Evolution vs. Creationism in the Classroom: The Lasting Effects of Science Education

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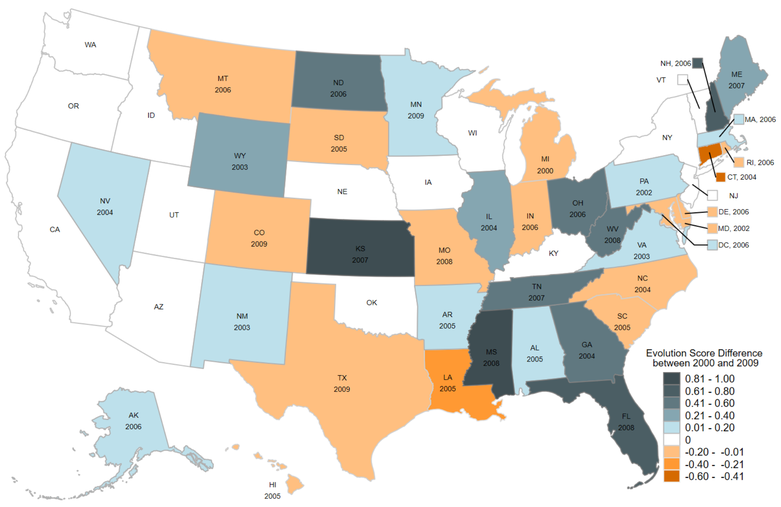
1. Motivation

- Costs of Anti-Science Attitudes are high
- Focus on the content of education as policy-relevant determinant
- Setting: Student's exposure to teaching about evolution theory in US science education

Does teaching of evolution affect adulthood attitudes on evolution?
Beyond attitudes, does it also affect related knowledge and choices?

2. Identification Variation

- Reforms of US State Science Education Standards, determined by institutional idiosyncrasies (elections dates, tenure of board members)



Note: Evolution score difference between 2000 and 2009

3. Data: Evolution coverage in US State Science Standards

- 'Evolution score' for Science Standards: 0=no treatment of evolution, 1=very scientific treatment of evolution, with .01 increments
- Based on: Appearance of the word "evolution", treatment of biological, human, geological, cosmological evolution and their connection, and absence of creationist language and book disclaimers
- Link evolution score with individual-level datasets (NAEP, GSS, ACS)

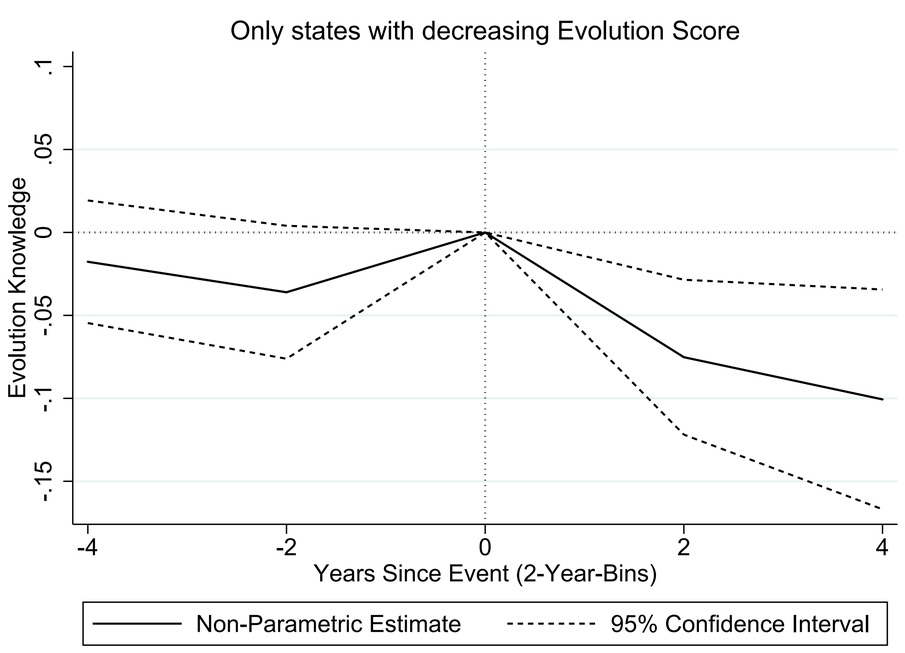
4. Identification Strategy

Two way fixed effects (TWFE) model:

$$Y_{istu} = \beta * Evolution\_Score_{st} + \gamma * X_i + \delta_s + \lambda_t + \theta_u + \epsilon_{istu} \qquad (1)$$

