From Awareness to Action: Informational Shocks and Demand for Environmental Regulation

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Abstract

Protecting the environment is often plagued by collective-action problems, so it is important to understand what motivates politicians to act. This paper investigates whether public information can influence popular demand for environmental regulation, and explores how information interacts with education, income, and exposure to pollution. To this end, I exploit the 1962 publication of *Silent Spring*, the first environmental science book to succeed in disseminating environmental concerns among the American public. Combining historical U.S. congressional roll-call votes and census data, I define demand for environmental regulation in terms of the total number of pro-environmental votes in Congress. I find that the propensity of politicians to vote in favor of pro-environmental regulation increased by 5 to 33 percentage points after the publication of the book. The response to the informational shock varies with the constituency's level of education, income, and exposure to pollution.

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1 Introduction

How to control pollution and combat climate change in the face of increasing global demand for energy are among the most pressing policy challenges facing the world today.[1] The rapid growth of the world's population and the economic catch-up of developing countries have been closely accompanied by a steady increase in all forms of pollution, which threatens the health and well-being of current and future generations. Despite the importance of pollution, the world is failing to control it effectively, with the most powerful countries among the top CO_2 polluters.[2] Since protecting the environment is often plagued by collective-action problems, understanding what motivates politicians to act is crucial to create effective pro-environmental regulation. In this paper, I argue that public information increases awareness, investigate whether awareness can influence public demand for environmental regulation, and explore relevant channels.

Addressing the relationship between information and demand for a clean environment can be challenging because the stock of information held by any given individual is often endogenous, likely influenced by personal characteristics such as level of education, income, and exposure to pollution. Isolating potential mechanisms requires exogenous variation, which is especially hard to find in this context. To overcome this problem, I exploit a particular historical event in which an informational shock reached a wide range of the U.S. population, offering novel information in a reasonably exogenous, rapid, and homogeneous manner. Serialized in *The New Yorker* during the summer of 1962 and published that September, *Silent Spring* was the first environmental science book to succeed in disseminating environmental concerns among the American public. It did so by documenting the detrimental effects —particularly on birds— of the indiscriminate use of pesticides. It denounced that powerful synthetic insecticides such as DDT were poisoning the food chains, that they had been shown to cause cancer, and threatened wildlife. Though the book focused on pesticides, the main takeaway was broader: the importance and fragility of our environment, and the detrimental consequences of pollution. The book was highly publicized by the media and was credited with increasing awareness and public support for environmental protection (Parks, 2017).[3]

In this paper, I examine the effect of a sudden increase in the stock of environmental information, generated by the publishing of *Silent Spring*, on actual demand for envi-

[1] See OECD green growth studies, Jänicke (2012), or Acemoglu et al. (2012) for additional references.

[2] China, United States, India, Russia, and Japan are the top carbon dioxide polluters according to the European Commission and Netherlands Environmental Assessment Agency (2015); they are also at the top of the National Power Index according to the United Nations (2007).

[3] It was later credited with the creation of the Environmental Protection Agency: `https://archive.epa.gov/epa/aboutepa/birth-epa.html`

ronmental regulation. To this end, I combine historical records of U.S. congressional roll-call votes held in the 84th through 91st Congresses (January 3, 1955 to January 3, 1971), census data, and cross-sectional estimates of pollution levels. I define demand for environmental regulation in terms of the total number of pro-environmental votes in Congress, i.e., positive votes for environmental bills.[4]

To identify the overall effect of the book on demand for environmental regulation, I use an event-study identification strategy that compares the fraction of pro-environmental votes before an after *Silent Spring* was published, controlling for an underlying linear trend. Identification comes from detecting discontinuities in the time-trend around the publication of the book. The most important assumption is that the trend up to the publication date is a good counterfactual for the outcomes of interest. I find that the propensity of politicians to vote in favor of environmental regulation increased by 5 to 33 percentage points after the book came out.

I then examine how information interacts with education, income, and exposure to pollution. To do this, I compare the characteristics of the population who lived in congressional districts in which "environmental" politicians were elected —defined as those who would later vote in favor of environmental regulation— with those of populations living in districts where "non-environmental" politicians were elected, before and after 1962, and including interactions of the informational shock with education, income, and pollution exposure. I find that the effect of the book on demand for environmental regulation was higher among less educated people. This finding is consistent with the idea that public information and education are substitutes in the production function of awareness, which in turn raises demand for environmental regulation. I complement this before-after analysis with an intensity-of-treatment approach that uses access to mass media (television) as a proxy for the intensity of the treatment.

The interactions between information, education, awareness, income, and pollution exposure, and their combined effect on overall demand for environmental regulation, are not, *ex ante*, clear. In Figure 1, I propose a framework for thinking about this. I hypothesize that information and formal education are inputs in the production function of awareness (knowing about the need for environmental regulation). Awareness, in turn, interacts with income and exposure to generate demand for a clean environment. That demand might be observed when it translates into various actions. Some actions are directed toward protecting against the harms of pollution. This may be achieved by, for example, moving out of a polluted neighborhood, buying water and air filters, or purchasing health insurance. Other actions might be directed toward reducing pollution; such as driving green cars, using public transportation, switching to solar energy, or

[4] I did not find any explicitly anti-environmental bills in the period.

participating in elections and voting for politicians who push for environmental regulation. In this paper, I focus on this last action, which I call demand for environmental regulation. Income enters the framework in two ways: first, it influences education attainment, and later, it influences demand and final action through its role in the budget constraint.

The magnitudes and directions of the interactions of education, income, exposure to pollution, and information in the production of demand for environmental regulation, are also unclear. Education affects one's ability to obtain, process, and act upon scientific knowledge. In the scenario that pollution poses a direct threat to human health, as long as individuals recognize this, advances in environmental knowledge (and access to information) will lead to greater environmental interest among the most educated people first, followed by eventual improvements among less educated people as the knowledge diffuses. This suggests a complementarity between education and information. It can be argued that this effect would be even stronger in the areas that are most polluted, or where local or regional environmental issues pose serious threats to human health, at the time of the election. Moreover, this theory may also apply when the worst consequences of environmental mistreatment lay in the future —posing a stronger threat in old age or even to future generations— to the extent that the highly educated are better at handling intertemporal trade-offs.

But perhaps well educated people are neutral or even less likely than lesser educated people to support collective action to protect the environment in response to an informational shock. In the extreme case in which information and education are perfect substitutes, the shock would have no impact at all on awareness, and therefore the cycle would stop. On the other hand, even if awareness increased, highly educated people tend to also be richer, and therefore better able to protect themselves from (short-run) effects of pollution. Some of these affluent people might also own, benefit from, or sympathize with the polluting firms and industries, so health concerns are not the only variable at play. The effect of income is not clear-cut either, since some low-income individuals might work for polluting industries. The same happens with exposure to pollution. The most exposed, and the poor, may face a trade-off between health and income. In this case, those individuals who have the most to gain from environmental regulation (because they are the most exposed to pollution) may also have the most to lose.

My empirical approach is likely to understate the demand for environmental regulation. Whether the channel is concerned constituents electing pro-environmental members to Congress, or the latter trying to better represent their constituency, the link between public environmental concern or willingness to act on that concern, and what their representatives actually do when elected to office, can sometimes be blurry. Nonetheless, to the extent that politicians represent their constituencies when voting, this setting can serve to measure demand for environmental regulation. I am not the first to measure demand in this way (see Kahn, 2002).

The rest of this paper is organized as follows. Section 2 describes the book and the regulatory context of the time, Section 3 summarizes the literature, Section 4 describes the data, Section 5 outlines the empirical approach, Section 6 presents the results, Section 7 discusses robustness checks, and Section 8 concludes.

2 The Book and Regulatory Context

Silent Spring is an environmental science book written by Rachel Carson and published on September 27, 1962. It documented the adverse environmental effects caused by the indiscriminate use of pesticides and advocated for environmental protection. This book was highly influential at the time and is widely credited with triggering popular ecological awareness in the United States.

> Few books have been credited with inducing as much social and political change as Rachel Carson's *Silent Spring*. Published in September 1962, *Silent Spring* synthesized scientific research on the toxicity of chemical pesticides, most notably DDT, as the foundation for a polemic against unreflexive science and for a holistic, ecological approach to environmental management. Half a century later, the book is still widely cited in both academic journals and popular media, less for its contents than for its generally accepted role as a catalyst for environmental awareness, activism, legislation, and regulation that changed the character of people's relationship with government and nature. (Meyer and Rohlinger, 2012)

Indeed, the book's influence on public opinion was credited with spurring environmental regulation, from the Clean Air Act (1963, 1970) and Clean Water Act (1972) to the establishment of Earth Day (1971) to President Nixon's founding of the Environmental Protection Agency (EPA, 1970), a federal agency whose mission is protecting human health and the environment (Kline, 2011). In 1972, the U.S. banned the production of DDT and its agricultural use, and a worldwide ban on its agricultural use was formalized under the Stockholm Convention (see Figure 2 for a timeline of environmental regulation in relation to *Silent Spring*).

How did this happen? For starters, *Silent Spring* was widely publicized by the media. By the time *Silent Spring* was published, advance sales had already reached 40,000 copies, and the *The New Yorker* was serializing chapters of the book, resulting in more than 50 newspaper editorials and numerous news accounts and other stories. The book quickly made it onto the *New York Times*'s bestseller list and was then selected by the Book-of-the-Month Club, both of which extended its geographic reach. As it arrived in bookstores that fall, more news stories and book reviews appeared. Publicity included a note in the *Los Angeles Times* and a positive editorial in *The New York Times*, and excerpts of the book were published in the National Audubon Society's magazine, as well as various magazines and newspapers, such as *Chicago Daily News*. On April 3, 1963, CBS aired a one-hour telecast on Rachel Carson and her book in its documentary series, CBS Reports, further spreading the book's main message through television. The web Appendix contains pictures of articles and popular cartoons featuring *Silent Spring*—evidence that the book had became part of the popular culture and that a considerable portion of the population knew of the book and its message.

