Selfish, Short-Sighted, but Informed: How Education Fosters Environmentalism in Emerging Economies

Michaël Aklin[*]   Iza Ding[†]

Does education foster environmentalism in emerging economies? If so, how? We begin by using multiple surveys to demonstrate strong evidence that an individual's level of formal education is a crucial predictor of their environmental concern and demand for environmental policy. Individuals with college education are 9 percent more likely to prioritize the environment over growth than people without college education. This effect climbs to 15 percent in China, the world's largest emerging economy. We then field an original, nationally representative survey experiment in China to test three mechanisms that might causally link education to environmentalism: knowledge, altruism, and longer time horizons. We find the strongest support for the knowledge channel. Our findings suggest that environmental messaging that appeals to the altruistic and future-oriented sides of mankind might be less effective than messages that improve individuals' knowledge of how environmental damage affects their immediate self-interest.

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[*]Associate Professor, Department of Political Science and Graduate School of Public and International Affairs, University of Pittsburgh. aklin@pitt.edu.

[†]Assistant Professor, Department of Political Science and Graduate School of Public and International Affairs, University of Pittsburgh. yud30@pitt.edu.

Introduction

Does education foster environmentalism — individuals' concern for environmental problems and support for policies that protect the environment? If so, how? Recent studies suggest that formal education is an especially important driver of environmentalism (Liu, Ouyang, and Miao, 2010; Aklin et al., 2013). But there is a lack of systematic analysis of this relationship, as well as the specific mechanisms that causally link education to environmentalism.

Understanding the micro-foundations of environmental beliefs is important because it is a powerful predictor of governmental policies (Prakash and Bernauer, 2020). Even in non-democratic countries, it has been well-established that public opinion figures considerably into policy-making, including environmental policy (Mertha, 2009, 2014; Tang and Wu, 2018; Zhang and Zhang, 2018).

Yet most studies on individual environmentalism have been carried out in OECD countries (Diamond 2020; Tvinnereim et al 2020; Tingley and Tomz 2020), while research on the Global South remains scarce, despite its growing importance in the world economy and in mitigating climate change.[1]

Our study examines the relationship between education and environmentalism through a two-stage analysis of survey data, including cross-national data from the World Value Survey (WVS), data from the China Family Panel Survey (CFPS), and an original nationally representative survey with embedded experiments among adult Chinese citizens in 2017.

We put China under our microscope for three reasons. First, China is the world's largest emitter of CO_2 and possibly SO_2 (Le Quéré et al., 2018). Given the size of its economy, population, and environmental problems, the environmental preferences of the Chinese public deserve special attention (Aldy and Stavins, 2007). Second, ample research shows that the Chinese government has been responsive, albeit selectively, to public environmental concerns (Wang,

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[1]For notable exceptions see, e.g., (Liu and Mu, 2016; Stokes, Giang, and Selin, 2016)

2015; Van der Kamp, 2017; Alkon and Wang, 2018). Therefore, environmental attitudes of Chinese citizens may have a significant impact on environmental outcomes, both domestically and globally (Aklin and Mildenberger, 2020). Third, there is a dearth of public opinion surveys focusing on environmental issues in China. Most existing household surveys only contain a few questions pertaining to the environment, which does not allow for a comprehensive understanding of the makeup of individual environmental attitudes and in-depth analyses of the causal mechanisms that shape them.

In the first stage, we use WVS and CFPS data to confirm earlier conjectures about the crucial role formal education plays in the development of environmentalism. Leveraging within-country variation, we find that people with university education are 9 percent (95% CI: [7,11]) more likely to prioritize the environment over economic growth than people without formal education in non-OECD countries. The effect does not depend on a person's income or employment status, nor on a range of other confounding factors. Furthermore, the effect is generally monotonic. We also find that the effect is even steeper than the non-OECD average in China, where university educated individuals are 15 percent (95% CI: [9,20]) more likely to favor the environment over growth.

Having established a strong association between education and environmentalism in the global south, we conduct a second-stage survey experiment to explore three causal mechanisms linking education to environmentalism. We test theoretical hypotheses derived from existing literature on how education changes an individual through informational, affective, and cognitive channels. First, education could strengthen knowledge of — and, by extension, concern about — environmental issues. Second, education might increase empathy and altruism, which make people support environmental policies even when they do not directly experience environmental damage themselves. Third, education may lengthen a person's time horizon, which is important given that the impact of many environmental problems spreads out over a long period of time.

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We test these hypotheses using mediation analysis and two framing experiments. We find the strongest evidence in favor of the information channel and little evidence for the other two.

This is, to our knowledge, the first study that explores the mechanisms linking education to environmentalism in emerging economies. Our findings have important implications for the public communication of environmental policies, which is increasingly important given environmental and climate change mitigation policies often face strong public resistance in many parts of the world. They suggest that climate and environmental appeals that speak to the altruistic and future-oriented sides of mankind might be less effective than messages that more directly speak to individuals' immediate self-interest.

The rest of this article proceeds as follows. In the first section, we present our theoretical hypotheses linking education to individual environmentalism. In the second section, we assess the impact of education on environmentalism using the latest wave of the WVS data (2010-2014). In the third section, we test education's effect using CFPS data. In the fourth section, we test three mechanisms linking education and environmentalism using original survey experiments embedded in a nationally representative survey in China. In the concluding section, we discuss the implication of our findings and avenues for future research.

