The Monetary Value of Education on Voting Participation in the United States

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Why does voter turnout remain static even though
the level of education increases over time?

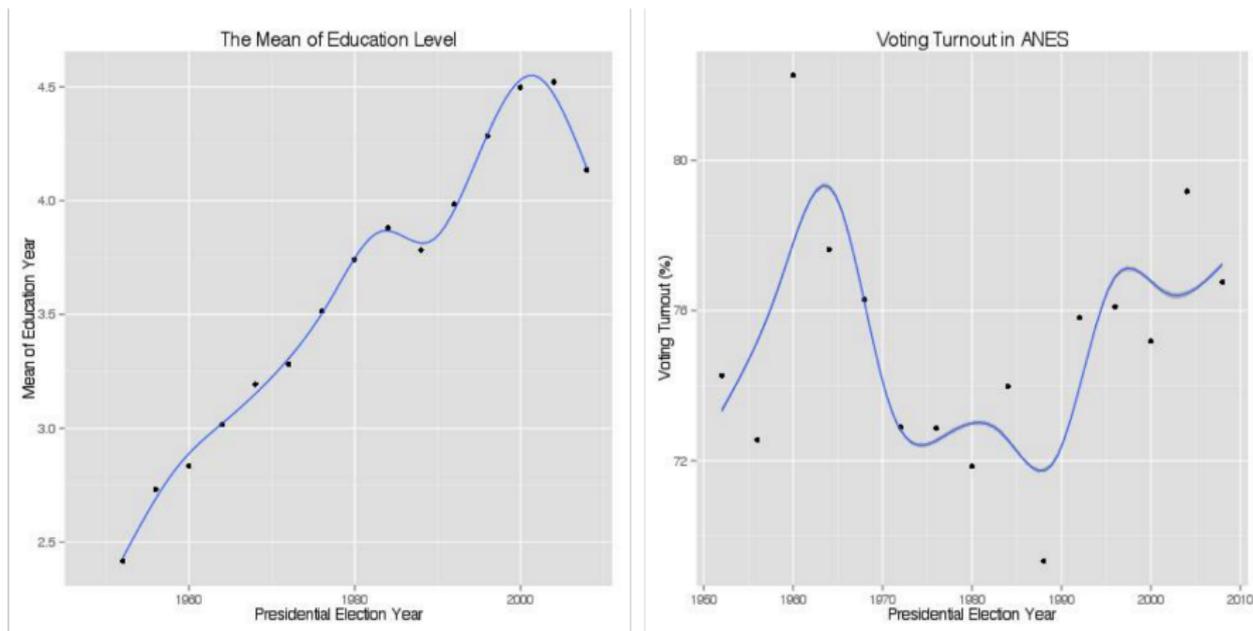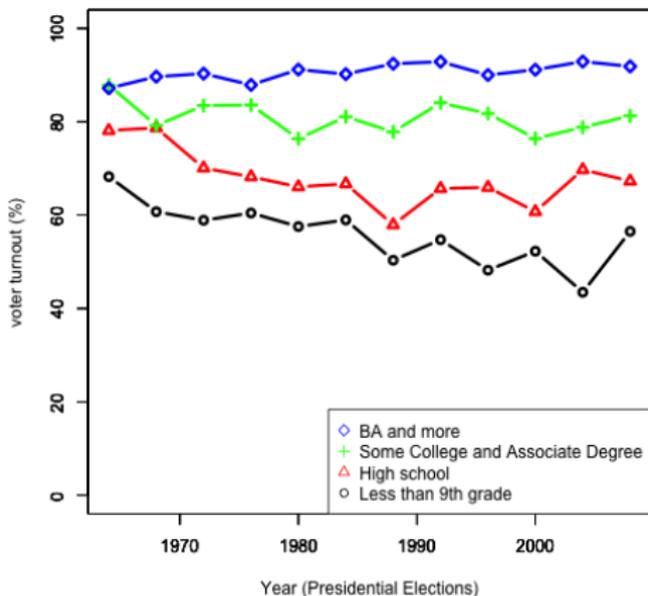# Education and Political Participation

Figure: The Level of Education and Turnout in ANES in Presidential Election

Note: These figures are made by the author with ANES data.