Silent Spring was not the first book to discuss these topics. Books on organic farming, nature, and wildlife conservation had been published before, though without nearly as much fanfare. In fact, only six months before Carson, Murray Bookchin published a book denouncing the harms of pesticides (*Our Synthetic World*), but it did not become popular, perhaps because it lacked the passionate sense of urgency embedded in Carson's writing, perhaps because it lacked a publication strategy.[5] Since the publication of *Silent Spring*, however, as shown in Gould and Lewis (2009) (reposted as web Appendix Figure A3), the number of new books listed in the Library of Congress under environmental headings began growing exponentially, together with the creation of regional and national environmental organizations. Gould and Lewis (2009) also point out an apparent compositional change in these organizations: after 1962, not only did more people become interested in the environment, but they also did so in a stronger, more radical way, pushing harder for changes in public policy. This finding is consistent with other studies. According to *The New York Times*'s Annual Event Index, the 1963–1967 period was characterized by higher rates of environmental protests than the 1960–1962 period (Agnone, 2007). Eventually, Congress passed the National Environmental Education Act of 1990, which promoted environmental education initiatives at the federal level.

It is central for this study to establish not only that the book's message reached a wide range of the population, but that this actually increased awareness about environmental issues. Unfortunately, there are no reliable surveys prior to the creation of the EPA, in 1970, that would allow me to track the levels of public support for environmental regulation before and after the publication of *Silent Spring*.[6]

[5] See Fox (1981), for a historical account of the conservation movement.

[6] Agnone (2007) creates an index of environmental public opinion from 1954 onward, but warns the reader about its limitations: it has many missing observations and combines surveys for different years, geographic scopes, and questions which are not necessarily comparable to one another.

Despite being heavily promoted, the book didn't immediately affect the amount of legislation voted on in Congress in regards to environmental protection, as one would initially expect, though there is evidence of a positive trend in the 1960s.[7] The first step toward environmental regulation is an entity capable of supervising and enforcing the regulations approved by Congress. Thus, the rise in the number of issues discussed previous to 1970 won't be a good measure of the demand for environmental regulation in the country: so many things changed in two decades that it would be hard to identify a clean effect of the book on issues discussed in the EPA era (1970 onward). However, the eight-year delay in producing certain types of environmental regulation provides an excellent setting for studying variations in the composition of demand for a clean environment. The fact that the nature and the number of environmental bills weren't changing significantly as a result of the informational shock strengthens the identification assumption of my model. By the time *Silent Spring* came out, some water-pollution regulation was already in place, but no equivalents existed for air pollution. By 1962, scientific research and interest in this topic was just nascent, and the population was generally unaware of (and uninterested in) the detrimental effects of pollution, let alone of how to help.

3 Literature

The literature on determinants of the demand for environmental regulation can be roughly divided into three (sometimes overlapping) categories: that which tries to infer preferences from surveys, that which tries to infer preferences from behavior (such as migration, housing prices, and sales of particular products), and that which directly examines willingness to take action on environmental regulation, looking at Congressional roll-call votes. In this section, I summarize some of the main findings of the literature.

Part of it has documented the demographic characteristics of green (pro-environment) voters, by attempting to understand the degree of correspondence between the actions of politicians and the preferences of their constituency. Kahn (2002) finds that demographic and economic changes may contribute to increasing aggregate demand for environmental regulation. Moreover, he finds that stated survey attitudes and actual choices consistently show that more educated people and minorities tend to be more pro-environment, and that manufacturing workers tend to oppose environmental regulation (minorities may be over-concentrated near environmental hazards and thus would benefit from cleanups).[8] This suggests that direct votes on environmental regulation may be consistent with re-

[7] I classify regulation either as environmental or non-environmental by searching systematically for certain keywords in the synopsis of each issue discussed in Congress. I end up focusing on the words "pollution" and "clean". For more details, see Section 4.

[8] General Social Survey, conducted annually since 1972.

ports from attitude surveys. Holian and Kahn (2015) find that household voting patterns mirror congressional voting patterns on national carbon legislation, and they argue that stated preferences based on microdata are highly informative for predicting local aggregate voting.[9] In addition, they conclude that political liberals and more educated voters favor environmental protection while suburbanites tend to oppose it. A narrower literature looks at the role of expertise in demand for environmental regulation. Morris and Smart (2012) reveal that doctors in 1980–2000 were not more willing to pay to live in less polluted areas than anyone else, once income and educational attainment are controlled for, rendering expertise an irrelevant determinant in demand for clean air.

A possible explanation is that nowadays information and awareness about environmental issues are sufficiently widespread across the population that being a physician does not make a difference anymore. A way to study whether educated people have better access to environmental information or are more able to process it, is to go back to a time when the general public knew little about environmental threats to human health, nature, wildlife, and the planet. In this regard, focusing on the 1950s and 1960s may be of value. The literature has focused mostly on data that emerged after 1970, and little is known about the period prior to the EPA, especially involving demographic and pollution variability across geographic areas.

A smaller line of research has addressed the potential effects of media coverage and/or salient events on demand for a clean environment. Kahn (2007) shows that unexpected events such as environmental catastrophes capture wide public attention. He finds that congressional representatives were actually less likely to vote in favor of bills tied to these events, probably because these bills were much more demanding than the standard ones discussed in normal years. He also finds that liberal representatives from the Northeast were most likely to increase their pro-environment voting in the aftermath of these shocks. Closer to my own question, Brulle et al. (2012) argue that extreme weather events, media coverage, and public access to accurate scientific information are not significant explanatory variables of public environmental concern, while elite cues, media advocacy, and economic measures seem to be very important. In particular, the authors find that *The New York Times*'s mentions of *An Inconvenient Truth* —a proxy for the extent of overall media attention to the 2005 film— significantly boosted the public's perception of the urgency of climate change. Based on this finding, and by analogy, I would expect to see an important effect of *Silent Spring* on public interest and concern for the environment. However, Nolan (2010) finds that viewings of *An Inconvenient Truth* increased viewers' knowledge, concern, and reported willingness to reduce greenhouse gases, but that this

[9] This sets an optimistic precedent for my current methodology; see Guber (2001) for a more skeptical view.

impact was short-lived and not likely to lead to direct action.

In addition, it has been shown that cultural production may contribute to spreading interest and awareness. In a second paper, Brulle et al. (2012) argue that, by publishing ideas about environmental problems in books and magazine articles, and engaging in publicity campaigns, critical intellectuals and their responsive critical communities create the social networks and commitments that eventually generate new environmental movement organizations (EMOs). In a similar vein, Agnone (2007) uses time-series data from 1960 to 1998 to test hypotheses regarding the impact of protest (as measured by *The New York Times* event annual index) and public opinion (as measured by surveys) on the passage of U.S. environmental legislation. Evidence points to an amplification mechanism between environmental movement protest and public opinion, where public opinion affects policy above and beyond its independent effect when protest raises the salience of the issue among legislators.

Few papers have attempted to analyze the role of informational shocks or understand the channels through which they affect demand, and economists haven't reached a consensus yet regarding this topic. Moreover, reliance on surveys to elicit demand is widespread. I can complement these findings by inferring demand from actions and thus shed some light on the obscure link that connects awareness, concern, and action. In addition, understanding the role of education and the channels through which it acts remains an open question, specifically regarding whether educated people process information differently, and thus respond differently to informational shocks. And of course, climate change is a serious worldwide concern(Acemoglu et al., 2012) that requires regulation. Learning about how voters and politicians think and what motivates their actions is therefore crucial. When environmental awareness affects voting behavior (as opposed to just raising concern), carefully designed information campaigns are powerful means to expedite environmental protection.

4 Data

The Inter-university Consortium for Political and Social Research (ICPSR) houses data on all roll-call voting records for both chambers of the U.S. Congress.[10] The Senate comprises 100 members (senators), two per state, in office for six years; the House of Representatives comprises 435 members (representatives) in office for two years, where

[10] In the United States Congress, a bill is a piece of legislation proposed by either of the two chambers of Congress. Anyone elected to either body can propose a bill. After the House of Representatives approves a bill, it is considered by the Senate. After both chambers approve a bill, it is sent to the President of the United States for consideration.

each state is represented in proportion to the size of its population and entitled to at least one representative. My unit of analysis is an individual member of Congress. Each ICPSR record contains a congressman's voting action on every roll-call vote taken during a specific Congress, along with identifying characteristics (name, party, state, district and most recent means of attaining office). In addition, the data contains descriptive information for each roll-call, including a synopsis of the issue, which I use to classify the legislation as either environmental or nonenvironmental. First, I identify issues that refer to environmental regulation by searching for specific keywords in their synopsis. Then, I review each issue to ensure a correct classification of the bill, keeping only those that propose pro-environmental regulation. In particular, I end up focusing on issues that contain the words "pollution" and/or "clean" in their synopsis. See web Appendix Table A1 for my complete selection of environmental issues.

To include characteristics of the constituencies, I merge the roll-call dataset with census data. Lewis et al. (2013) provide digital boundary definitions for every congressional district in existence between 1789 and 2012.[11] NHGIS provides the equivalent for census counties and tracts.[12] Using both maps, I merge congressional districts to census counties. County-level data on the Census of Population and Housing, Business, and Agriculture are also available in ICPSR.

