Statistical Modeling and Causal Inference with R

Week 3: Revisiting regression estimators of causal effects

Manuel Bosancianu

Max Schaub

September 21, 2020

Hertie School of Governance

Lecture Q&A

- ✓ Topics?
- ✓ Speed?
- ✓ Complexity?
- ✓ What to improve?

Egan and Mullin (2012)

- ✓ Hypothesis?
- ✓ How could not controlling for interview location bias the results?
- ✓ How could not controlling for the interview date bias the results?
- ✓ Can the coefficient for post-grad education be interpreted as causal? Why? Why not?

OVB due to location

- ✓ Y_i: belief in global warming
- ✓ D_i: deviations from local temperature
- ✓ W_i: location (think of U.S. South vs. other region)

What does OVB likely look like?

$$Y_i = \alpha^s + \kappa^s D_i + u_i^s \text{ (short)}$$
$$Y_i = \alpha^l + \kappa^l D_i + \beta W_i + u_i^l \text{ (long)}$$
$$W_i = \theta + \gamma D_i + e_i \text{ (relationship confounder and treatment)}$$

the OVB is calculated as:

$$OVB = \kappa^s - \kappa^l = \gamma \times \beta$$

OVB due to interview date

- ✓ Y_i: belief in global warming
- ✓ D_i: deviations from local temperature
- ✓ W_i: interview date (think of summer vs. winter)

What does OVB likely look like?

$$Y_i = \alpha^s + \kappa^s D_i + u_i^s \text{ (short)}$$
$$Y_i = \alpha^l + \kappa^l D_i + \beta W_i + u_i^l \text{ (long)}$$
$$W_i = \theta + \gamma D_i + e_i \text{ (relationship confounder and treatment)}$$

the OVB is calculated as:

$$OVB = \kappa^s - \kappa^l = \gamma \times \beta$$

Possible causal graph for Egan and Mullin (2012)

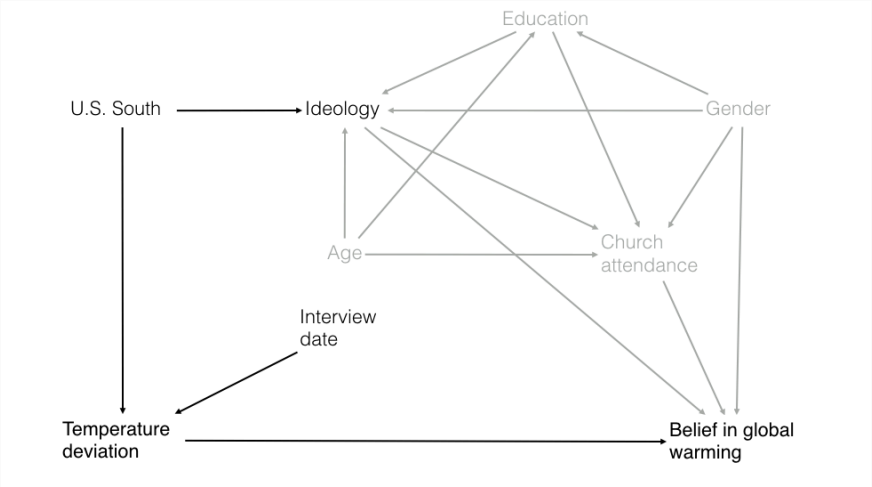


Table 1 from Egan and Mullin (2012)

