

# Education and Preferences: Experimental Evidences from Chinese Adult Twins

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# Introduction

The expected utility theory used to be held in such high regard akin to a religion in Economics

According Oskar Morgenstern (1979):

This also takes care of the matter of whether those questioned would "correct" their behavior if it were pointed out to them that they "act" in violation of the expected utility hypothesis. That theory, as formulated by the **von Neumann-Morgenstern axioms**, is normative in the sense that the theory is "absolutely convincing" which implies that men will act accordingly. If they deviate from the theory, an explanation of the theory and of their deviation will cause them to readjust their behavior. This is similar to the man who tries to build a perpetuum mobile and then is shown that this will never be possible. Hence, on understanding the underlying physical theory, he will give up the vain effort.

# The Behavioral Economics Revolution: Behavioral Anomalies

- Decision making under risk and uncertainty
  - Allais paradox (1953)
    - Independence axiom
    - Allais behavior
  - Ellsberg paradox (1961)
    - Knightian uncertainty
    - Ambiguity aversion, familiarity bias
  - Prospect theory: Four folds risk attitude (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992)
    - Moderate prospect/hazard; longshot prospect/hazard

# The Behavioral Economics Revolution: Behavioral Anomalies

- Decision making involving time
  - Time inconsistency (Laibson, 1997)
    - Hyperbolic discount/tumoral discounting
  - Timing of consumption (Lowenstein, 1987)
    - Anticipation, dread
  - Timing of uncertainty resolution (Chew and Epstein, 1989; Chew and Ho, 1994; Lovallo and Kahneman, 2000)
    - Hopefulness, anxiousness

# Research Questions?

- Whether the incidence of behavioral anomalies reflects cognitive ability or preference/bias?  
Or
- Could the decision making biases, referring to the departures from the classical model in the literature, can potentially be rectified via education or perhaps re-education, as with the opening quote from Oskar Morgenstern?
- Reflective equilibrium (Savage, 1954)
  - Preferences that initially contradict some normative principle may not survive thorough deliberation.
  - Is this true?
- What constitutes "truly" normative behavior?

# Our Goal

- Investigate the relationship between educational attainments and two dimensions of preference – decision making under risk and uncertainty and decision making involving time
- Address the question whether behavioral anomalies can be ameliorated by education.

# Literature: Determinants of Preferences or Preference Formation

- Theoretical studies
  - Wealth (Becker and Mulligan, 1997); market institutions (Bowles 1998); culture (Bisin and Verdier, 2000); etc.
- Experimental and empirical studies
  - Cognitive ability (Dohmen, et al., 2010; Benjamin et al., 2006; Burks et al., 2009); non-cognitive ability and gender (Borghans et al., 2009); heritability of preference (Cesarini et al., 2009; Zhong et al., 2009); social identity (Benjamin et al., 2010); etc.
- How about education?
  - Among factors affecting preference formation, education appears especially important given that we learn and develop different ways of thinking and acting besides being trained to acquire professional skills.

- Risk attitudes
  - A higher level of education tends to reduce the degree of risk aversion toward moderate prospects, moderate hazards, and longshot prospects.
- Decision making anomalies under risk and uncertainty
  - University educated subjects exhibit significantly more Allais type behavior compared to pre-high school subjects, while high school educated subjects also exhibit more ambiguity aversion as well as familiarity bias relative to pre-high school subjects.
- Decision making involving time
  - A higher level of education tends to reduce the degree of impatience, hyperbolic discounting, dread, and hopefulness
- Summary
  - People with a higher level of education tends to exhibit more "biased" preference in risk attitude and less "biased" preference regarding time.



- Within-twin-pair fixed-effects estimator

$$y_{1i} = \alpha + E_{1i}\beta + Z_{1i}\delta + X_i\gamma + \mu_i + \varepsilon_{1i} \quad (1)$$

$$y_{2i} = \alpha + E_{2i}\beta + Z_{2i}\delta + X_i\gamma + \mu_i + \varepsilon_{2i} \quad (2)$$

- $\mu_i$ : represents a set of unobservable variables at the family level

$$y_{1i} - y_{2i} = (E_{1i} - E_{2i})\beta + (Z_{1i} - Z_{2i})\delta + \varepsilon_{1i} - \varepsilon_{2i} \quad (3)$$

- Additivity (linearity) assumption: First-order approximation
- Other concerns (see Robustness section)
- Small sample bias correction
  - $t$ -statistics are based on a permutation procedure