Next, I add geographical variation in pollution. Measures of pollution before the EPA was created are scarce. The EPA provides diverse measures of air pollution by state and year for the 1950s and 1960s, and state-level emissions for SO_2 and NO_X since 1900. This data, however, is not available on a county or district level prior to 1970, and even so, it is not available for every U.S. county. Therefore, in this paper I use the available data from the 1970s to proxy for county-level pollution in my period of interest.[13] This data has some limitations. First, data collected in the early 1970s could have been affected by protective measures taken after the publication of *Silent Spring*; however, most of the effective actions to protect the environment took place after the creation of the EPA in 1970, so I think that using it is reasonable. Second, including pollution data from the 1970s costs me many observations, since 1970 data is available for only 30% of the sample. Another concern is the potential for selection in the counties that report their air quality: those counties that are suffering the most pollution or host the most environmentally-concerned residents might have more incentives to record pollution levels, generating a spurious relationship between pollution and other characteristics of the county. To

[11] cdmaps.polisci.ucla.edu

[12] www.nhgis.org

[13] The EPA's county-by-year Air Quality Index for 1970 was retrieved from: https://www3.epa.gov/ttn/airs/airsaqs/detaildata/AQIindex.htm. The state-by-year SO_2 and NO_X emissions for 1950–1970 were sent to me upon request.

address these concerns, in the paper I present several robustness checks with alternative pollution controls. For instance, the USDA Census of Agriculture provides data on farm labor, specified farm expenditures, and use of commercial fertilizer at the county level for 1954, 1959, 1964, and 1969. Alternatively, I use county-by-year level infant mortality (Census of Vital Statistics) and cause of death (National Center for Health Statistics, 1959–1971) as proxy for deleterious effects of pollution. The latter has the advantage of being available for all counties in a high frequency.[14]

5 Empirical Approach

5.1 Baseline

In this section, I use an event-study approach to assess the overall impact of the informational shock on a measure of demand for environmental regulation based on how politicians vote in Congress. My unit of observation is the vote of a specific member of Congress i representing state or congressional district c on a specific issue/bill b, at a specific date t (day, month, year) and chamber, for all environmental issues discussed from the 84th through the 91st U.S. Congresses.[15]

$$EVote_{pctb} = \alpha + \beta Post_t + +\delta Trend_t + \gamma X_{tc} + \epsilon_{itpc}, \tag{1}$$

where *EVote* is a binary variable representing a pro-environmental vote in any given (environmental) bill, *Post* is a binary variable indicating all time periods after the publication of *Silent Spring*, *Trend* is an annual trend used as a baseline control, and X is a set of controls at the national, state, and congressional district level that may include state fixed effects, district fixed effects, and state-specific trends.

The book was published in September 1962, at the end of the 87th U.S. Congress. I focus on the time window between the 84th and the 91st U.S. Congresses, from January 3, 1955, to January 3, 1971. No environmental issues are discussed in December 1970 or January 1971, implying that my sample effectively ends before the creation of the EPA on December 2, 1970.[16]

[14] Other sources of information may become available in the future. Clay et al. (2015) digitized new information on plant-level coal consumption, county-level air quality (TSP) measures and infant mortality rates for (the very few) counties with available information in the 1954–1962 period. Federal Power Commission Reports provide data on thermal-power-plant coal consumption and location. In the future, I might use industrial composition interacted with known pollution levels by industry as a proxy for local pollution levels.

[15] By environmental issue, I mean those that include the words "pollution" or "clean" in their synopsis.

[16] The Congress starts and ends on the third day of January of every odd-numbered year.

In my analysis, I run specifications with votes from both chambers of Congress first, and then limit the sample to bills discussed in the House of Representatives. The advantage of focusing on the House of Representatives is that more environmental bills are discussed in this chamber (not just the ones that are already pre-approved), that there is a larger number of representatives than senators and therefore a larger number of observations per bill, that representatives are in office for a shorter period of time and thus up for reelection more frequently (every two years), and that representatives are elected in congressional districts rather than states, which is adequate for analyzing the relationship between congressional votes and characteristics of the constituencies.

To address the concern that standard errors may be correlated within electorate regions, I cluster standard errors by state when running my analysis on both chambers, and by congressional district when focusing on the House of Representatives. To improve the precision of my estimates and absorb biases, I include a wide range of controls.

The key identification assumptions are that (i) all states and districts received equal treatment —no selection into treatment—, and (ii) the timing of the treatment was exogenous to demand for environmental regulation. The first assumption requires that news about the book or the general content of the book spread homogeneously across the population. It will fail to hold if, for example, talk about the book was more abundant in areas where more environmentally concerned people live. It could be that newspapers and magazines made more references to *Silent Spring* in counties where people's concern about the state of the environment was already relatively high. To address this concern, I use data on cross-county access to mass media, in particular to television.[17] I generate an index that serves as a proxy for cross-sectional intensity of the treatment, which is more likely to be exogenous to the model. This will also help address the second assumption. I argue that though small groups of the population were becoming aware of environmental matters, the exact date the book was published was exogenous. Other books of similar topics were published before and after, without capturing the public's attention. This may suggest that it wasn't so much that public interest pushed for the book to be published and communicated, but the other way round.

5.2 Channels

In this section, I propose an empirical approach to study the channels through which the publishing of *Silent Spring* may affect demand for environmental regulation.

To better understand what I'm trying to achieve, refer to Figure 1. Arrow 1 is a definition (or assumption) stating that the informational shock increases the stock of public

[17] I would like to include radio and newspapers in a future iteration of this paper.

information. All the other arrows illustrate testable hypotheses analyzed in this paper. I start by arguing that the book did, in fact, increase overall awareness in the population (an aggregation of arrow 2), by showing circumstantial evidence and analyzing the evolution of public-opinion surveys. Then, I conduct a direct-effect or baseline analysis, where I control for education, income, and exposure to zero out education in arrow 2, exposure to pollution in arrow 4, and both directions of the income effects in arrow 5, to try to identify arrow 3. The heterogeneity analysis follows, and I use interactions of the informational shock with education, income and exposure to learn more about the channels represented by arrows 2, 4 , and 5, respectively. Arrow 2 suggests that the combined stock of information and education determines the level of awareness. How this combination works is an empirical question.

In order to dissentangle the controbution of specific attributes of the population to the demand for environmental regulation in response to the book, I run the regression shown below. Once again, the unit of observation is the vote of a specific House member i on a specific issue/bill b, at a specific date t (day, month, year), for all issues related to the environment in my study period:

$$\begin{aligned} EVote_{pctb} = \alpha + \beta_1 Post_t + \beta_2 Educ_{ct} + \beta_3 Inc_{ct} + \beta_4 Expos_{ct} \\ + Post_t(\beta_5 Educ_{ct} + \beta_6 Inc_{ct} + \beta_7 Expos_{ct}) + \delta Trend_t + \gamma X_{ct} + \epsilon_{itpc}. \end{aligned} \tag{2}$$

Once again, *EVote* represents a pro-environmental vote, *Post* is a binary variable indicating all time periods after the publication of *Silent Spring*, *Trend* is an annual trend used as a baseline control, and X is a set of controls at the national, state, and congressional district level that may include state fixed effects, district fixed effects, and state-level trends. The innovation here is that I include an indicator for the level of education (*Educ*), median family income (*Inc*), and exposure to pollution (*Expos*) before and after the release of *Silent Spring*.

The main difference with the previous specification is that now we can distinguish between the overall effect of information that is associated with higher income, higher education, or higher exposure, respectively. A positive (negative) estimate of β_5 would suggest that information and education are complements (substitutes) in the production function of environmental awareness, which in turn increases pro-environmental voting.

Below, I present a full specification, which allows me to assess more specific channels by adding flexibility to the model.

$$
\begin{aligned}
EVote_{pctb} = \alpha + \beta_1 POST_t + \beta_2 Educ_{ct} + \beta_3 Inc_{ct} + \beta_4 Expos_{ct} \\
+ \beta_5 Educ_{ct} Inc_{ct} + \beta_6 Educ_{ct} Expos_{ct} + \beta_7 Inc_{ct} Exp_{ct} \\
+ POST_t(\beta_8 Educ_{ct} + \beta_9 Inc_{ct} + \beta_{10} Expos_{ct} + \beta_{11} Educ_{ct} Inc_{ct} \\
+ \beta_{12} Educ_{ct} Expos_{ct} + \beta_{13} Inc_{ct} Exp_{ct}) + \delta Trend_t + \gamma X_{ct} + \epsilon_{itpc}.
\end{aligned} \tag{3}
$$

Controls may include district, race, and gender ratios, median age, population, schooling, death rates, state or district fixed effects, and state-level trends. I use robust standard errors in all regressions, clustered by congressional district.

The identifying assumption here is that, within each congressional district, and keeping all control variables fixed, the timing of the treatment is independent of any other variables that correlate with the evolution of the relevant interactions over time. This would be violated if, for example, the publication of *Silent Spring* coincided with actions from environmental activists who systematically sought support from the most educated and pollution-exposed individuals. This would bias upward the estimated coefficient β_{12} associated with $Post_{ct} Educ_{ct} Expos_{ct}$.

6 Results

6.1 Baseline

In this section, I present the baseline results. There were nine possible voting outcomes.[18] I use the standard binary Yes count for the main outcome and check the robustness of my results later using two alternative indicators.[19] Since the environmental regulation I work with is all pro-environmental, a Yes vote is equivalent to a pro-environmental vote.

First, I present a graphical analysis. Panel A in Figure 4 shows a scatter plot of the fraction of pro-environmental votes by chamber and environmental bill (defined as those that mention "pollution" or "clean" in their synopsis). Red squares represent

[18] The nine categories for the variable vote in Congress are Yes [Y], Paired Yes [PY], Announced Yes [AY], Announced No [AN], Paired No [PN], No [N], General Pair [GP], Present [P], and Not Voting [NV]. When a member of Congress chooses to pair, she is pairing her own vote with an opposite vote, such that her vote gets neutralized. A general pair means that the congresswoman is not being associated with a yes or no answer, while a paired-yes and paired-no mean that she chooses explicitly to be associated with one side or the other, even though, at the end of the day, the vote won't contribute points to that side. The different categories may correspond to different strategies on the part of the member of Congress.