Table 1 The Structure of Beliefs about Global Warming

	I	II	III
Departure from normal local temperature (°F) in week prior to survey	.010* (.003)	.013* (.005)	.011* (.006)
Gender: Male			-.234* (.040)
Race/Ethnicity: Black			.023 (.070)
Race/Ethnicity: Hispanic			.207* (.092)
Race/Ethnicity: Not White Black or Hispanic			.083 (.095)
Age: 18-24			-.087 (.089)
Age: 25-34			-.132 (.071)
Age: 35-44			-.118 (.063)
Age: 55-64			.013 (.058)
Age: 65 plus			-.029 (.061)
Education: High school or less			.088 (.050)
Education: College grad			.061 (.055)
Education: Post grad			.123* (.057)
Party ID: Republican			-.383* (.067)
Party ID: Lean Republican			-.150 (.078)
Party ID: Lean Democrat			.325* (.074)
Party ID: Democrat			.394* (.064)
Ideology: Very conservative			-.451* (.071)
Ideology: Conservative			-.204* (.045)
Ideology: Liberal			.194* (.068)
Ideology: Very liberal			.158 (.105)
Attend services: Never			.091 (.081)
Attend services: Seldom			-.111 (.079)
Attend services: Few times/year			-.064 (.068)
Attend services: Weekly			-.084 (.063)
Attend services: More than weekly			-.168* (.073)
Fixed effects for date of interview, state of residence, and weather station	No	Yes	Yes
Number of observations	6,726	6,500	6,492
Goodness-of-fit statistics:			
Expected % correctly predicted	58.19	59.72	63.07
Expected proportional reduction in error	.14	5.70	13.60

Note: Ordered probit. DV: Opinion on whether there is "solid evidence" for global warming (scored "no" = 1; "mixed"/"some"/DK/ref = 2; "yes" = 3). Coefficients significantly different from zero at $^*p < .05$ (two-tailed tests, robust standard errors clustered on weather station). *N*'s vary across specifications due to the omission of cases perfectly predicted by models. Excluded categories are the medians or modes of each variable: female, white, between 45 and 55 years old, some college, Independent, moderate, attends services a few times per month.

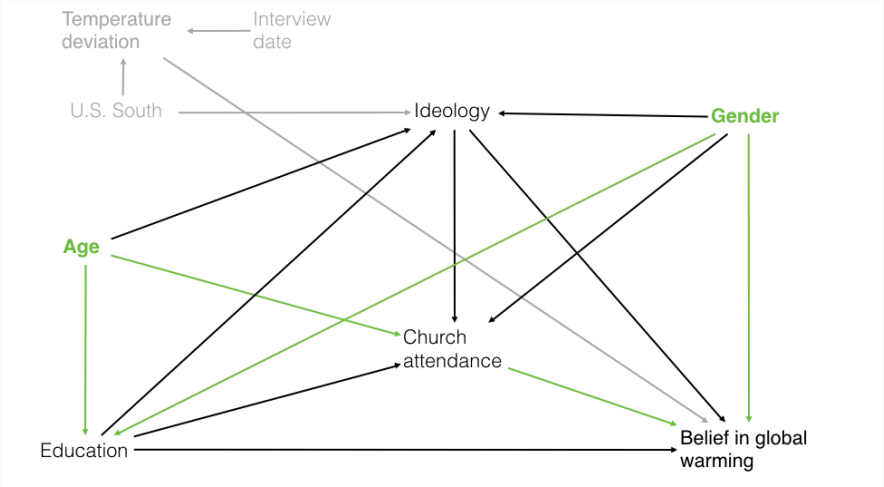
A causal effect of post-grad education?