1 Background and Theory

Emerging economies in the global south play an increasingly important role in mitigating climate change. Rapid economic and population growth in these countries have produced major carbon emissions and daunting environmental challenges. Air pollution regularly plagues cities like Beijing, Mexico City, and New Delhi.[2] Soil and water pollution have caused less public outcry (Greenstone and Hanna, 2014), but still pose serious threats to public health (Lu et al.,

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[2]"In Mexico City, The Return Of Terrible Smog," NPR, April 13, 2016. "On Scale of 0 to 500, Beijing's Air Quality Tops 'Crazy Bad' at 755," *New York Times*, January 12, 2013. "Indian government declares Delhi air pollution an emergency," *Guardian*, November 6, 2016.

2015). Deforestation, urbanization, and population growth have been associated with rising surface temperatures, agricultural disruption, and extreme weather events (Bradshaw et al., 2007; Grimmond, 2007; Malhi et al., 2008).

The human, economic, and political costs of carbon and pollution emissions are substantial. Indoor air pollution in India amounts to 4-6% of the national burden of disease (Smith, 2000). Outdoor air pollution in China leads to over one million premature deaths per year (Lozano et al., 2012), and has shaved 5.5 years off the life expectancy of its northern residents (Chen et al., 2013). In 2013, welfare loss due to air pollution in South Asia, East Asia, and the Pacific amounted to an equivalent of 7.5% of their regional GDPs (World Bank, 2016). Pollution is one of the leading causes of social unrest in China (Lin and He, 2014), and, according to some scholars, erodes the legitimacy of its single-party regime (Alkon and Wang, 2018).

To what extent is such growing environmental damage accompanied by growing environmental consciousness and concern? What drives individual environmentalism — individuals' concern for environmental problems and support for policies that protect the environment in emerging economies?

Classic modernization theories portend that environmentalism increases with national or individual income (Diekmann and Franzen, 1999; Inglehart, 1995; Franzen, 2003; Franzen and Meyer, 2010). Specifically, wealthier individuals will champion environmentalism as a post-material value (Inglehart, 1995; Kemmelmeier, Krol, and Kim, 2002). Yet, empirical evidence for the positive impact of income on environmentalism, especially in the developing world, is at best mixed. For example, Franzen and Meyer find that citizens in wealthier countries express more concern for the environment (Franzen and Meyer, 2010), but several other studies reveal no significant correlation between income and environmentalism (Dunlap et al., 2000; Dunlap and Mertig, 1995; Liu and Mu, 2016). This is not surprising — even if income plays an important role, as the environmental Kuznets Curve suggests, developing countries may have

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not reached the peak of curve. Yet global environmental and climate challenges require more immediate attention.

Instead, recent studies find formal education to be an especially important driver of individual environmental concerns (Liu, Ouyang, and Miao, 2010; Aklin et al., 2013). For example, a study from Australia finds a positive correlation between tertiary education and environmental activism (Tranter, 1997). Aklin et al. find no effect of income on environmentalism in Brazil (Aklin et al., 2013); rather, they find that Brazilians with secondary education are significantly more likely to express pro-environmental views. A study conducted in rural areas of Sichuan province in China finds that education leads to pro-environmental attitudes (Liu, Ouyang, and Miao, 2010). Likewise, a national survey of urban Chinese citizens finds education to be a significant predictor of individuals' environmental concerns (Ding, 2016). Overall, scholars find that the impact of education on environmental concern is much larger than that of income.

Policymakers and environmental activists often assume education to be important, yet the causal mechanism linking education to environmentalism remains opaque. What exactly about education makes people more pro-environment? Understanding this mechanism can help inform not only the content of environmental education but also the messaging in environment policies. Messaging is particularly important in both policy making and implementation — it is often not the content of policies but their effective communication to the public that leads to their successful adoption and implementation.

Existing literature suggests three potential mechanisms of educational benefits—informational, affective, and time-discounting (cognitive) (Littledyke, 2008). First, education provides people with scientific knowledge, based on which they make more informed decisions (Schahn and Holzer, 1990). When individuals become more aware of a social problem, they are more conditioned to worry about the problem (Schahn and Holzer, 1990; Barwick and Zou, 2020). In the realm of environmental issues, if students are taught the facts and science behind cli-

mate change, they are more likely to view it as an urgent issue requiring immediate resolution. Education—especially higher education—may increase individuals' likelihood of being exposed to environmental knowledge, leading to higher levels of concern.

Second, environmental problems—climate change, in particular—are global problems, the resolution of which requires individuals and states to make economic sacrifices for the common good. Education might make people more altruistic and concerned for problems outside their own physical environments and beyond their own lived experiences. This expectation might seem counter-intuitive at first, as the post-enlightenment educational model in Western societies teaches rational-economic thinking, and as a result might make individuals more self-oriented. However, educators have promoted incorporating affective domain into environmental education (Littledyke 2008). Education is also a highly *social* experience, where students interact with others on a regular basis. Students in higher education are more likely to be exposed to people outside their traditional communities and from other cultural backgrounds. Such experience is believed to promote pro-social thinking, leading to concern for issues not directly affecting themselves and their own communities. Evidence from experimental economics shows that education makes people more altruistic (Bettinger and Slonim, 2007). Likewise, studies have shown that formal education increases civic participation (Dee, 2004).