[19] Standard Binary Index: Yes=1=Y=PY=AY, No=0=N=PN=AN. Alternative Binary Index: Yes=1=Y=PY=AY, No=N=AN=PN=GP, Alternative Triple Index: Yes=1=Y=PY=AN, Neutral=0.5=GP=P, No=0=N=PN=AN.

issues voted on in the Senate, and blue circles represent issues voted on in the House of Representatives. Overall, no significant changes show up in trend before and after 1962. If anything, the fraction of pro-environmental votes seems to fall after the release of *Silent Spring*.[20] In closer inspection, we can see that there are very few observations from the Senate; these are driving the negative discontinuity. Panel B plots fitted values for the votes that correspond only to the House, and it shows the expected results: a jump upwards in the share of positive votes for pro-environmental regulation, accompanied by a rise in steepness. This might indicate positive reinforcement.

In figure 5, I narrow the set of environmental regulations to bills that are related to water pollution (the most common theme in the list). Both panels show a consistent increase in the share of positive votes after 1962, in both chambers of Congress. These results are robust to alternative voting indexes (see web Appendix Figure A7). I consider this to be a good selection of environmental issues, and I will continue to report results with both samples throughout the paper.

Then, I present results from my regression analysis. Panel A in Table 1 presents estimates corresponding to equation 1 for all environmental bills in my sample and both chambers of Congress. The unit of observation is given by pairing a bill with a senator or house representative. The treatment is a post-*Silent Spring* indicator, which takes value 1 after the book is released and 0 otherwise. The outcome is an indicator of each pro-environmental vote issued. Note that the graphical analysis implicitly weighs each bill equally, while the regression analysis assigns the same weight to each individual vote. In other words, in the graphical analysis the unit of observation was a bill, while in the regression analysis the unit of observation is a bill-congressman pair.

The results suggest that *Silent Spring* was associated with a significant rise in the probability that a member of Congress votes in favor of an environmental bill. This effect varies from 5 to 33 percentage points, depending on the specification. For instance, the inclusion of control variables in columns 4 and 6 increases the magnitude of the treatment-effect estimate.[21]

Panel B presents estimates corresponding to equation 1 for all water-related environmental bills emerging from both chambers of Congress. The resulting estimates are larger and more homogeneous than before, suggesting that *Silent Spring* was associated with a rise of 22 to 35 percentage points in the probability that a senator or representative votes in favor of (water-related) environmental legislation. This is to be expected be-

[20] This is robust to using alternative voting indexes (see web Appendix Figure A6)

[21] Controlling for total carbon emissions and per capita carbon emissions (reported annually by the EPA), and aggregate quarterly variables such as real GDP per capita, civil rate of unemployment, Consumer Price Index, and total monthly legislation discussed in Congress appears to raise the coefficient of interest.

cause water-related bills before and after 1962 are more comparable to one another than to other environmental bills; the assumption that the only difference between votes before and after the publication of the book was the publication of the book itself is more credible when similar bills are being discussed.

Panel C presents estimates corresponding to equation 1 for all environmental bills in just the House of Representatives. As shown in the graphical analysis, the Senate gets fewer environmental bills and exhibits more volatile voting patterns, suggesting that more strategic behavior may be at play.[22] Thus, the rest of the paper focuses on the House of Representatives. Another advantage of restricting the sample to the House is that now I can include district-level fixed effects and controls. Although the initial specifications suggest that *Silent Spring* was associated with a 6 to 21 percentage-points increase in the probability that a representative votes in favor of an environmental bill, this effect completely disappears after including time-varying controls or district fixed effects.

In other words, Column 1 shows a specification without controls or fix effects, and presents the highest (and most significant) estimate in a manner perfectly consistent with the intuitions carried from the graphical analysis. However, the sign of the estimate becomes negative as soon as controls are included (Columns 5 and 6). Could it be that the controls are somehow not precise enough? As noted below the table, I account for pollution by including death rates and cause of death. I use the share of deaths by pneumonia, food poisoning, and cancer as an indicator of deaths that could be associated with pollution. This is a broad measure that might account for air pollution, water pollution, and soil pollution, and thus it seems reasonable for this analysis. Moreover, these data come with good geographic and temporal disaggregation, and thus I benefit from not having to drop many observations. However, the downside is that it's not a direct measure of pollution.

To inspect this further, Table 3 replicates column 5 of Panel C using alternative cross-section measures of pollution.[23] Column 1 replaces cause of death by the 1970 district-level Air-Quality Index, and column 2 uses 1980 district-level carbon emissions (both available from the EPA).[24] Both columns replace panel controls by their cross-section 1950 equivalents.[25] In contrast to Panel C, these cross-section controls do not eliminate the initially significant and positive treatment effect, which suggests that the publication

[22] This might have something to do with the fact that most bills are born at the House, and must be approved by the House before they are discussed in the Senate.

[23] Its not possible to replicate column 6, since district fixed effects would be perfectly colinear with cross-section pollution, causing it to drop out of the regression.

[24] Maximum level of CO_2 in eight hours.

[25] Many Census questions show little variation from one decade to the next, and thus numbers might not be totally consistent across time. For this reason, I prefer cross-section controls, and I use time-varying controls mostly to include district fixed effects.

of *Silent Spring* was associated with an increase of approximately 15 percentage points in the probability of voting in favor of environmental regulation. These direct and more accurate pollution controls, however, come at a cost in terms of observations. The 1970 data capture only 30% of the sample in Table 1, and the 1980 data about 50%. Moreover, this sample may be subject to selection: since most counties were not recording pollution back then, those for which we have data were likely the most polluted or the most concerned about pollution at the time. Thus, whatever results we see here might not be representative of the rest of the country. The last two columns go back to using only my indirect measure of pollution, with two caveats: Column 3 contains only cross-section equivalents of controls (comparable to Columns 1 and 2), and Column 4 contains time-varying controls, but uses only the sample of observations that would contain 1970 air-quality data. The coefficient in Column 3 comes out negative and insignificant, indicating that the different results I get, compared to Column 5 in Panel C, are exclusively related to my pollution data, and not to the nature (cross-section or time-variant) of the other controls. Finally, the coefficient in Column 4 comes out as significant and even larger in magnitude than the ones found in the first two columns. The takeaway is that the results are not robust to the sample under analysis, and the counties with 1970 and 1980 pollution data may just not be comparable to the rest of the country. This finding suggests that those districts that were most influenced by *Silent Spring*, later, and as a consequence, became the first to start recording their levels of pollution. It could also mean that the most polluted counties or those with the most environmentally sensitive population were the most affected by the book.

Finally, I conduct the baseline analysis for various subsamples of environmental issues. Table 4 shows the results. Columns 1 and 2 use a subsample of environmental bills without the two issues that shaped the the 1963 Clean Air Act. Since this was such an important act, these issues might have received more attention than other bills at the time. Moreover, they bills associated to the 1963 Clean Air Act were the first environmental bills to be discussed in Congress after the release of *Silent Spring*, and were voted on by representatives who were elected just months after the release of the book.[26] Thus, there are reasons to believe these bills might have been outliers. The results seem to sustain this theory with an insignificant (though positive) treatment coefficient in Column 1 (controlling for 1970s air quality) and actually significantly negative in Column 2 (the usual specification, controlling for cause of death and including district fixed effects). However, this is not the end of the story. Restricting the sample to only water-related environmental bills, the original result returns stronger than before, with highly significant

[26] Members of Congress for 1963 were elected on December 1962, i.e., four months after *Silent Spring* came out and about six months from the early sales of the book.

coefficients that suggest a rise of as much as 43 percentage points in the probability that a representative votes pro-environmental. The conclusion is that the results are partly driven by the influential Clean Air Act but also appear in bills that are sufficiently similar before and after 1962. It is likely that the nature of the environmental issues being discussed in Congress changed from one period to the next.

6.2 Channels

The objective of this section is to learn about the arrows proposed in Figure 1. Once again, treatment is an indicator that takes the value 1 after *Silent Spring* was published, and the outcome variable is a standard binary vote index that takes value 1 for a pro-environmental vote, and 0 otherwise. The unit of observation is the vote made by a member of the House on a given bill.

Table 5 displays the estimates corresponding to equation 2 in a sample of all environmental issues discussed in the House. All regressions include a list of time-varying district-level controls, district fixed effects, and state-specific trends. The share of pollution-related deaths is a proxy for pollution. New variables and interactions of interest are added from one specification to the next for a clearer interpretation of the results. Column 1 shows that median family income has a significant and positive coefficient. The interpretation is that an increase of one dollar in the average value at the congressional district level, of the county median family income, is associated with a 0.0018 percentage-point increase in the probability that its representative votes in favor of environmental regulation. Pollution and schooling appear insignificant and have negative signs. It would seem that income is more decisive than education and pollution at the time of voting for environmental regulation. Column 2 includes interactions of these three variables with the post-*Silent Spring* treatment. The three interactions are significant. The income control loses significance and changes sign (becomes negative) in this alternative specification, suggesting that income is not inherently associated with environmental regulation. In fact, it seems the income effect was driven by *Silent Spring*. Perhaps richer counties had better access to the book or to information about the book, and thus responded significantly to its release.[27]

Exactly the opposite happens with median years of schooling: the sign of the control variable becomes positive (and insignificant), while the interaction with the treatment is negative and significant. This suggests that there is no such thing as an inherently negative association between education and demand for environmental regulation. In fact, the impression I got from Column 1 was misleading, and was driven by the fact that

[27] This argument makes sense, especially because *Silent Spring* was publicized by *The New Yorker*.

less educated people were the ones who reacted most strongly to the informational shock, perhaps because they were relatively less informed to begin with. This may suggest a substitutability (rather than a complementarity) between (private) education and (public) information in the production function of awareness (see Figure 1). Pollution displays a similar but even stronger pattern: the pollution control remains insignificant (though it becomes positive, indicating that, if anything, polluted counties would tend to favor environmental regulation) while the interaction with the treatment becomes positive and significant at the 1% level. It seems that *Silent Spring* had a major positive effect among polluted districts. Thus, it is the most exposed (because they have the need), the richest (because they have the means), and the less educated (because they now have more information) that react most strongly to the informational shock, leaving everything else constant in each case.