Table 1 The Structure of Beliefs about Global Warming

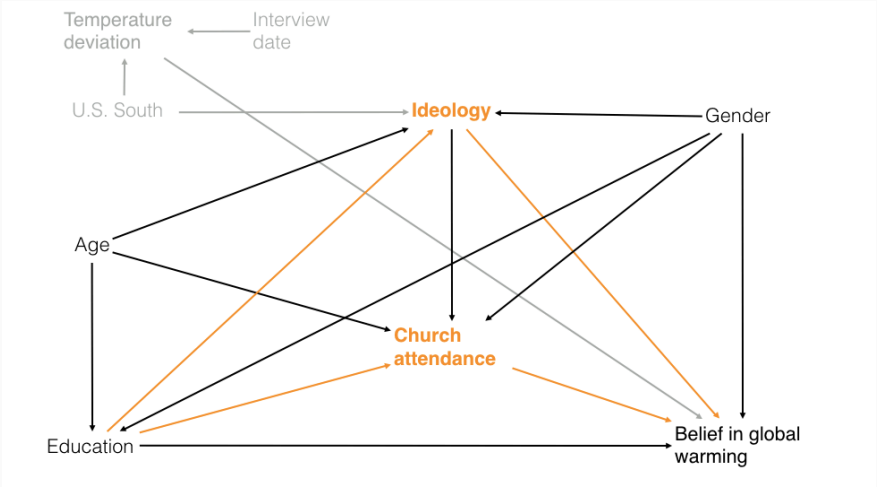
	I	II	III
Departure from normal local temperature (°F) in week prior to survey	.010* (.003)	.013* (.005)	.011* (.006)
Gender: Male			-.234* (.040)
Race/Ethnicity: Black			.023 (.070)
Race/Ethnicity: Hispanic			.207* (.092)
Race/Ethnicity: Not White Black or Hispanic			.083 (.095)
Age: 18-24			-.087 (.089)
Age: 25-34			-.132 (.071)
Age: 35-44			-.118 (.063)
Age: 55-64			.013 (.058)
Age: 65 plus			-.029 (.061)
Education: High school or less			.088 (.050)
Education: College grad			.061 (.055)
Education: Post grad			.123* (.057)
Party ID: Republican			-.383* (.067)
Party ID: Lean Republican			-.150 (.078)
Party ID: Lean Democrat			.325* (.074)
Party ID: Democrat			.394* (.064)
Ideology: Very conservative			-.451* (.071)
Ideology: Conservative			-.204* (.045)
Ideology: Liberal			.194* (.068)
Ideology: Very liberal			.158 (.105)
Attend services: Never			.091 (.081)
Attend services: Seldom			-.111 (.079)
Attend services: Few times/year			-.064 (.068)
Attend services: Weekly			-.084 (.063)
Attend services: More than weekly			-.168* (.073)
Fixed effects for date of interview, state of residence, and weather station	No	Yes	Yes
Number of observations	6,726	6,500	6,492
Goodness-of-fit statistics:			
Expected % correctly predicted	58.19	59.72	63.07
Expected proportional reduction in error	.14	5.70	13.60

Note: Ordered probit. DV: Opinion on whether there is "solid evidence" for global warming (scored "no" = 1; "mixed"/"some"/DK/ref = 2; "yes" = 3). Coefficients significantly different from zero at $^*p < .05$ (two-tailed tests, robust standard errors clustered on weather station). *N*'s vary across specifications due to the omission of cases perfectly predicted by models. Excluded categories are the medians or modes of each variable female, white, between 45 and 55 years old, some college, Independent, moderate, attends services a few times per month.

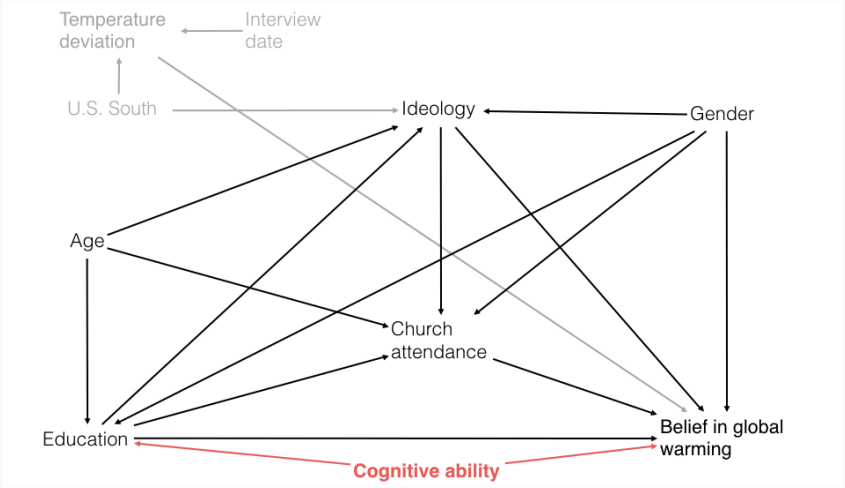
A causal effect of post-grad education?



A causal effect of post-grad education?



A causal effect of post-grad education?



Thank you for watching, and see you next Monday!

References

Egan, P. J., & Mullin, M. (2012, July). Turning Personal Experience into Political Attitudes: The Effect of Local Weather on Americans' Perceptions about Global Warming. *The Journal of Politics*, *74*(3), 796–809.