Third, education may expand an individual's cognitive horizon and prompt them to engage in long-term thinking and planning. Humans are hardwired to think "fast" and intuitively. The training of logical thinking in education makes people think "slower," i.e., more deliberatively and consciously (Kahneman, 2011). Individuals with higher educational attainments may be more concerned with issues that manifest over longer time horizons such as global warming (Bloom, 1995). One study notes, for instance, that education helps "people better understand inter-temporal choice and delay immediate gratification for future reward" (Warner and Pleeter, 2001) (p.37). Similarly, another study argues that education enhances patience and makes fu-

ture rewards more tangible (Becker and Mulligan, 1997). This intuition has found support in the study of financial decisions. In a field experiment conducted in Denmark, researchers have shown that highly educated individuals have substantially lower discount rates than less educated citizens (Harrison, Lau, and Williams, 2002). These findings are confirmed by several studies drawing on both experimental and observational data (Lawrance, 1991; Warner and Pleeter, 2001; Bauer and Chytilová, 2010).

We use an original survey to test these three mechanisms linking education and environmentalism. But before showing our results on the mechanism, we first assess the robustness of the relationship between education and environmentalism in the following two sections — first across the non-OECD world, then in China.

2   Education and Environmentalism in Emerging Economies

We begin our empirical examination by exploring the relationship between education and environmentalism across non-OECD countries. We draw from the WVS, a comprehensive cross-national public opinion survey fielded five times since 1981. The main outcome we model is the respondent's choice between the following two statements: "*Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs*," and "*Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent*." The pro-environmental answer is coded as 1, the other as zero.

We model individual environmentalism as a function of formal education. Several studies report a benign effect of education on environmental concerns, but few, if any, specifically sought out to identify its causal effect (Liu, Ouyang, and Miao, 2010; Aklin et al., 2013; Franzen and Meyer, 2010). To account for potential confounding factors, we adjust for a range of socioeconomic and geographic variables. In the full sample, we include country-specific intercepts to account for macro-level sources of variation in individual attitudes. Countries with different

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institutions and exposure to environmental problems may experience varying levels of public concern. These effects would, for the most part, be absorbed by the inclusion of country-specific intercepts. Likewise, the inclusion of survey wave fixed effects accounts for secular trends in environmental concerns.

Adjusting for country- and time-specific effects is unlikely to suffice to remove potential bias in the estimate of the treatment effect of formal education. We therefore adjust our estimates for several well-known potential confounders. We include the following variables in our model: income (divided into eleven categories), age, gender, the size of the city in which the respondent lives (thirteen categories), and the employment status of the respondent (fourteen categories, including self-employed, employed part time, unemployed, etc.). These variables are widely believed to be potentially correlated with both a person's attitude toward the environment and their level of education (Dunlap et al., 2000; Franzen and Meyer, 2010), although there is a lack of consensus regarding their effect (Daniels et al., 2012). We find that the positive effect of formal education remains robust regardless of the set of covariates used for adjustment.

In sum, we estimate the parameters of the following generic model:

$$\text{Env. over Growth}_{it} = \sum_{j=1}^{5} \gamma_j \text{Education}_{it} + \\ + \mathbf{X}'_{it}\beta + \kappa_c + \tau_t + \varepsilon_{it},$$

where i indexes individual respondents, c countries, and t survey waves. We use five categories of education: no formal education; primary school; secondary school with a technical focus; secondary school with a focus on tertiary education; and university. Lack of formal education represents the baseline category. The vector $\mathbf{X}$ contains several socio-economic indicators listed above. The parameters are estimated with least squares and standard errors are clustered by country (except for the subset of results for China, in which we use heteroskedastic-robust standard errors).
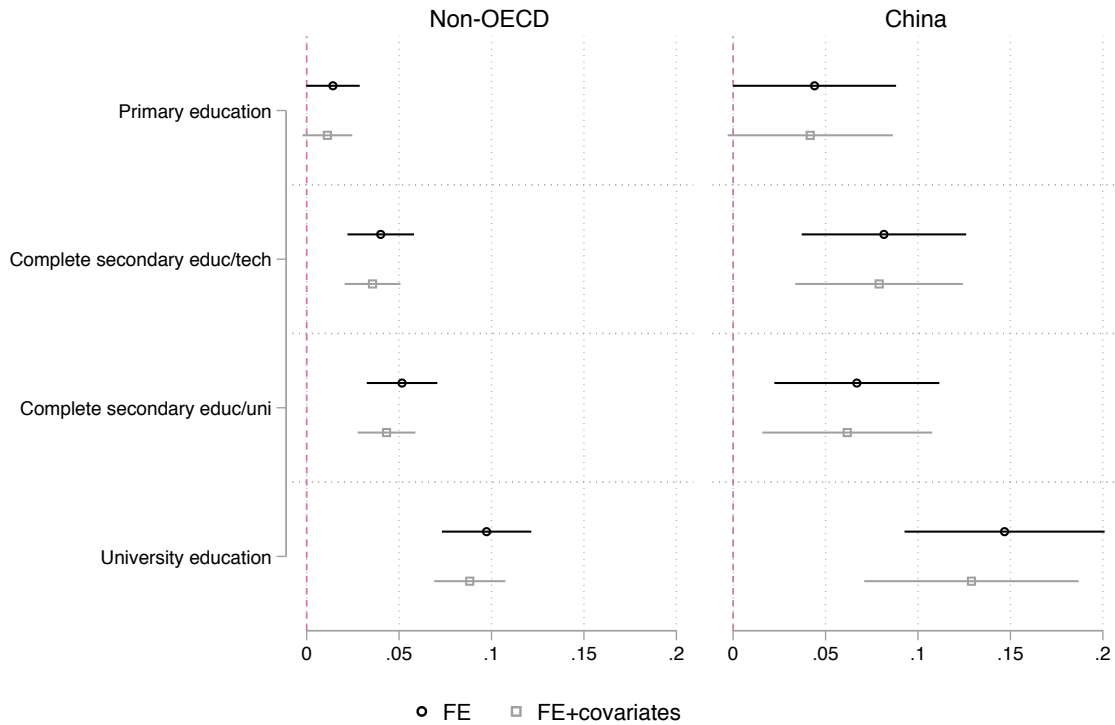
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Figure 1: Marginal effects of education on responses to *Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs* [0,1], with 95% confidence interval. Omitted category: no formal education. The estimates based on the non-OECD sample include country and wave fixed effects. The estimates based on the Chinese sample include wave fixed effects. Standard errors clustered by country (heteroskedastic-robust for the Chinese subsample).