Column 3 adds an extra layer of interactions to all variables of interest. Lets take income. Median family income appears now to be inherently positively associated with environmental regulation. It would appear that *Silent Spring* either encouraged poor people to demand environmental regulation, or discouraged the rich, and that income and education are substitutes in terms of voting for environmental regulation but became complements after *Silent Spring* came out. In other words, the positive effect of income in the demand for environmental regulation operates mainly through its interaction with education: the richest, most educated people tended to oppose environmental regulation before the shock, and are the ones who reacted most strongly in favor of environmental regulation after the informational shock. Last, Column 4 includes the most complete specification. Nothing comes out significant except for a positive effect of education, overall, on the propensity to vote green. However, all the signs from Column 4 remain unchanged. This specification contains fewer observations per variable of interest, which decreases the power of the statistical test to detect significant effects.

In short, the shock appears to have heterogeneous effects that wash out when we increase by too much the number of channels. The pattern is not necessarily robust to variations in the sample. See Table 6 for the results that correspond to the sample with 1970s air pollution data.

6.3 Intensity of Treatment

I complement the previous analysis using existing ICPSR data on county-level access to public media (television) to capture the intensity of the informational shock.[28] The idea

[28] In the future, I might incorporate radio and newspapers.

behind this approach is that areas that didn't have access to this source of information were less likely to learn about *Silent Spring*, and thus, less likely to alter their voting patterns in elections. I expect to find a positive and significant coefficient when using access to media in a reduced-form analysis. The implicit assumption is that inhabitants of counties with less access to information were not any less (or more) inherently concerned about the environment than people living in other regions. This would not hold if, for instance, environmentally sensitive individuals tended to demand broader access to media. A product's early days, however, often give rise to variation in ownership that might depend on exogenous (remoteness) or observable (income) factors. In fact, between 1949 and 1969, the number of U.S. households with at least one television set rose from less than a million to 44 million, indicating that the lack of TV access could have been due to difficulties in acquiring the product rather than to a lack of interest.[29] Moreover, there seems to be considerable overall and within-state variation in the distribution of the share of TV-owning households per county in 1960 (see web Appendix Figure A8).

Table 7 shows results for the intensity model, taking into account all environmental issues discussed in the House. The unit of observation and outcome are the same as in the baseline and heterogeneity analysis. The innovation lies in the treatment variable, which is now replaced by the interaction between the original *Silent Spring* treatment and the district mean of the share of TV-owning households per county in 1960. The first two columns replicate the baseline model with the new treatment, and the last two columns replicate the heterogeneity analysis. Odd columns measure pollution directly, using the 1970 Air Quality Index, and even columns use only a proxy, given by the share of pollution-related deaths. Column 1 shows the expected results: among districts that monitored pollution in 1970, the positive effect of *Silent Spring* on the probability of voting green is a complement of the degree of access to media (television), since the sign of the treatment is both positive and significant. This result, however, does not hold in the greater sample (Column 2). As happened with the baseline specification, this problem is once again solved when we restrict the sample to water-related environmental issues (see Table 8).

The heterogeneity specifications show that well educated people, richer people, and those who are more exposed to pollution respond more strongly to the informational shock but the size of the effect diminishes with the number of attributes. These findings remain after moving from the complete sample to the water-specific sample, but are not robust to the pollution control used. As above, it seems that districts with 1970s pollution data are intrinsically different from the rest.

[29] By 1959, roughly 88 percent of U.S. households had least one TV; this figure reached 96 percent in 1970.

7 Robustness Checks

I start by analyzing variations in timeframe. Table 9 shows the baseline specification for all environmental issues in two alternative windows of time. Columns 1–3 are based on the 86th to 90th Congresses (January 1959 to January 1967). This period encompasses exactly two Congresses elected before *Silent Spring* and two Congresses elected after *Silent Spring*. It also represents a narrowing of the time window used for the baseline study, since the complete data set encompasses the 84th through 91st Congresses (January 1955 to January 1971). For each timeframe, the first column includes 1970 pollution data, the second column includes only cause of death as a proxy for pollution, and the third column adds district fixed effects to the previous one. In all six specifications, we get positive and significant treatment coefficients. The positive baseline effect of the informational shock on demand for environmental regulation seems to be larger when closer to 1962.

Then I move on to conducting placebo tests. So far, I have found positive effects of the informational shock on voting patterns that may be interpreted as increasing demand for a clean environment. However, are these effects particular to environmental regulation, or is there a general trend toward voting in favor of issues discussed in Congress? Finding an effect of *Silent Spring* in voting patterns for issues that are totally unrelated to environmental protection might signal that my previous results were spurious. Table 10 replicates the baseline and heterogeneity specifications on a sample of military issues discussed in the House between 1955 and 1971.[30] Table 11 does the same thing using treatment intensity. In the two tables, the heterogeneity analysis comes out without significant effects, as predicted. However, the baseline specifications shows a treatment coefficient that is both significant and comparable in magnitude to the ones obtained in the standard specifications. I get a similar result when I use the complete universe of issues after eliminating the environmental ones. This means that, while the evidence is consistent with a large effect of *Silent Spring* on demand for environmental regulation, I cannot rule out alternative causal factors correlated in time.

8 Conclusion and Discussion

The 1962 environmental science book *Silent Spring* is widely credited with spreading information about environmental issues among the U.S. population. In this paper, I document that the publication of the book was associated to a marked decrease in public

[30] I obtained these by looking for the word "military" in the synopsis of each issue, making sure there was no overlap with environmental regulation, which there wasn't.

confidence that the government was doing enough for the environment. I then show that this increase in environmental awareness was associated with a 5 to 33 percentage-point increase in the probability that members of Congress voted in favor of environmental regulation. The effect of the informational shock is not necessarily persistent across different specifications of pollution and county samples. I move on to show that the informational shock caused by the release of the book appears to have had heterogeneous effects across the population. It is associated with a decrease in the probability of voting green for districts with more schooling and income but with an increase for counties that are simultaneously rich and educated. When I ran a placebo analysis over a set of nonenvironmental bills I obtained similar results for other pieces of legislation. This suggests that, while the evidence is consistent with a large effect of *Silent Spring* on demand for environmental regulation, I cannot rule out other explanations for that rise.

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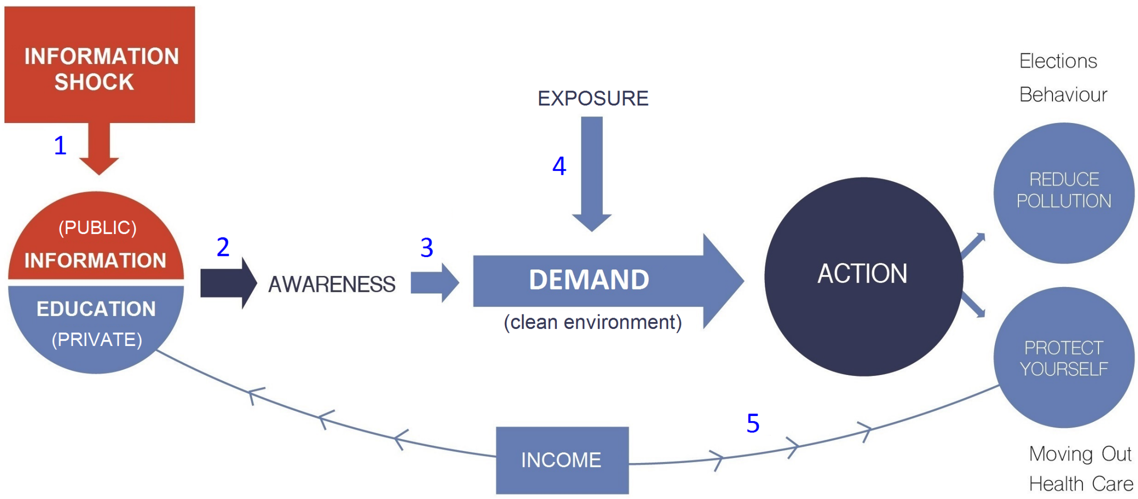
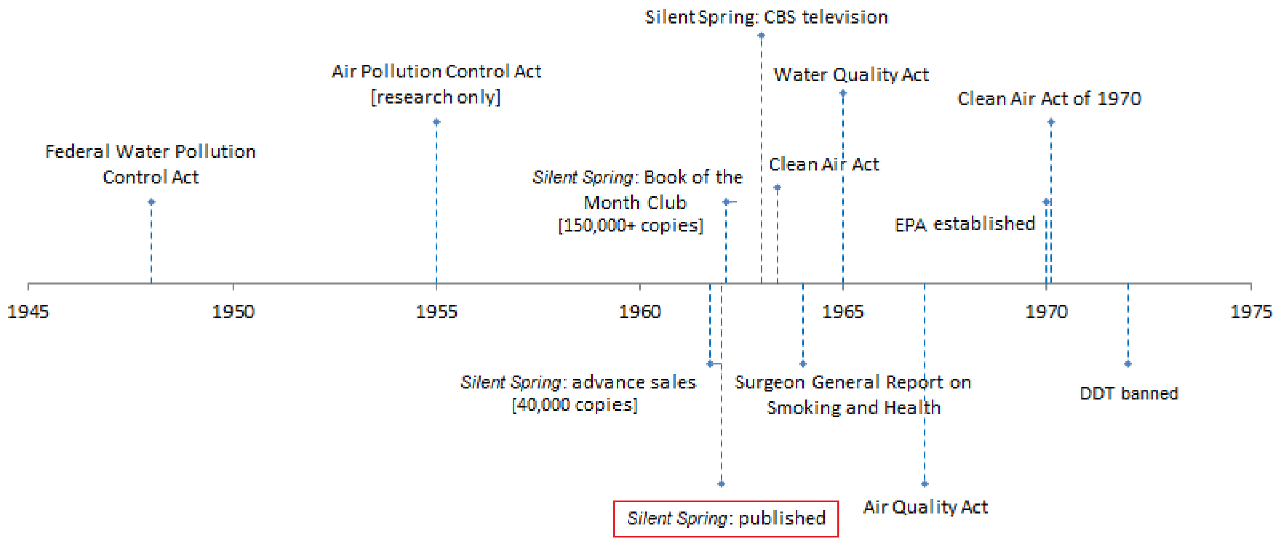
9 Figures and Tables