Turnout based on the Level of Education

4 A BA and advanced degree

3 Some college and associate degree

2 High school

1 Less than high school

Note: These figures are made by the author with ANES data.

Why do less educated people not participate in voting over time?

Why do less educated people not participate in voting over time?

Quick answer: The monetary value of lower level education on voting changes.

Why Does Education Increase Voter Turnout?

Education and Voter Turnout

- It allows citizens to obtain more prestigious occupations, higher wealth, and greater involvement in voluntary organization(Becker 1964; Helliwell and Putnam 2000).

- It increases cognitive ability, civic skills, and civic orientations (Almond and Verba 1963; Lerner 1958; Nie, Junn, Stehlik-Barry 1996; Campbell and Stokes 1980; Kam and Palmer 2008).

- It decreases the cost for participation by being exposed to a variety of intellectual resources (Henderson and Chatfield 2011).

Why Does Voter Turnout Decrease?

Why has voter turnout declined even as education level has increased? (Brody 1978; Nie, Junn and Stehlik-Barry 1996)

- Education level has increased → More demands
  → Limited resources → Less political engagements (Nie, Junn, and Stehlik-Barry 1996).

- **The relative value of education** is not same value as the absolute value of education, considering an average level of education by each year (Nie, Junn, and Stehlik-Barry 1996; Campbell 2009; Helliwell and Putnam 2000).

The Monetary Value of Education

- Education forms "the condition that the citizen encounters when he or she participates politically" (Brody 1978, pp.288).
- Education associates with socioeconomic status (Putnam 2001).
- This study assumes that education provides resources to decrease **information costs** and **opportunity costs** for voting participation.
- **The definition of the monetary value of education**
  : A financial outcome resulted from the level of education.

The Monetary Value of Education

- The monetary value of education changes over time.
- "as price inflation means that, over time, the same income does not buy the same amount of stuff, education inflation means that, over time, the same level of education does not confer the same status.... a graduate degrees still provides a status boost, comparable to the effect of a four-year degree in an earlier generation (Campbell 2013, pp.38).
- My grandfather's high school degree VS. my high school degree for earning wages.

The value of education and opportunity costs

- The monetary value of education affects earning money and purchasing products.
- In that sense, it affects opportunity costs by providing income.

High opportunity costs and Economic adversity

- "when a person experiences economic adversity his scarce resources are spent on holding body and soul together-surviving-not on remote concerns like politics?" (Rosenstone 1982, pp.26).
- Since my purchasing power is lower than my grandfather's given the same degree, my socioeconomic status is also different. Therefore, the cost of voting is higher for me than for him.
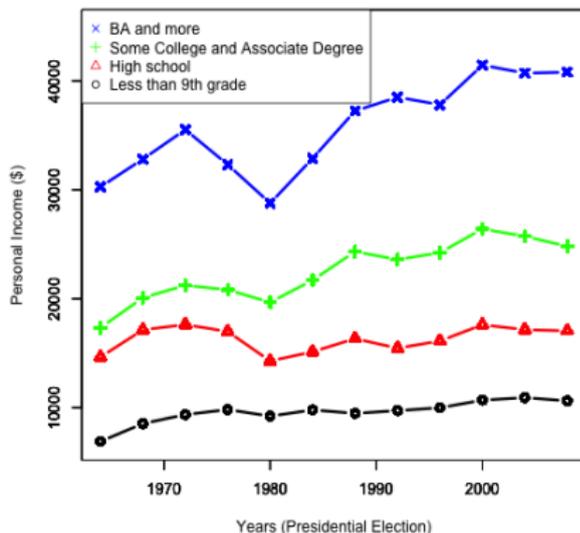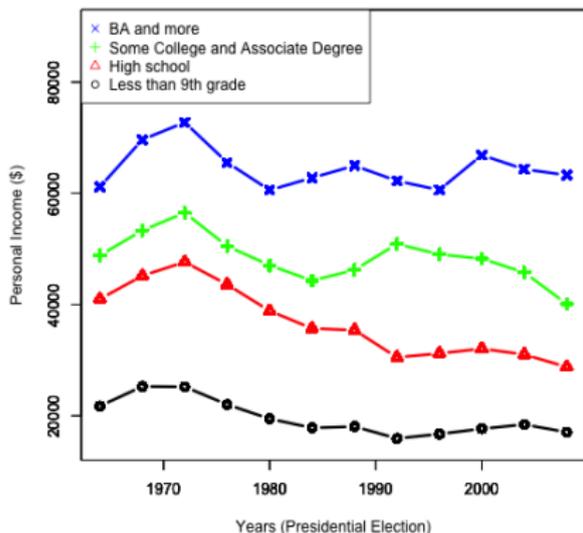
Figure: The Level of Education and Median Income by Gender in American Census Data