We plot marginal effects in Figure 1 (full results are reported in Table A1 in the appendix). The left panel presents the result for the full non-OECD sample. The right panel does the same for the Chinese sample.

We find the likelihood of valuing the environment over economic growth is about 8 percent higher for individuals who completed university education compared to people without formal education. The effect of education is especially large for respondents in China. Completing college increases the probability of taking a pro-environment position by 14-15 percentage points.

We note that the effects across all models remain stable whether adjustments for confounders are made or not. In all cases, we find evidence for a monotonic (if not linear) increase in the prioritization of the environment as a respondent receives more formal education.

To illustrate further the role of education, we estimate the same models separately for each (non-OECD) country. We report the effect of university-level education (compared to no formal education) in Figure 2. We find that the effect is positive in 83% of the cases. It can be quite large, with point estimates climbing up to 37 percentage points. The average is about 10 percentage points. In only two countries is the effect negative and statistically significant at conventional levels.

3   Education and Environmental Concern in China

We next verify the robustness of our findings using the China Family Panel survey. The CFPS covers a representative sample of Chinese households. Its questions span multiple aspects of respondents' lives and opinions, offering us the opportunity to study individual environmental attitudes in a context that does not prime them to focus on the environment. In fact, environment-related questions represent a minor part of this broad survey.

Respondents were asked to rate the severity of environmental problems in China, ranging from zero to ten. The distribution of answers is reported in Figure A1. The sample mean was 6.9 (standard deviation: 2.7), with a strong left skew. More than 24% of the respondents reported a score of 10, showing a high level of overall concern for environmental pollution in China. That being said, about 34% responded with a score of 5 or less.

We estimate a model that is similar to the one in the previous section. Education is broken down into the same five categories as before. Income is now self-reported annual income. In some specifications, we allow income to have a quadratic relationship with environmental concern. We also include age and gender. We take advantage of the richness of the survey to
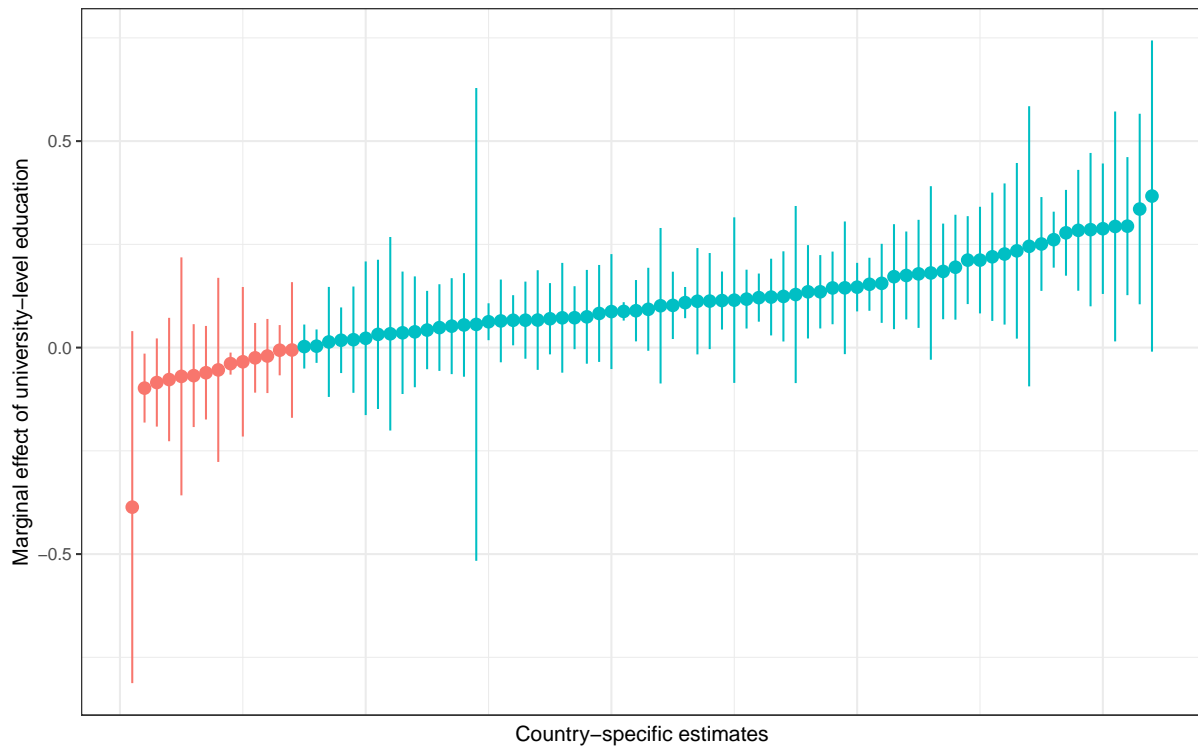
Figure 2: Marginal effects of university-level education (vs. no formal education) on responses to *Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs* [0,1], with 95% confidence interval on a country-by-country basis. Blue: marginal effect is positive. Red: marginal effect is negative. The model was estimated for each country separately and adjusts for income, age, gender, and wave fixed effects. Only non-OECD countries included.