Figure 1: A theoretical framework for the response to information about environmental threats



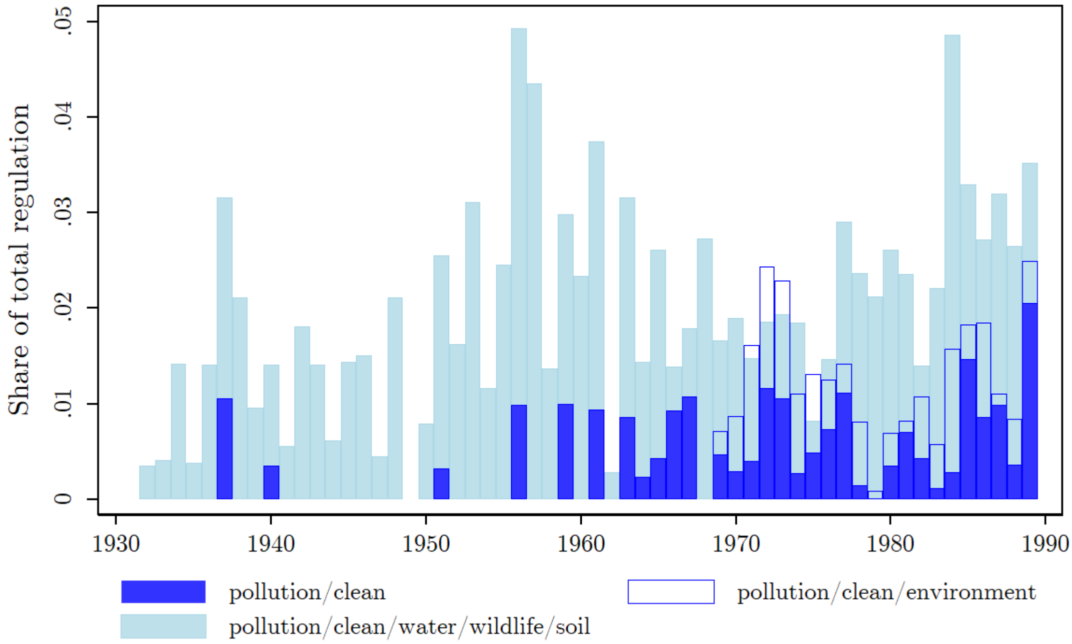
Notes: This diagram presents a framework to understand how informational shocks about environmental threats affect behavior. The shock increases the overall stock of information (1) to produce awareness about environmental issues (2). This awareness, in turn, influences the demand for a clean environment (3). Factors such as the degree of exposure to environmental threats also contribute to demand (4). The degree of demand for a clean environment takes the form of action towards reducing pollution directly or taking measures to protect oneself from environmental hazards. Income influences one's ability to engage in certain actions (5).

Figure 2: Timeline of *Silent Spring* and environmental regulation



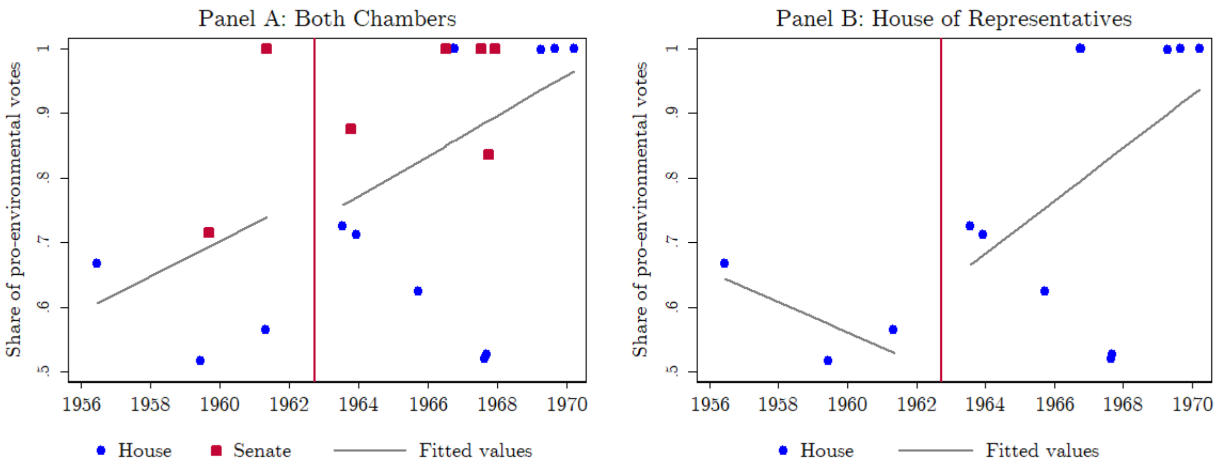
Notes: This diagram shows a timeline of events from the Federal Water Pollution Control Act of 1948, through the publication of *Silent Spring* in 1962, to 1972, when the harmful pesticide DDT was banned by the Environmental Protection Agency. Only two important pollution-control acts were passed between 1945 and 1962; six were passed between 1962 and 1975.

Figure 3: Share of environmental bills discussed in Congress



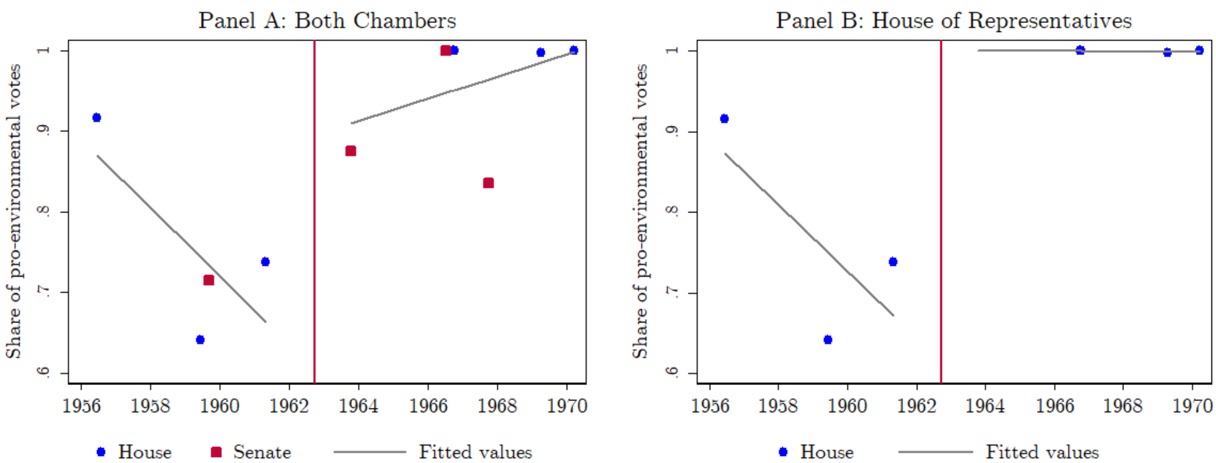
Notes: This figure shows the share of bills voted on by Congress that pertain to environmental regulation over time, as determined by the presence of three sets of keywords in their synopsis. The full blue bars at the bottom of the figure correspond to bills that contain the words "pollution" and/or "clean" in their synopsis; I refer to these bills as environmental bills throughout this paper. Other keywords often show up in unrelated contexts.
Source: Inter-university Consortium for Political and Social Research, and Congressional Quarterly, Inc. United States Congressional Roll Call Voting Records, 1789–1998.

Figure 4: Share of pro-environmental votes by bill 1956–1970
All environmental bills, Senate and House of Representatives



Notes: This figure plots the share of pro-environmental votes by environmental bill, defined as any bill containing keywords "pollution" and/or "clean." Vote based on a standard binary yes count. Panel A includes votes from both chambers of Congress. Panel B is restricted to the House of Representatives.
Source: ICPSR 1955–1971.

Figure 5: Share of pro-environmental votes by bill 1956–1970
Water-related environmental bills, Senate and House of Representatives



Notes: This figure plots the share of pro-environmental votes by chamber and bill containing "water pollution" and/or "clean water" and no motions to recommit, for enhanced comparability. Pro-environmental votes based on a standard binary yes count. Panel A includes votes from both chambers of Congress. Panel B is restricted to the House of Representatives.
Source: ICPSR 1955–1971.