Note: Left panel shows male population and right panel represents female population. These figures are made by the author with Census Data.

The Aim of This Study

1. **Specifies the relative value of education with the monetary value of education.**
2. **Explores the effect of the monetary value of education on voter turnout given opportunity costs.**
3. **Attempts to answer why less educated people are less likely to vote over time.**

The EITM framework (Granato et al., 2010)

- Step 1: Identify a theoretical concept of human behavior of interest and relate it to a statistical concept.

- Step 2: Develop behavioral (formal) and statistical analogues.

- Step 3: Unite the theoretical and statistical analogues in testable theory.

Step 1: A Theoretical Concept and A Statistical Concept

Education and Voter Turnout

- Rational choice theory : $U(V) = PB - C$ (Downs 1957)

  1. $U(V)$: Utility of voting
  2. P: the probability that individuals' vote matters.
  3. B: the benefits of having individuals' candidate win.
  4. C: costs for voting.

- Previous research assumes that C is constant and small (Niemi 1976; Green and Shapiro 1994; Aldrich 1993).

- However, this study attempts to specify C as an opportunity cost resulted from the level of education with an empirical implication.

Education and Voter Turnout

- Theoretical concept: Decision making theory

$$U(V) = PB - C + E \qquad (1)$$

1. PB: party differential(PD) (Downs 1957)
2. C: Opportunity costs
3. E: The level of education

- Statistical Concept: Discrete choice (Voter Turnout: Whether respondents voted in the November Elections)

A group of people based on the level of education will vote under these conditions

1. PD - C > 0 and E > 0
2. PD - C $= 0$ and E > 0
3. PD - C > 0 and E $= 0$
4. PD > 0 and E - C $= 0$
5. PD $= 0$ and E - C > 0
6. PD - C < 0 and E > 0 and $|E| > |PD - C|$
7. PD > 0 and E - C < 0 and PD $> |E - C|$

- Assume that the true values of a group of people's party differential, education, and opportunity costs are conditioned on their observed values, $\widehat{PD}$, $\hat{E}$, and $\hat{C}$.

- The probability that a group of respondents for voting is:
  $\Pr(V = 1 \mid \widehat{PD}, \hat{E}, \hat{C}) = 1 - \Pr(PD = 0 \mid \widehat{PD}) * \Pr(E = 0 \mid \hat{E}) * \Pr(C = 1 \mid \hat{C})$
  1. $\Pr(PD) = \Phi(\alpha_{PD} + \beta_{PD}\hat{PD})$
  2. $\Pr(E) = \Phi(\alpha_E + \beta_E\hat{E})$
  3. $\Pr(C) = -\Phi(\alpha_C + \beta_C\hat{C})$

- The familiar property of the standard normal cumulative distribution function: $1 - \Phi(z) = \Phi(-z)$.