include a dichotomous indicator that takes value 1 for respondents who live in urban areas. The models we estimate are:

$$\text{Severity of env. problems in China}_i = \alpha_k + \sum_{j=1}^{5} \gamma_j \text{Education}_i + \kappa \text{Income}_i + \omega' X_i + \epsilon_i,$$

where k denote provinces and i individual respondents. Standard errors are clustered by province in order to account for regional differences within China.

The results are reported in Figure 3 (full results in Table A2 in the appendix). We confirm our findings in the previous section: education again appears to be a reliable predictor of individual environmental concern in China. The effect is monotonic. Compared to those without formal education, the most educated individuals in the CFPS sample express a level of concern that is between 1.5 and 2.4 percent higher. This represents between 60 and 91% of the outcome's standard deviation.

4 Mechanisms Linking Education to Environmentalism

4.1 Theoretical Hypotheses

Our findings indicate that formal education, especially university education, is a primary driver of environmentalism in non-OECD countries. These results are consistent with previous single-country studies. Despite this clear association, however, it remains unclear *how* education leads to environmentalism. To further study the mechanisms linking education to environmentalism, we commissioned a nationally representative survey with embedded experiments in China in 2017. The household survey draws a nationally representative sample ($N = 4,120$). Our questions are embedded in other general questions about social and economic question, thereby mitigating issues of survey demand. [3]

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[3]The survey has been reviewed by the Institutional Review Board at the University of Pittsburgh, which determined that it and meets all the necessary criteria for an exemption (PRO17090192).
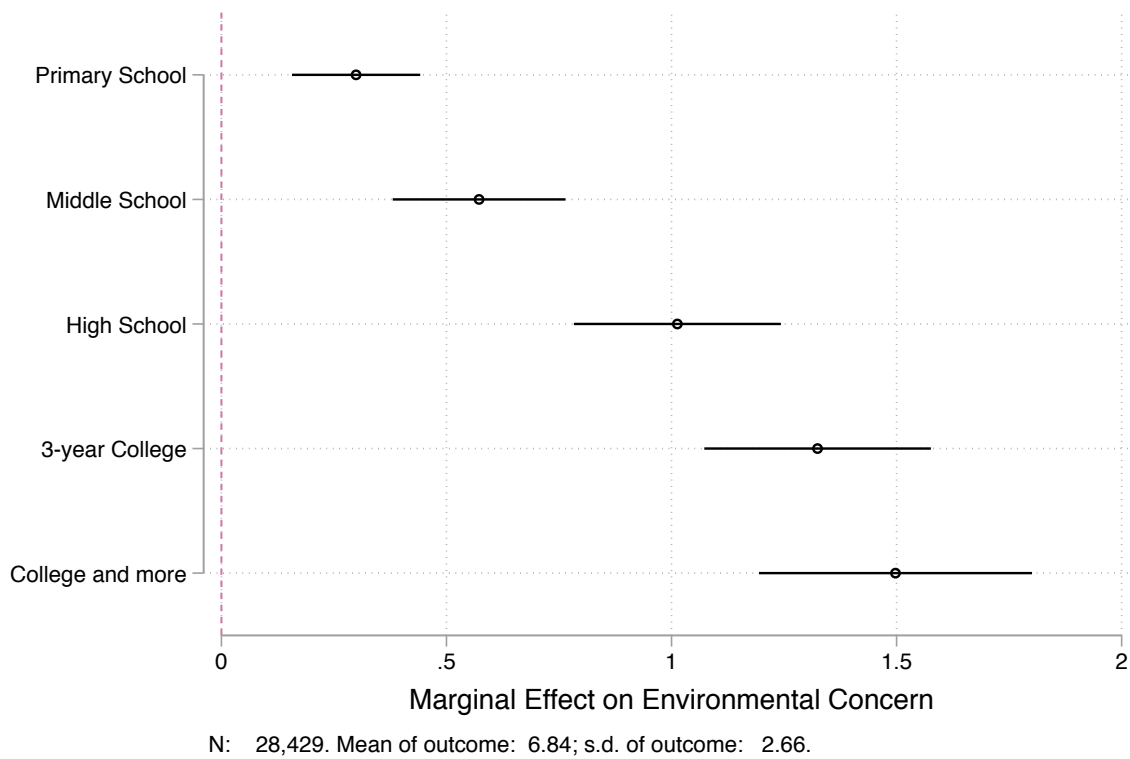
Figure 3: Marginal effects with 95% confidence interval. Dependent variable: *How would you rate the severity of the environmental problem in China?* (between 0 and 10). Omitted category: no formal education. The standard errors are clustered by province.

