 1-5), indicators for interview mode (telephone and web, with face-to-face as the omitted category), and an indicator for whether the individual lives with their spouse. For the linear probability model errors are clustered at the individual level and the logit model uses observed information matrix errors (in parentheses). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.2 IV strategy

A.2.1 Model diagnostics

Table A4: Gap between age first became parent by sex and birth year

	Age first became parent				
Birth year	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989
Male	28.33	27.86	26.92	24.23	21.21
	(1404)	(1064)	(702)	(366)	(118)
Female	25.55	25.49	24.52	22.73	20.19
	(2259)	(1925)	(1442)	(1132)	(549)
Difference	2.78***	2.38***	2.41***	1.50***	1.02***

Notes: Regression results of parents born between 1965-1989 (both individuals included and excluded in our estimation sample) who had a child before wave 4 or wave 10, using just one observation per individual. Numbers of observations in parentheses. Note that the seemingly negative time trend of age of parenthood is simply a composition effect since the groups of parents from the last columns of generations consist of respondents who had a child early enough to be included. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

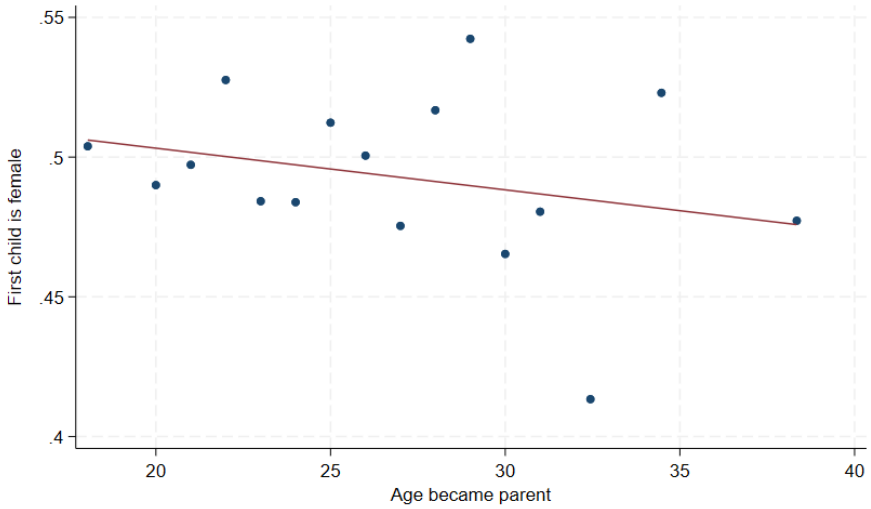

Figure A1: Rate of female first child, by binned age became parent groups

Note: Figure includes one observation per unique individual in our main sample (grandparents and potential grandparents). On the horizontal axis, the median age is 24 and the standard deviation is 4.

Table A5: Effect of a first-born girl on climate change worries of parents

	Climate change worries	
	(1)	(2)
First child is female	-0.05	-0.04
	(0.10)	(0.10)
Controls	No	Yes
Observations	1422	1422

Notes: Regression results of parents aged 18-55 with children no older than 13 years old who reported their climate change worries in both wave 4 and wave 10. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Effect of grandparenthood on binary climate change worries (second stage)

	Binary climate change worries			
	Linear probability model		Probit model (marginal effects)	
Is grandparent	-0.35*	-0.32	-0.32**	-0.30*
	(0.19)	(0.21)	(0.15)	(0.17)
Wave 10 (2018-20)	0.10***	0.09***	0.09***	0.09***
	(0.02)	(0.02)	(0.02)	(0.02)
Controls	No	Yes	No	Yes
Observations	12432	12432	12432	12432

Notes: Estimates based on the full estimation sample using a linear probability model. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.2.2 Results split by wave

Table A7: First stage estimates

	Is grandparent			
	Wave 4		Wave 10	
First child is female	0.058***	0.052***	0.050***	0.044***
	(0.012)	(0.010)	(0.011)	(0.010)
Controls	No	Yes	No	Yes
F excl. instrument	25.25	28.35	19.98	20.66
Observations	6216	6216	6216	6216