Step 2: Behavioral (formal) and Statistical Analogues

- $\Pr(V = 1 \mid \widehat{PD}, \hat{E}, \hat{C})$

  $= 1 - [1 - \Phi(\alpha_{PD} + \beta_{PD}\widehat{PD})][1 - \Phi(\alpha_E + \beta_E\hat{E})][1 - \Phi(\alpha_C + \beta_C\hat{C})]$

  $= 1 - \Phi(-\alpha_{PD} - \beta_{PD}\widehat{PD}) \, \Phi(-\alpha_E - \beta_E\hat{E}) \, \Phi(-\alpha_C - \beta_C\hat{C})$

  $= 1 - \Phi[(-\alpha_{PD}\alpha_E\alpha_C) - (\alpha_E\alpha_C\beta_{PD})\widehat{PD} - (\alpha_{PD}\alpha_C\beta_E)\hat{E} -$
  $(\alpha_{PD}\alpha_E\beta_C)\hat{C} - (\alpha_C\beta_{PD}\beta_E)\widehat{PD}\hat{E} - (\alpha_E\beta_{PD}\beta_C)\widehat{PD}\hat{C} -$
  $(\alpha_{PD}\beta_E\beta_C)\hat{E}\hat{C} - (\beta_{PD}\beta_E\beta_C)\widehat{PD}\hat{E}\hat{C}]$

  $= \Phi[(\alpha_{PD}\alpha_E\alpha_C) + (\alpha_E\alpha_C\beta_{PD})\widehat{PD} + (\alpha_{PD}\alpha_C\beta_E)\hat{E} +$
  $(\alpha_{PD}\alpha_E\beta_C)\hat{C} + (\alpha_C\beta_{PD}\beta_E)\widehat{PD}\hat{E} + (\alpha_E\beta_{PD}\beta_C)\widehat{PD}\hat{C} +$
  $(\alpha_{PD}\beta_E\beta_C)\hat{E}\hat{C} + (\beta_{PD}\beta_E\beta_C)\widehat{PD}\hat{E}\hat{C}$

$= \Phi[\gamma_0 + \gamma_1\widehat{PD} + \gamma_2\hat{E} + \gamma_3\hat{C} + \gamma_4(\widehat{PD}\hat{E}) + \gamma_5(\widehat{PD}\hat{C}) + \gamma_6(\hat{E}\hat{C}) + \gamma_7(\widehat{PD}\hat{E}\hat{C})]$

$$(2)$$

Step 3: A Theoretical and Statistical Analogues in Testable Theory

- However, does the level of education affect Opportunity costs?
- OLS (Opportunity Costs) $= \gamma_0 + \gamma_1$(The Level of Education) $+$ γ_2(Party differential) $+ \gamma_3$(Strength of Partisanship) $+ \gamma_4$(Age) $+$ γ_5(Gender) $+ \gamma_6$(Race) $+ \gamma_7$(Time dummies) $+ \epsilon$
- Probit(Voter Turnout) $= \delta_0 + \delta_1$(Party differential) $+ \delta_2$(The level of education) $+ \delta_3$(Opportunity costs) $+ \delta_4$(Strength of Partisanship) $+$ δ_5(Age) $+ \delta_6$(Gender) $+ \delta_7$(Race) $+ \delta_8$(Time dummies) $+ \epsilon$

Hypothesis

1. Hypothesis 1: Education affects the opportunity costs (i.e., $\gamma_1 > 0$)
2. Hypothesis 2: Though education should increase the likelihood of voting, those with high opportunity costs, will be less likely to vote due to the declined monetary value of education (i.e., $\delta_2 > 0$, $\delta_3 < 0$).

- This study argues the monetary value of education reflects opportunity costs for voting.
- The monetary value of lower level education on earning wages change over time, leading to the decline of voter turnout among less educated people.
- More educated people not only struggle less from earning wages, but they also tend to vote more because of reduced opportunity costs. However, less educated people struggle from higher levels of economic adversity, resulting in unwillingness or inability to vote.