Mechanism	Hypothesized Effect of Education	Empirical Test
Knowledge	Edu. increases knowledge about env.	Mediation analysis
Altruism	Edu. increases altruism	Interaction of framing experiment about exposure and edu.
Time horizon	Edu. reduces discounting	Interaction of framing experiment about timing and edu.

Table 1: Summary of Theoretical Hypotheses and Empirical Tests

We test three pathways through which education influences environmental attitude formation:

Hypothesis 1 (Knowledge): *Education fosters environmentalism through knowledge about environmental systems and change.*

Hypothesis 2 (Altruism): *Education fosters environmentalism through producing more altruistic individuals.*

Hypothesis 3 (Time horizon): *Education fosters environmentalism through expanding individuals' time horizons.*

To distinguish between these mechanisms, an ideal experimental design would assign different types of long-term educational experiences to individuals. This is not feasible here. Instead, for each mechanism, we attempt to find the best possible test using survey data. Our approach is summarized in Table 1.

We test the knowledge hypothesis using mediation analysis. Specifically, we ask if we can establish a path from education to environmentalism via scientific knowledge as a mechanism. We test the altruism hypothesis with a framing experiment. We emphasize whether a particular environmental problem will affect the respondent's locality or a distant one. If our conjecture is correct, we would find that less educated individuals are more sensitive to the treatment than the highly educated. We also use a framing experiment to test the time horizon hypothesis. We emphasize the timeline over which the consequences of climate change will be felt. We expect less educated citizens to respond more strongly to this (i.e. to discount the future more heavily), while the treatment effect should be weaker (or nil) for highly educated respondents.

4.2 Knowledge Mechanism

4.2.1 Empirical Strategy

To test the knowledge mechanism, we asked respondents questions that enable us to approximate their level of scientific knowledge about the environment. We then rely on mediation analysis to investigate whether education operates through the mechanism of knowledge (Baron and Kenny, 1986; Hicks and Tingley, 2012; VanderWeele, 2015).[4]

To assess individuals' environmental knowledge, we asked two questions in our survey. First, we asked "Which of the following is NOT a greenhouse gas? (Methane; CO_2; SO_2; Nitrogen)." We name this "climatic knowledge." Second, we asked "Which of the following chemical compounds is NOT produced by burning coal? (CO_2; H_2O; SO_2)." We refer to this as "scientific knowledge." About 13% of the respondents answered correctly the climate question, and 44% did so for the scientific question.

The outcome that we model is the response to: "*In your opinion, how severe are environmental problems in your locality?*" Respondents who said that these problems were "somewhat light" or "very light" were coded as zero (52% of the sample). Those who described them as "somewhat severe" or "very severe" were coded as 1 (48%).

To evaluate the plausibility of the knowledge mechanism, we examine whether knowledge (scientific or climatic) mediates the effect of education. The causal path is summarized in Figure 4. Education is measured using a dichotomous indicator that takes value 1 if the respondent has gone to college. Results in general remain similar with a more disaggregated categorical variable. As before, we adjust for confounders such as age and gender.

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[4]Mediation analysis imposes several strong assumptions. One is sequential ignorability, which requires that the mediator (knowledge) is uncorrelated with other mediators. This assumption cannot be tested here.
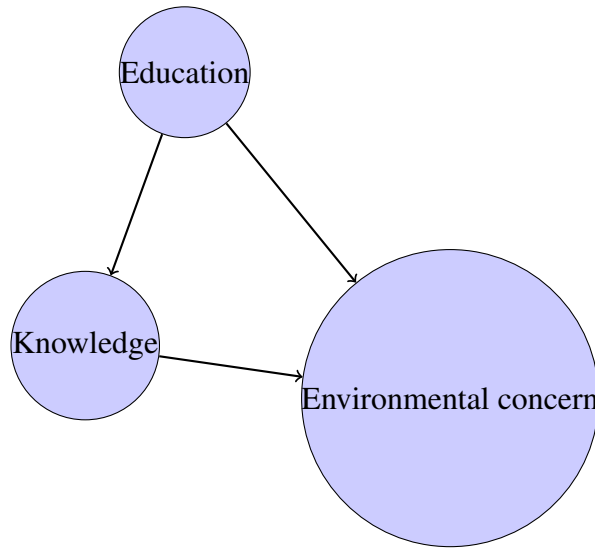
Figure 4: Causal path

4.2.2 Results

We begin by establishing the plausibility of the two steps hypothesized above: formal education improves knowledge about the environment, and knowledge strengthens environmental concern. We report the results in Table 2. These parameters should not be interpreted causally; they are reported to provide a first assessment regarding the path linking education to environmentalism.

We find that people with college education are ∼11-12% more likely to answer correctly the questions about the climate and the chemistry of coal burning. Furthermore, people who had the correct responses were also more likely to report a higher level of perceived severity of environmental problems, though the effect is only statistically significant among those who responded correctly to the climate question.