Table 1: State-level baseline analysis for all environmental issues, both chambers

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. All issues						
POST *Silent Spring*	0.215***	0.214***	0.0497*	0.335***	0.0495*	0.333***
T-statistic	(20.18)	(20.05)	(2.39)	(10.16)	(2.38)	(10.09)
Observations	6,854	6,854	6,854	6,854	6,854	6,854
R-square	0.0561	0.0648	0.0763	0.129	0.0828	0.135
Panel B. Water issues						
POST *Silent Spring*	0.225***	0.224***	0.321***	0.357***	0.320***	0.351***
T-statistic	(19.85)	(20.10)	(12.05)	(7.04)	(12.15)	(6.82)
Observations	2,882	2,882	2,882	2,882	2,882	2,882
R-square	0.120	0.169	0.174	0.218	0.208	0.245
State F.E.	NO	YES	YES	YES	YES	YES
Annual trend	NO	NO	YES	YES	-	-
Controls	NO	NO	NO	YES	NO	YES
Trend by State	NO	NO	NO	NO	YES	YES

Notes: This table contains my complete sample of environmental issues discussed in both chambers of Congress from January 1955 through January 1971. I control for total and per capita carbon emissions by state-year, real GDP per capita, civil unemployment rate, and Consumer Price Index by quarter, and total monthly legislation discussed in Congress. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and state-clustered standard errors in parentheses.

*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005

Source: ICPSR 1955–1971.

Table 2: Baseline analysis for all environmental issues, House of Representatives

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. All issues						
POST *Silent Spring*	0.214***	0.214***	0.0584**	0.0574**	-0.000557	-0.00535
T-statistic	(20.57)	(20.30)	(2.77)	(2.71)	(-0.02)	(-0.21)
Observations	6,086	6,086	6,086	6,086	4,893	4,893
R-square	0.0534	0.0630	0.0729	0.0810	0.119	0.159
Panel B. Water issues						
POST *Silent Spring*	0.418***	0.418***	0.566***	0.564***	0.413***	0.408***
T-statistic	(62.89)	(61.12)	(30.26)	(30.03)	(25.46)	(20.93)
Observations	3,742	3,742	3,742	3,742	2,720	2,720
R-square	0.201	0.210	0.215	0.222	0.293	0.322
State F.E.	NO	YES	YES	YES	YES	-
Annual trend	NO	NO	YES	YES	-	-
Controls	NO	NO	NO	YES	YES	YES
Trend by State	NO	NO	NO	NO	YES	YES
District F.E.	NO	NO	NO	NO	NO	YES

Notes: This table contains my complete sample of environmental issues discussed in both chambers of Congress from January 1955 through January 1971. I control for death rate, share of deaths associated with pollution, population, population density, share of urban population, median family income, median years schooling for persons 25+, labor force male, labor force employed in agriculture, median age in years, share of labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, share of manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and state-clustered standard errors in parentheses.

*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005

Source: ICPSR 1955–1971.

Table 3: Baseline analysis for all environmental issues with pollution controls, House of Representatives

	(1) Includes 1970 pollution	(2) Includes 1980 pollution	(3) Includes cause of death	(4) Includes cause of death, 1970 pollution
POST *Silent Spring*	0.102*	0.118**	0.00257	0.118*
T-statistic	(1.99)	(3.25)	(0.11)	(2.26)
Observations	872	1,724	4,776	778
R-square	0.136	0.121	0.121	0.167
State F.E.	YES	YES	YES	YES
Annual trend	YES	YES	YES	YES
Trend by state	YES	YES	YES	YES
District F.E.	NO	NO	NO	NO
Controls: cross-section	YES	YES	NO	YES
Controls: panel	NO	NO	YES	YES

Notes: I control for death rate, share of deaths associated with pollution, population, population density, share of urban population, median family income, median years schooling for persons 25+, labor force male, labor force employed in agriculture, median age (years), labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. Values from 1950 Census used in columns 1–3, and time-varying equivalents for column 4. This table contains my complete sample of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and state-clustered standard errors in parentheses.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.005$
Source: ICPSR 1955–1971.

Table 4: Baseline analysis for subsamples of environmental issues with pollution controls, House of Representatives

	Excluding Clean Air Act		All water-related		Water-related, no motions to recommit	
	(1)	(2)	(3)	(4)	(5)	(6)
POST *Silent Spring*	0.0893	-0.0764**	0.433**	0.428***	0.374**	0.341***
T-statistic	(1.09)	(-2.65)	(3.34)	(7.51)	(2.85)	(5.39)
Observations	794	4062	511	2,629	401	1,917
R-square	0.212	0.178	0.332	0.324	0.366	0.585
Pollution: 1970 Air Quality Index	YES	NO	YES	NO	YES	NO
State F.E.	YES	YES	YES	YES	YES	YES
District F.E.	NO	YES	NO	YES	NO	YES

Notes: All models contain state-specific trends and time-varying controls for: death rate, share of deaths associated with pollution (pneumonia/cancer/food poisoning), population, population density, share of urban population, median family income, median years of schooling for persons 25+, share of male labor force, share of labor force employed in agriculture, median age (years), share of labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. Values from the 1950 Census are used in columns 1–3, and time-varying equivalents for column 4. This table contains subsamples of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.

*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005.

Source: ICPSR 1955–1971.

Table 5: Heterogeneity analysis for all environmental issues, House of Representatives

	(1)	(2)	(3)	(4)
POST *Silent Spring*	-0.00963	0.217	1.543**	1.222
	(-0.34)	(1.27)	(3.17)	(1.48)
Share of pollution-related deaths	-0.121	4.461	8.696	6.124
	(7.07)	(0.14)	(1.00)	(0.65)
Median family income	0.0000186**	-0.0000142	0.000309***	0.000358
	(2.78)	(-0.69)	(3.56)	(1.75)
Median years schooling, persons 25+	-0.0126	0.0276	0.159**	0.177*
	(-1.03)	(1.29)	(2.74)	(2.02)
(POST)*(Income)		0.0000393*	-0.000262**	-0.000189
		(1.97)	(-2.98)	(-0.92)
(POST)*(Schooling)		-0.0569*	-0.155**	-0.131
		(-2.55)	(-2.67)	(-1.47)
(POST)*(Pollution)		3.256***	-1.320	5.860
		(3.44)	(-0.27)	(0.41)
(Income)*(Schooling)			-0.0000265***	-0.0000316
			(-3.78)	(-1.64)
(Income)*(Pollution)			-0.000909	-0.00215
			(-0.98)	(-0.55)
(Schooling)*(Pollution)			-0.0574	-0.492
			(-0.08)	(-0.34)
(POST)*(Income)*(Schooling)			0.0000231**	0.0000177
			(3.31)	(0.92)
(POST)*(Income)*(Pollution)			0.00157	-0.000244
			(1.61)	(-0.06)
(POST)*(Schooling)*(Pollution)			-0.339	-0.893
			(-0.43)	(-0.56)
(Income)*(Schooling)*(Pollution)				0.000122
				(0.33)
(POST)*(Income)*(Schooling)*(Pollution)				0.00014
				(0.37)
Interactions	NO	NO	YES	FULL
Observations	4,721	4,721	4,721	4,721
R-square	0.171	0.176	0.181	0.182

Notes: Income denotes median family income; schooling denotes median years of schooling for persons 25+; pollution denotes the share of deaths associated with pollution (pneumonia/food poisoning/cancer). All columns contain a set of state-specific trends and and district fixed effects. I control for death rate, population, population density, share of urban population, share of male labor force, share of labor force employed in agriculture, median age (years), labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. This table contains my complete sample of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.

*p < 0.05, **p < 0.01, ***p < 0.005.

Source: ICPSR 1955–1971.

Table 6: Heterogeneity analysis for all environmental issues
1970s pollution controls, House of Representatives

	(1)	(2)	(3)	(4)
POST *Silent Spring*	0.193**	-0.0617	-0.885	-7.305*
	(3.34)	(-0.14)	(-0.45)	(-2.27)
Pollution in 1970: Air Quality Index	0.000337	0.000483	-0.00111	-0.0527*
	(1.18)	(1.42)	(-0.15)	(-2.45)
Median family income	0.0000481**	0.0000402	-0.000291	-0.00154*
	(-3.10)	(-0.64)	(-0.67)	(-2.20)
Median years of schooling, ages 25+	-0.0398	-0.0541	-0.118	-0.773*
	(-1.16)	(-0.91)	(-0.63)	(-2.48)
Share of pollution-related deaths	6.937***	7.011***	7.105***	7.096***
	(-5.10)	(-4.85)	(-4.77)	(4.89)
(Treatment)*(Income)		0.0000045	0.000293	0.00138*
		(-0.07)	(-0.69)	(2.05)
(Treatment)*(Schooling)		0.024	0.0335	0.631*
		(-0.47)	(-0.19)	(2.12)
(Treatment)*(Pollution)		-0.000242	-0.000736	0.0449*
		(-0.89)	(-0.10)	(2.18)
(Income)*(Schooling)			0.0000197	0.000132*
			(-0.63)	(2.28)
(Income)*(Pollution)			0.00000084	0.00000960*
			(-0.77)	(-2.47)
(Schooling)*(Pollution)			-0.000351	0.00440*
			(-0.35)	(-2.09)
(Treatment)*(Income)*(Schooling)			-0.0000157	-0.000115*
			(-0.52)	(-2.07)
(Treatment)*(Income)*(Pollution)			-0.00000089	-0.00000841*
			(-0.80)	(-2.23)
(Treatment)*(Schooling)*(Pollution)			0.000564	-0.00373
			(-0.53)	(-1.80)
(Income)*(Schooling)*(Pollution)				-0.000000795*
				(-2.38)
(Treatment)*(Income)*(Schooling)*(Pollution)				0.000000697*
				(-2.14)
Interactions	NO	NO	YES	FULL
Observations	914	914	914	914
R-square	0.192	0.193	0.194	0.197

Notes: Income denotes median family income; schooling denotes median years of schooling for persons 25 years old and up; pollution denotes the 1970 Air Quality Index reported by the EPA. All columns have annual trend, trend by State, controls and district fixed effects. Controls include death rate, share of pollution-related deaths, population, population density, share of urban population, share male labor force, share labor force employed in agriculture, median age (years), labor force working outside county of residence, share using public transport to work, share of occupied housing units with 1 automobile, manufacturing establishments with 100+ employees, share of non-white population and value of chemicals used for insect control on livestock. This table contains my complete sample of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.
*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005.
Source: ICPSR 1955–1971.