Data and Method

Data

- The unit of analysis: A group of respondents based on the level of education
- The time-series cumulated data of the American National Election Study (ANES) and American Census data

Variables

1. Voting (whether respondents voted in the November Election or not)
2. Education (4 level)
3. Opportunity costs (1/ (Median Income /10,000))
   Median income is adjusted by the Consumer Product Index to normalize and base year is 2008.
4. Party differential $||I_i - I_R| - |I_i - I_D||$
5. The strength of partisanship, gender, race, and age
6. Presidential years (1972 to 2008)

Step 3: A Theoretical and Statistical Analogues in Testable Theory

Mediation Model (Imai and Keele 2010)

- $M = \alpha_1 + \beta_1 X + \epsilon_1$
- $Y = \alpha_2 + \beta_2 X + \epsilon_2$
- $Y = \alpha_3 + \beta_3 X + \beta_4 M + \epsilon_3$
    1. α_1, α_2, and α_3: Constants
    2. ϵ_1, ϵ_2, and ϵ_3: errors
- Evidence for mediation
    1. β_1 is statistically significant, meaning there is a relationship between the independent variable (X) and the mediator (M).
    2. β_2 is statistically significant, meaning there is a relationship between the independent variable (X) and the dependent variable (Y);
    3. β_4 is statistically significant, meaning mediator (M) helps predict the dependent variable (Y).
    4. β_3 is the direct effect of the independent variable (X) on the dependent variable (Y). It is significantly smaller in size relative to β_2.

Research Models

Model 1

$$OpportunityCosts_t$$
$$= \gamma_{0t} + \gamma_{1t}(TheLevelofEducation) + \gamma_{2t}(Partydifferential)$$
$$+ \gamma_{3t}(StrengthofPartisanship) + \gamma_{4t}(Age) + \gamma_{5t}(Gender)$$
$$+ \gamma_{6t}(Race) + \gamma_{7t}(Timedummies) + \epsilon_t \quad (3)$$

Model 2

$$VoterTurnout_t$$
$$= \gamma_{0t} + \gamma_{1t}(TheLevelofEducation) + \gamma_{2t}(Partydifferential)$$
$$+ \gamma_{3t}(StrengthofPartisanship) + \gamma_{4t}(Age) + \gamma_{5t}(Gender)$$
$$+ \gamma_{6t}(Race) + \gamma_{7t}(Timedummies) + \epsilon_t \quad (4)$$

Research Models

$VoterTurnout_t$

$$= \gamma_{0t} + \gamma_{1t}(TheLevelofEducation) + \gamma_{2t}(Opportunitycosts)$$
$$+ \gamma_{3t}(Partydifferential) + \gamma_{4t}(StrengthofPartisanship)$$
$$+ \gamma_{5t}(Age) + \gamma_{6t}(Gender) + \gamma_{7t}(Race)$$
$$+ \gamma_{8t}(Timedummies) + \epsilon_t \quad (5)$$

Results

Table: OLS Regression Results

	Dependent variable:	
	Opportunity costs	
The Level of Education	-0.159^{***}	(0.001)
Party Differential	-0.430^{***}	(0.025)
Strength of PI	-0.001	(0.001)
Age	0.001^{***}	(0.00004)
Black	0.009^{***}	(0.002)
Hispanic	0.020^{***}	(0.002)
Asian	0.025^{***}	(0.005)
Other Race	0.004	(0.004)
Female	0.271^{***}	(0.001)
Constant	0.641^{***}	(0.004)
Observations	17,460	
R^2	0.863	
Adjusted R^2	0.863	
Residual Std. Error	0.083 (df = 17441)	
F Statistic	$6,116.094^{***}$ (df = 18; 17441)	

OLS Regression Results

Independent Variable	Model 1	
Year 1976	0.034***	(0.003)
Year 1980	0.052***	(0.003)
Year 1984	0.036***	(0.003)
Year 1988	0.021***	(0.003)
Year 1992	0.032***	(0.003)
Year 1996	0.026***	(0.003)
Year 2000	0.001	(0.003)
Year 2004	0.010***	(0.003)
Year 2008	0.004	(0.003)

Note: $^*p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table: OLS Regression Results: Dependent Variable - Opportunity Cost