Next, we report the estimates for the mediation analysis. We find some evidence that this sequence is jointly causal (Table 3). Education has a positive effect on environmental concern, and about 9% of it operates through knowledge (95% CI: [4.1%, 52%]). As we can see, the up-

	DV: Knowledge		DV: Environmental Concern	
	(1)	(2)	(3)	(4)
	RE	RE	RE	RE
High school	0.03**	0.06***		
	(0.01)	(0.02)		
College and Postgrad	0.12***	0.11***		
	(0.01)	(0.02)		
Climate knowledge			0.04*	
			(0.02)	
Scientific knowledge				0.02
				(0.02)
Observations	4183	4183	3879	3879
R^2	0.02	0.01	0.00	0.00

Table 2: Predicting climatic and scientific knowledge (models 1 and 2) and environmental concern (models 3 and 4). Heteroskedastic-robust standard errors in parentheses. Symbols: $*$: $p < 0.1$; $**$: $p < 0.05$; $* * * p < 0.01$.

per bound is large. It suggests that up to half of the effect of education operates via knowledge.

The mediated effect's 95% confidence interval includes zero, though barely so.

4.3   Altruism Mechanism

4.3.1   Empirical Strategy

In this section, we test the hypothesis that education makes people more altruistic and concerned

for problems faced by those not in their immediate geographic vicinity. To estimate the effect of

altruism, we randomly assigned respondents to one of the following two treatment conditions.

First, we gave half of the respondents the following information: "*Chemical oxygen demand is*

a measure of water pollution. Water bodies affected by higher levels of organic pollution con-

sume more oxygen to decompose organic matter. Studies have shown that this is particularly the

*case in **the province of Qinghai**.*"[5] (Treatment=1) The rest of the respondents were given the

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[5]Qinghai is rural province in the Western part of China and not covered by our survey.

	Mean	**95% CI**
ACME (via knowledge)	0.004	[-0.001, 0.009]
Direct effect of college education	0.036	[0.001; 0.077]
Total effect of college education	0.04	[0.005; 0.081]
% of total effect mediated	9.3%	[4.1%; 52%]

Table 3: Results of the mediation analysis (using climate knowledge as mediator). Outcome equals 1 if the respondents said 'somewhat' or 'very' severe to the question *In your opinion, how severe are environmental problems in your locality?*. Education equals 1 if the respondent went to college and 0 if not (non-responses removed). All models adjust for age and gender. See **??** for the same analysis using scientific knowledge as alternative mediator.

following information "*Chemical oxygen demand is a measure of water pollution. Water bodies affected by higher levels of organic pollution consume more oxygen to decompose organic matter. Studies have shown that this is particularly the case in **your locality**.*" We immediately follow the information with the question "On a scale of 1-10, how favorable are you with an environmental tax on your purchases so more governmental funds may be diverted to solve this problem?"

To evaluate the effect of education, we then interact the treatment with the respondent's educational attainment. According to this hypothesis, the effect of distance from the site of environmental damage should be weaker for those who are highly educated. The model we estimate is:

$$\text{Support for env. tax} = \beta \text{Treatment}_i$$

$$+ \gamma \text{College}_i + \delta \text{Treat}_i \cdot \text{College}_i + \varepsilon_i.$$

4.3.2 Results

The results are reported in Figure 5. The treatment (COD affecting Qinghai) operates as expected. People are less willing to support an environmental tax if the problem concerned a
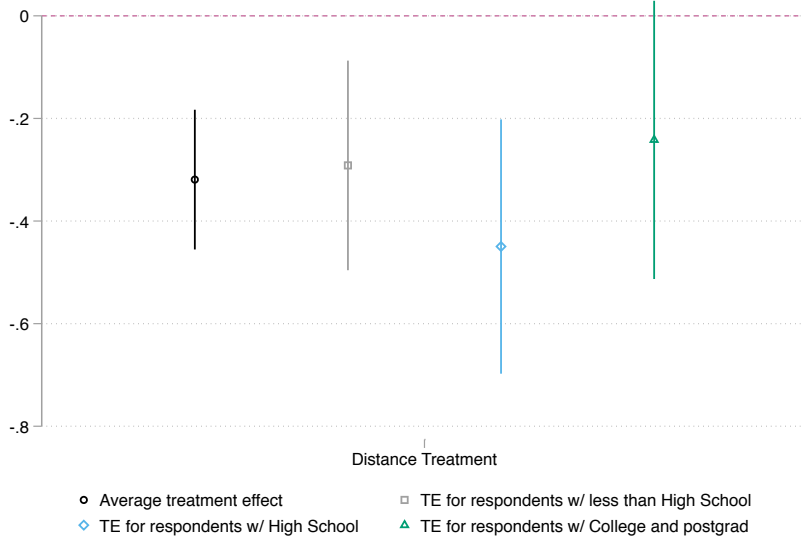
Figure 5: Outcome: "On a scale of 1-10, how favorable are you with an environmental tax on your purchases so more governmental funds may be diverted to solve this problem." Confidence intervals built with robust standard errors.

remote province of China instead of their own locality. The effect is very weakly attenuated for individuals with college degrees. Given the size of the confidence intervals, however, we find the estimates to offer little support for this hypothesis. It does not appear that environmental altruism increases for individuals who are more educated.