Table 7: Intensity of treatment for all environmental issues, House of Representatives

	Baseline		**Heterogeneity**	
	1970 pollution & cause of death	Cause of death	1970 pollution & cause of death	Cause of death
	(1)	(2)	(3)	(4)
Treatment intensity	0.00204**	-0.000279		
	(3.25)	(-0.85)		
1970 Air Quality Index	0.000345			
	(1.20)			
Share of pollution-related deaths	6.880***	2.542***	7.185***	
	(5.08)	(7.06)	(4.99)	
Median family income	0.0000476**	0.0000174**		
	(3.06)	(2.60)		
Median years schooling, persons 25+	-0.0395	-0.0123		
	(-1.15)	(-1.01)		
(Treatment intensity)*(Income)			0.0000188*	-0.0000003
			(2.56)	(-0.14)
(Treatment intensity)*(Schooling)			0.00981**	-0.000981
			(3.26)	(-1.16)
(Treatment intensity)*(Pollution)			0.000641**	0.210
			(2.81)	(1.44)
(Treatment intensity)*(Income)* (Schooling)*			-0.00000166**	5.95e-08
			(-2.79)	(0.33)
(Treatment intensity)*(Income)*(Pollution)			-0.000000112**	-0.0000363
			(-2.62)	(-0.87)
(Treatment intensity)*(Schooling)*(Pollution)			-0.0000563**	-0.0201
			(-2.62)	(-1.40)
(Treatment intensity)*(Income)*(Schooling)*(Pollution)			9.75e-09**	0.00000399
			(2.74)	(1.12)
State F.E.	YES	NO	YES	NO
District F.E.	NO	YES	NO	YES
Observations	914	4,720	914	4,720
R-square	0.405	0.589	0.445	0.592
Adj. R-square	0.274	0.442	0.301	0.442

Notes: Treatment intensity is computed as the interaction between the post-1962 indicator, and and the share of TV-owning households by county in 1960. Income denotes median family income; schooling denotes median years of schooling for persons 25+; pollution denotes either the 1970 Air Quality Index reported by the EPA or the share of pollution-related deaths as indicated in the headline. All columns contain state-specific trends and time-varying controls. I control for death rate, share of pollution-related deaths, population, population density, share of urban population, share of male labor force, share of labor force employed in agriculture, median age (years), share of labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. This table contains my complete sample of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.
*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005.
Source: ICPSR 1955–1971.

Table 8: Intensity of treatment for water-related environmental issues, House of Representatives

	Baseline		**Heterogeneity**	
	1970 pollution & cause of death	Cause of death	1970 pollution & cause of death	Cause of death
	(1)	(2)	(3)	(4)
Treatment intensity	0.00409**	0.00394***		
	(2.76)	(5.38)		
1970 Air Quality Index	-0.000323			
	(-0.93)			
Share of pollution-related deaths	-0.110	-1.086*	-0.549	
	(-0.05)	(-2.07)	(-0.26)	
Median family income	-0.0000349	-0.0000324*		
	(-1.52)	(-2.21)		
Median years schooling, persons 25+	-0.0355	0.00782		
	(-0.63)	(0.52)		
(Treatment intensity)*(Pollution)			0.000907**	-0.0307
			(1.96)	(-0.10)
(Treatment intensity)*(Income)			0.0000161*	0.00000011
			(2.33)	(0.04)
(Treatment intensity)*(Schooling)			0.0125**	0.00159
			(2.96)	(1.15)
(Treatment intensity)*(Income)*(Schooling)			-0.00000165**	-0.00000012
			(-2.88)	(-0.46)
(Treatment intensity)*(Income)*(Pollution)			-0.000000132**	0.0000175
			(-3.09)	(0.27)
(Treatment intensity)*(Schooling)*(Pollution)			-0.0000855**	-0.00438
			(-3.01)	(-0.17)
(Treatment intensity)*(Income)* (Schooling)* (Pollution)			1.28e-08***	-0.00000021
			(3.37)	(-0.04)
State F.E.	YES	NO	YES	NO
District F.E.	NO	YES	NO	YES
Observations	401	1,917	401	1,917
R-square	0.365	0.584	0.403	0.590

Notes: Treatment intensity is computed as the interaction between the post-1962 indicator, and and the share of TV-owning households by county in 1960. Income denotes median family income; schooling denotes median years of schooling for persons 25+; pollution denotes either the 1970 Air Quality Index reported by the EPA or the share of pollution-related deaths as indicated in the headline. All columns contain state-specific trends and time-varying controls. I control for death rate, share of pollution-related deaths, population, population density, share of urban population, share of male labor force, share of labor force employed in agriculture, median age (years), share of labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. This table contains a subsample of water-related environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.
*p < 0.05, **p < 0.01, ***p < 0.005.
Source: ICPSR 1955–1971.

Table 9: Baseline specification for all environmental issues, alternative time periods, House of Representatives

	01/03/1959– 01/03/1967 (± 2 Congresses)			01/01/1960–12/31/1965 (± 3 years)		
	(1)	(2)	(3)	(4)	(5)	(6)
POST *Silent Spring*	0.343***	0.0874*	0.0882*	0.662***	0.196**	0.196**
	(-4.01)	(-2.25)	(-2.10)	(-3.54)	(-3.22)	(-2.66)
Observations	643	3152	3152	366	1916	1916
R-square	0.205	0.127	0.181	0.205	0.0692	0.183
District fixed effects	NO	NO	YES	NO	NO	YES

Notes: All models contain state-specific trends and time-varying controls for: death rate, share of deaths associated with pollution (pneumonia/cancer/food poisoning), population, population density, share of urban population, median family income, median years of schooling for persons 25+, share of male labor force, share of labor force employed in agriculture, median age (years), share of labor force working outside county of residence, share using public transport to work, share of occupied housing units with one automobile, manufacturing establishments with 100+ employees, share of non-white population, and value of chemicals used for insect control on livestock. This table includes the complete sample of environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count: Y/PY/AY=1, N/PN/AN=0. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.
*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005.
Source: ICPSR 1955–1971.

Table 10: Placebo test using military issues, baseline and heterogeneity, House of Representatives

	Baseline		Heterogeneity	
	(1)	(2)	(3)	(4)
POST *Silent Spring*	0.259***	0.264***	0.347	-0.402
	(-8.10)	(-20.15)	(-0.19)	(-1.07)
(Treatment)*(Income)			0.00000239	0.0000722
			(0.01)	(0.76)
(Treatment)*(Schooling)			0.0279	0.0830*
			(0.17)	(2.05)
(Treatment)*(Pollution)			0.00158	-1.996
			(0.13)	(-0.35)
(Treatment)*(Income)*(Schooling)			-0.00000581	-0.00000875
			(-0.20)	(-0.96)
(Treatment)*(Income)*(Pollution)			-0.00000113	0.000713
			(-0.51)	(0.41)
(Treatment)*(Schooling)*(Pollution)			0.000197	0.142
			(0.16)	(0.23)
(Treatment)*(Income)*(Schooling)*(Pollution)			5.12e-08	-0.0000881
			(0.26)	(-0.54)
District fixed effects	NO	YES	YES	NO
Controls	YES	NO		
Observations	3625	19286	3625	19286
R-square	0.119	0.0932	0.129	0.0962

Notes: Income denotes median family income; schooling denotes median years of schooling for persons 25 years old and up; pollution denotes the 1970 Air Quality Index reported by the EPA (in odd columns) or share of pollution-related deaths (in even columns). All specifications include annual trend, trend by State, and time-varying controls (the same as in the main regressions). This table includes only military-related environmental issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.

*p < 0.05, **p < 0.01, ***p < 0.005.

Source: ICPSR 1955–1971.

Table 11: Placebo test using military issues, intensity of treatment

	Baseline		Heterogeneity	
	(1)	(2)	(3)	(4)
Treatment intensity	0.00272***	0.00287***		
	(7.74)	(19.07)		
(Treatment intensity)*(Income)			-0.00000032	-0.0000001
			(-0.08)	(-0.10)
(Treatment intensity)*(Schooling)			0.0000867	0.000506
			(0.05)	(1.18)
(Treatment intensity)*(Pollution)			0.0000633	-0.0603
			(0.43)	(-0.86)
(Treatment intensity)*(Income)*(Schooling)			-3.37e-08	-4.37e-10
			(-0.10)	(-0.00)
(Treatment intensity)*(Income)*(Pollution)			-1.96e-08	0.0000173
			(-0.78)	(0.92)
(Treatment intensity)*(Schooling)*(Pollution)			-0.00000172	0.00688
			(-0.12)	(0.96)
(Treatment intensity)*(Schooling)*(Pollution)			1.17e-09	-0.00000237
			(0.52)	(-1.37)
District fixed effects	NO	YES	NO	YES
Observations	3625	19286	3625	19286
R-square	0.117	0.0916	0.128	0.096

Notes: Treatment intensity is computed as the interaction between the post-1962 indicator, and and the share of TV-owning households by county in 1960. Income denotes median family income; schooling denotes median years of schooling for persons 25 years old and up; pollution denotes the 1970 Air Quality Index reported by the EPA (in odd columns) or share of pollution-related deaths (in even columns). All specifications include state-specific trends and time-varying controls (the same as in the main regressions). This table includes only military issues discussed in the House of Representatives from January 1955 through January 1971. Standard binary vote count. I present t-statistics corresponding to robust and district-clustered standard errors in parentheses.

*p $<$ 0.05, **p $<$ 0.01, ***p $<$ 0.005.

Source: ICPSR 1955–1971.