Results

Table: Probit Regression Results

	DV: Voter Turnout			
	Model 2		Model 3	
The Level of Education	0.522***	(0.016)	0.384***	(0.027)
Party Differential	.022	(0.437)	−0.454	(0.442)
Opportunity Costs			−0.815***	(0.131)
Strength of PI	0.290***	(0.011)	0.290***	(0.011)
Age	0.014***	(0.001)	0.015***	(0.001)
Black	−0.145***	(0.033)	−0.138***	(0.033)
Hispanic	−0.175***	(0.048)	−0.160***	(0.048)
Observations	17,460		17,460	
Log Likelihood	−9,142.106		−9,125.224	
Akaike Inf. Crit.	18,322.210		18,290.450	
Note:	*p<0.1; **p<0.05; ***p<0.01			

Results

Table: Probit Regression Results

Asian	−0.511***	(0.090)	−0.488***	(0.090)
Other Race	−0.374***	(0.061)	−0.372***	(0.061)
Female	−0.067***	(0.022)	0.172***	(0.044)
Year 1976	−0.061	(0.045)	−0.032	(0.046)
Year 1980	−0.129***	(0.050)	−0.088*	(0.050)
Year 1984	−0.092**	(0.045)	−0.062	(0.045)
Year 1988	−0.249***	(0.046)	−0.234***	(0.046)
Year 1992	−0.083*	(0.044)	−0.054	(0.044)
Year 1996	−0.218***	(0.049)	−0.191***	(0.050)
Year 2000	−0.232***	(0.050)	−0.229***	(0.050)
Year 2004	−0.132**	(0.061)	−0.121**	(0.061)
Year 2008	−0.102**	(0.047)	−0.102**	(0.047)
Constant	−1.555***	(0.075)	−1.023***	(0.113)
Observations	17,460		17,460	
Log Likelihood	−9,142.106		−9,125.224	
Akaike Inf. Crit.	18,322.210		18,290.450	
Note:	*p<0.1; **p<0.05; ***p<0.01			

The effect of education on voter turnout

Table: Mediation Analysis Results

Treatment	Elementary	High school	Some college/Associate
Total Effect	-0.43	-0.25	-0.10
	[-0.45, -0.46]	[-0.26, -0.24]	[-0.10, -0.10]
Average Mediation Effect	-0.10	-0.06	-0.02
	[-0.13, -0.17]	[-0.08, -0.04]	[-0.03, -0.02]
Average Direct Effect	-0.33	-0.19	-0.08
	[-0.37, -0.28]	[-0.21, -0.16]	[-0.08, -0.07]

Note: Control is Bachelor's degree or more. Brackets show 95 percent confidence intervals.
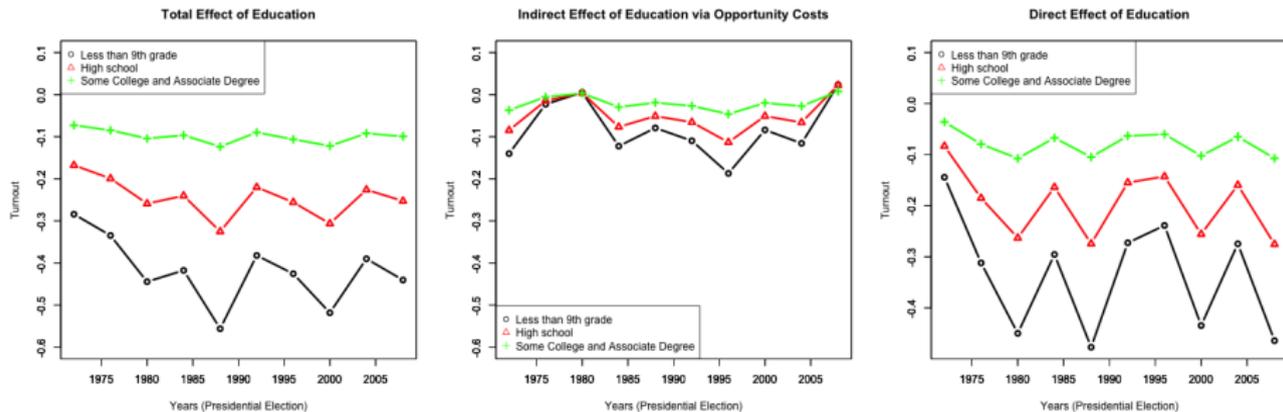
Figure: The relationship between the level of education and voter turnout via opportunity costs.