4.4 Time Horizon Mechanism

4.4.1 Empirical Strategy

In this last section, we test whether more educated citizens place more value on the future through an experiment embedded in our survey. We randomly assigned the following two questions to respondents. For half of the group, we gave them the following information: "Greenhouse gas emissions are believed to lead to a change in our climate. *Some studies show that it is already a major problem now.*" (Treatment=0) For the other group, we give them the following information: "*Some studies show that it will become a major problem within the next*

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30 years." (Treatment=1) We then immediately ask all subjects: "Would you support promoting renewable energy, such as solar and wind power, to reduce greenhouse gas emissions and tackle climate change even if it is costly to the economy and reduces employment?" (strongly supportive; somewhat supportive; somewhat against; strongly against.)'

We estimate the level of support for renewable energy at the expense of economic development and employment using the following model:

$$\text{Support for renewables} = \beta \text{Treatment}_i$$

$$+ \gamma \text{Education}_i + \delta \text{Treat}_i \cdot \text{Educ}_i + \varepsilon_i.$$

Here we are in fact estimating whether the more educated are more or less likely to respond to information about the urgency of the climate change problem. We expect the treatment effect to be large (and negative) for people with low levels of education, and closer to zero for people with high levels of education. This is because they should discount the future less than others.

4.4.2 Results

The results are summarized in Figure 6. As expected, the treatment (greenhouse gas emission will become a problem within the next 30 years), on its own, reduces support for a pro-climate policy. This is a typical discounting effect. What is key for the purpose of our analysis is whether this effect is muted for individuals with high levels of education. We find little evidence that this is the case. Highly educated individuals are, if anything, even less likely to support the policy. This seems inconsistent with a theory in which education increases the value of the future. Our data therefore offer little support for this causal channel.

Conclusion

Our study fills both theoretical and empirical gaps in existing research on the formation of environmental attitudes. Empirically, although there is a vast literature on environmental attitudes
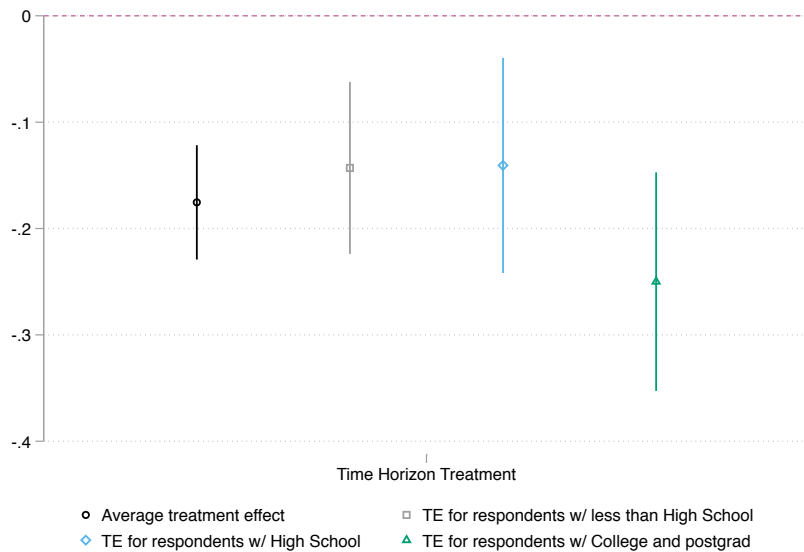
Figure 6: Outcome: "Would you support promoting renewable energy, such as solar and wind power, to reduce greenhouse gas emissions and tackle climate change even if it is costly to the economy and reduces employment?" (from 0 to 3). Confidence intervals built with robust standard errors.

in OECD countries exploring a multiplicity of factors, research outside OECD cases remains scarce. As emerging economies' global impact continues to grow, there is considerable value in understanding how environmental attitudes form and will likely evolve in these countries. It should be noted that even though we based our study in the global south, our findings should not be read as being exclusively applicable to citizens in these countries.

Further, most research on environmental attitudes has focused on democracies (especially wealthy democracies) with few exceptions (Aklin et al., 2013; Liu and Mu, 2016). However, the myth that public opinion does not matter in non-democratic contexts has long been dispelled. In developmental authoritarian states like China, the regime needs to balance the twin imperatives of economic development and environmental protection—the lack of either may bring about social instability. Environmental protection is thus a significant governance challenge across regime types (Bernauer and Koubi, 2009).

Theoretically, we make two contributions to the literature on environmental attitudes and the formation of public opinion more broadly. First, we find little evidence for the impact of income on individual environmental concern: richer people are not significantly more concerned about the environment than poorer people. Instead, we find education to be the most important driver of environmental concern both within China and more broadly in the global south.

Second, we offer the first systematic study to test specific mechanisms that link education to environmentalism. We find that knowledge is an especially important and significant mediator of education and environmental concern. In contrast, we find little evidence that education expands either individual time horizons or altruism. In other words, education produces more *informed* citizens who end up caring more about the environment, but not more *altruistic* or *future-oriented* citizens.

Our findings have important implications for environmental and climate policies and activism. First, our findings suggest that we should not expect post-material values such as environmental concerns to form naturally as income levels rise in the developing world. For governments that are interested in addressing environmental problems, increasing the quality and access to scientific education should be the priority.

Most importantly, we find that enhancing knowledge is still the best way to raise environmental concern among the general public. Our findings suggest that messages that speak to the altruistic and future-oriented sides of mankind (e.g., images of melting ice sheets or starving polar bears) would be less effective than messages that more directly speak to individuals' immediate self-interest (e.g., "climate change is happening *now* and happening to *you*"). Future research should further explore whether different types of education (liberal arts v.s. STEM) produce different kinds of environmental citizens.

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