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Effect of a first-born girl on climate change worries (reduced-form estimates)

	Climate change worries			
	Wave 4		Wave 10	
First child is female	-0.05**	-0.04*	-0.01	0.00
	(0.03)	(0.03)	(0.03)	(0.02)
Controls	No	Yes	No	Yes
Observations	6216	6216	6216	6216

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A9: Effect of grandparenthood on climate change worries (second stage)

	Climate change worries			
	Wave 4		Wave 10	
Is grandparent	-0.87*	-0.83*	-0.13	0.02
	(0.46)	(0.50)	(0.50)	(0.55)
Controls	No	Yes	No	Yes
Observations	6216	6216	6216	6216

Notes: Estimates based on the full estimation sample. Controls include self-reported general health status ranging from 1 (poor) to 5 (excellent), the age when the individual had their first child, and dummies for highly educated, female, white, cohabiting with a spouse, and interview mode (telephone and web, with face-to-face as the omitted category). Errors clustered at the individual level in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A.3 Data

Table A10 is based on Office for National Statistics (2000).

Table A10: Classification of SOC90 job categories in four distinct skill levels

Skill Level	**SOC90**
Level 4	General managers and administrators in national and local government, large companies and organizations (10) Natural scientists (20) Engineers and technologists (21) Health professional (22) Teaching professionals (23) Legal professionals (24) Business and financial professionals (25) Architects and surveyors (26) Librarians and related professionals (27) Professional occupations n.e.c. (29)
Level 3	Production managers in manufacturing, construction, mining and energy industries (11) Specialist managers (12) Financial institution and office managers, civil service executive officers (13) Managers in transport and storing (14) Protective service officers (15) Managers in farming, horticulture, forestry and fishing (16) Manager, and proprietors in service industries (17) Managers and administrators n.e.c. (19) Scientific technicians (30) Draughtspersons, quantity surveyors and other surveyors (31) Computer analysts /programmers (32) Ship and aircraft officers, air traffic planners and controllers (33) Health associate professionals (34) Legal associate professionals (35) Business and financial associate professionals (36) Social welfare associate professionals (37) Literary, artistic and sports professional (38) Associate professional occupations n.e.c. (39) Construction trades (50) Metal machining, fitting and instrument making trades (51) Electrical/electronic trades (52) Metal forming, welding and related trades (53) Travel and transport vehicles (54) Textiles, garments and related trades (55) Printing and related trades (56) Woodworking trades (57) Food preparation trades (58) Other craft and related occupations n.e.c. (59)
Level 2	Administrative /clerical officers and assistants in civil service and local government (40) Numerical clerks and cashiers (41) Filing and record clerks (42)

	Clerks (not otherwise specified) (43) Stores and despatch clerks, storekeepers (44) Secretaries, personal assistants, typists, word processors operators (45) Receptionists, telephonists and related occupations (46) Clerical and secretarial occupations n.e.c. (49) Security and protective service occupations (61) Catering occupations (62) Travel attendants and related occupation (63) Health and related occupations (64) Childcare and related occupations (65) Hairdressers, beauticians and related occupation (66) Domestic staff and related occupations (67) Personal and protective service occupations n.e.c. (69) Buyers brokers and related agents (70) Sales representatives (71) Sales assistants and check-out operators (72) Mobile, market and door-to-door salespersons (73) Sales n.e.c. (79) Food drink and tobacco process operatives (80) Textiles and tannery process operatives (81) Chemicals, paper, plastics and related process operatives (82) Metal making and treating process operatives (83) Metal working process operatives (84) Assemblers/lineworkers (85) Other routine process operatives (86) Road transport operatives (87) Other transport and machinery operatives (88) Machine and plant operatives n.e.c. (89)
Level 1	NCOs and other ranks, armed forces (60) Other occupations in agriculture, forestry and fishing (90) Other occupations in mining and manufacturing (91) Other occupations in construction (92) Other occupations in transport (93) Other occupations in communication (94) Other occupations in sales and service (95) Other occupations n.e.c. (99)