Note: Base control group is people with a Bachelor degree and advanced degree.

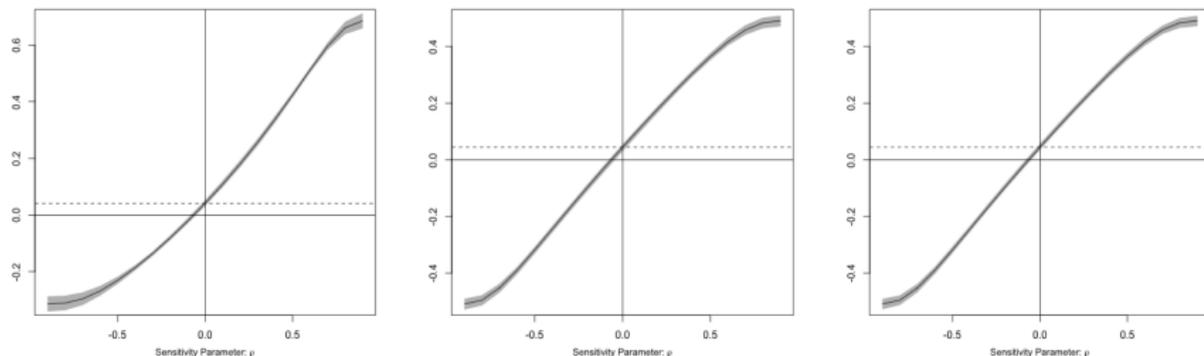# Sensitivity Analysis for Causal Mediation Effects

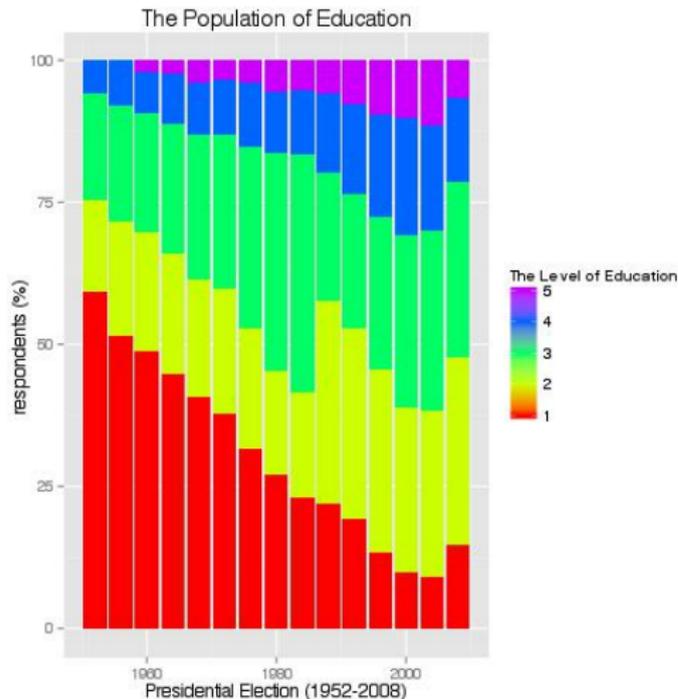Figure: The sensitivity parameter the correlation p between the residuals of the mediator and outcome regressions.

Note: These figures are made by the author with ANES data.