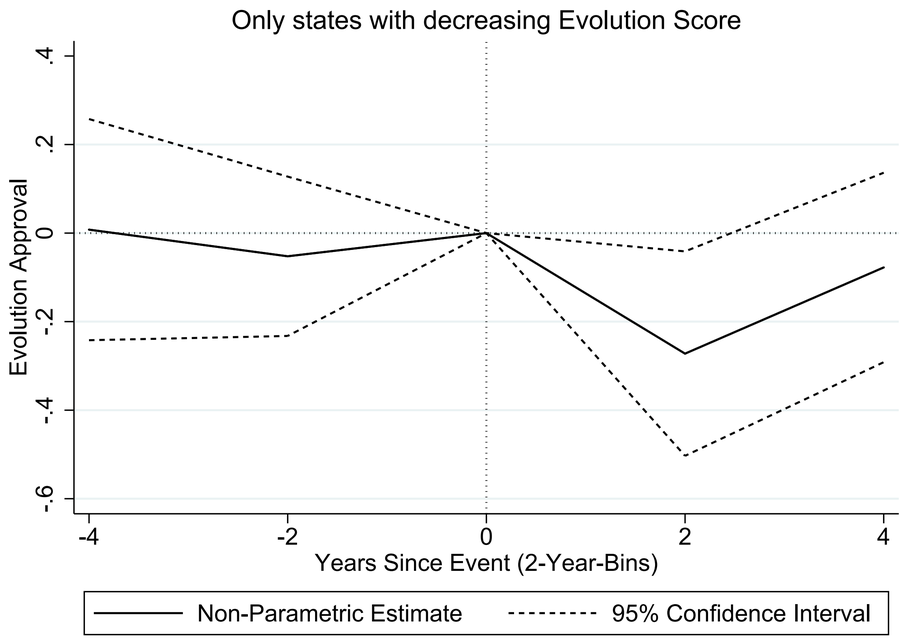
- Y_{istu}: Outcome variable (i.e. approval of evolution) of respondent i entering high school in state s and year t, completed the test or survey in year u
- $Evolution\_Score_{st}$: Score evaluating treatment of evolution in State Science Standard of state s in year t
- $X_i, \delta_s, \lambda_t, \theta_u$: Control variables, state, cohort, and test/survey year fixed effects
- ϵ_{istu}: Error term, SE clustered at the state level

5. Results I: Evolution Knowledge in School



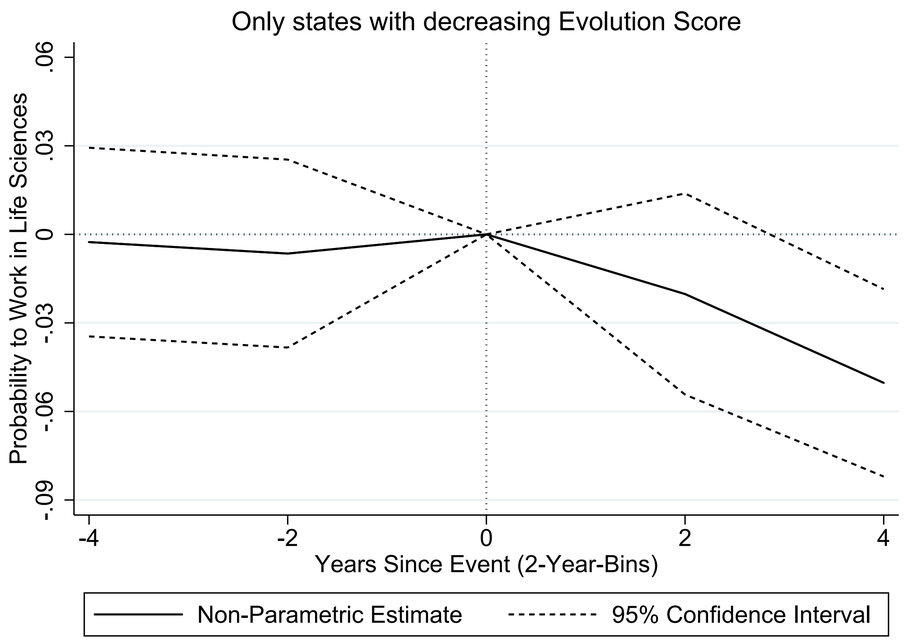
Note: Data source: U.S. Department of Education, National Center for Education Statistics, 1996-2009 National Assessment of Educational Progress; subset of states with increasing Evolution Score shows results that go in the expected direction, but are insignificant.

6. Results II: Evolution Approval in Adulthood



Note: Data source: General Social Survey; subset of states with increasing Evolution Score shows results that go in the expected direction, but are insignificant.

7. Results III: Working in Life Science



Note: Data source: American Community Survey; subset of states with increasing Evolution Score shows results that go in the expected direction, but are insignificant.

8. Robustnesschecks

- Placebo outcomes (non-evolutionary scientific knowledge, political and religious outcomes) and placebo sample (private school students)
- Time-varying treatment effects
- State-specific time trends
- Subset of reforms initiated during legislative period of closely elected Governor
- Control for political affiliation of ruling Governor
- Additional specifications: Logit, Probit, binary treatment indicators, no imputation of missings

9. Summary

Treatment of evolution in Science Standards varies across US states and over time and affects

- student's knowledge about evolution
- adulthood approval rates of evolution
- occupational choice
- $\longrightarrow$ Science education has lasting effects on students
- $\longrightarrow$ Potentially analogous effects of reforms on other scientific topics (vaccinations, climate change, trust in scientists in general)

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