Conclusion

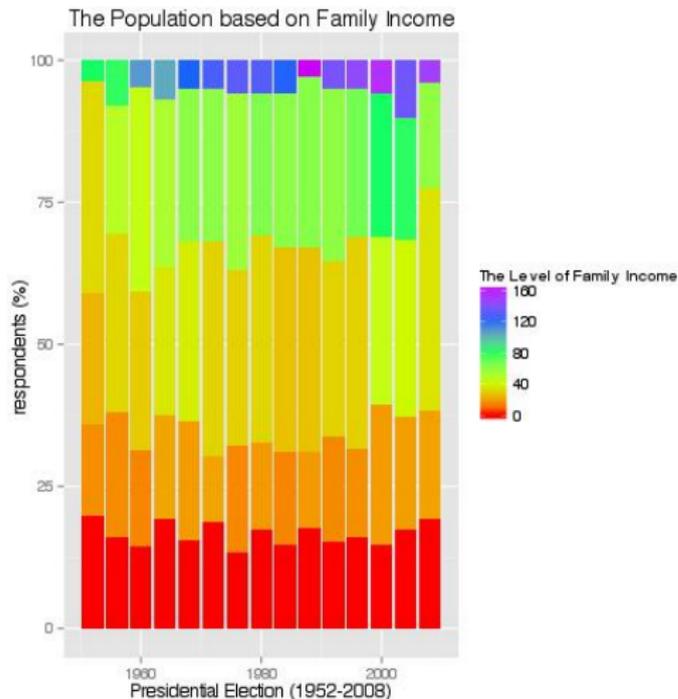**The Monetary Value of Lower Education Level**

- Education still positively influences the voting participation.
- Opportunity costs mediate the relationship between education and voting participation.
- Thus, education has an indirect effect on voter turnout via opportunity costs.
- Even though education should increase the likelihood of voting, those who have high opportunity costs will still be less likely to vote.
- The monetary value of lower education, including categories "less than high school" and "high school", has decreased and has led to the decline of voter turnout among people who have lower education.

Thank you

Education Population

The Population of Education

respondents (%)

The Level of Education
5
4
3
2
1

Presidential Election (1952-2008)

The Population based on Family Income

respondents (%)

The Level of Family Income

Presidential Election (1952-2008)

The Result of Correlation

Table: Correlation

Statistic	Education	Family Income	Opportunity Costs
Education	1	0.21	-0.67
Family Income	0.39	1	-0.33
Opportunity Costs	-0.67	-0.33	1
Turnout	0.24	0.21	-0.18

Appendix

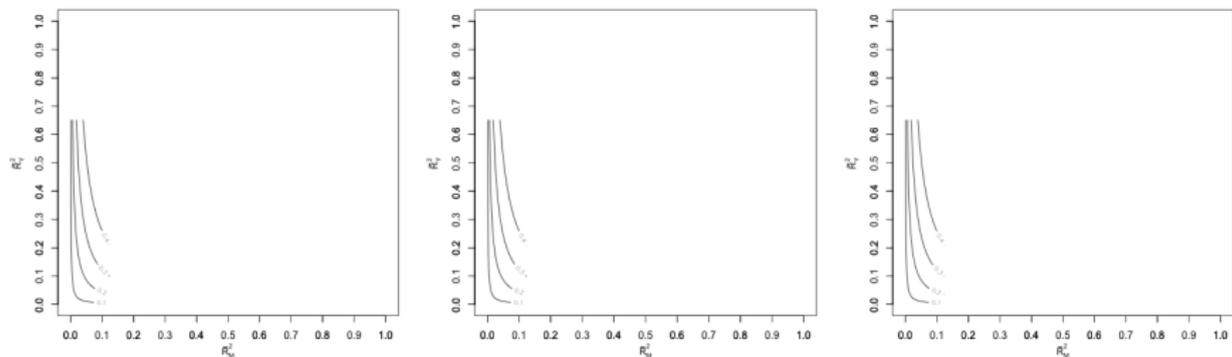Sensitivity Analysis for Causal Mediation Effects

Figure: A function of $\tilde{R}^2$.

Note: These figures are made by the author with ANES data.

Table: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max
Turnout	17,460	0.743	0.437	0	1
Education	17,460	2.582	0.927	1	4
Opportunity costs	17,460	0.417	0.222	0.137	1.085
Party differential	17,460	1.809	0.998	0	3
The strength of PI	17,460	45.858	17.603	17	99
Age	16,060	45.390	17.324	17	99
Black	17,460	0.130	0.336	0	1
Asian	17,460	0.013	0.112	0	1
Hispanic	17,460	0.061	0.240	0	1
Other race	17,460	0.027	0.163	0	1
Female	17,460	0.560	0.496	0	1