- The Chinese adult twin survey (CATS) data (Li et al., 2007; Huang et al., 2009; Li et al., 2010a, 2010b)
  - Socioeconomic information
- The incentivized choice experiments
  - Decision making under risk and uncertainty: Moderate prospect/hazard, and longshot prospect/hazard, Allais behavior, ambiguity aversion, familiarity bias
  - Decision making involving time: Impatience, hyperbolic discounting, anticipation, dread, hopefulness, anxiousness

**Table 1: OLS and Within-Twin-Pair Fixed-Effects Estimates of Education Attainments and Decision Making under Risk**

	Dependent variables					
	Moderate prospect			Moderate hazard		
	OLS		FE	OLS		FE
	(1)	(2)	(3)	(4)	(5)	(6)
<b>High school</b>	-0.087 (0.80)	-0.099 (0.89)	0.081 (0.42)	-0.130 (1.28)	-0.073 (0.70)	-0.057 (0.29)
<b>Technical school</b>	0.002 (0.02)	0.074 (0.53)	0.199 (0.87)	-0.090 (0.74)	0.042 (0.32)	0.183 (0.79)
<b>College-and-above</b>	0.004 (0.034)	0.060 (0.43)	<b>0.438**</b> <b>(2.03)</b>	-0.060 (0.54)	0.016 (0.12)	<b>0.386*</b> <b>(1.77)</b>
<b>Parental education</b>	No	Yes		No	Yes	
<b>Observations</b>	140	140	140	140	140	140
<b>Twin pairs</b>			70			70
<b>R-squared</b>	0.11	0.19	0.08	0.11	0.17	0.09
	Longshot prospect			Longshot hazard		
	OLS		FE	OLS		FE
	(7)	(8)	(9)	(10)	(11)	(12)
<b>High school</b>	0.094 (0.85)	0.129 (1.13)	0.202 (0.96)	-0.187 (1.60)	-0.167 (1.43)	-0.331 (1.55)
<b>Technical school</b>	0.180 (1.36)	0.234 (1.62)	0.338 (1.36)	0.0186 (0.14)	0.081 (0.57)	-0.165 (0.67)
<b>College-and-above</b>	0.061 (0.50)	0.158 (1.10)	<b>0.482**</b> <b>(2.06)</b>	-0.085 (0.69)	-0.064 (0.44)	-0.061 (0.26)
<b>Parental education</b>	No	Yes		No	Yes	
<b>Observations</b>	140	140	140	128	128	128
<b>Twin pairs</b>			70			64
<b>R-squared</b>	0.14	0.21	0.03	0.14	0.25	0.05

**Table 2: OLS and Within-Twin-Pair Fixed-Effects Estimates of Education Attainments and Decision Making under Uncertainty**

	Dependent variables								
	Allais			Ambiguity aversion			Familiarity bias		
	OLS		FE	OLS		FE	OLS		FE
	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
<b>High school</b>	0.092 (0.97)	0.094 (0.96)	0.295 (1.64)	0.176 (1.56)	0.077 (0.67)	<b>0.372*</b> <b>(1.72)</b>	0.080 (0.85)	0.0923 (0.98)	<b>0.319*</b> <b>(1.65)</b>
<b>Technical school</b>	0.064 (0.59)	0.056 (0.47)	0.274 (1.33)	0.369*** (2.73)	0.240* (1.66)	0.242 (0.95)	-0.160 (1.43)	-0.171 (1.43)	0.065 (0.28)
<b>College-and-above</b>	0.177* (1.77)	0.206* (1.73)	<b>0.417**</b> <b>(2.15)</b>	0.213* (1.73)	0.230 (1.60)	0.175 (0.73)	-0.125 (1.22)	-0.093 (0.78)	0.007 (0.03)
<b>Parental education</b>	No	Yes		No	Yes		No	Yes	
<b>Observations</b>	122	122	122	140	140	140	140	140	140
<b>Twin pairs</b>			61			70			70
<b>R-squared</b>	0.15	0.21	0.08	0.07	0.17	0.05	0.10	0.21	0.06

**Table 3: OLS and Within-Twin-Pair Fixed-Effects Estimates of Education Attainments and Decision Making Involving Time**

	Dependent variables								
	Impatience			Hyperbolic discounting			Anticipation		
	OLS		FE	OLS		FE	OLS		FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>High school</b>	0.047 (0.42)	0.017 (0.15)	-0.004 (0.02)	-0.064 (0.66)	-0.055 (0.53)	-0.133 (0.66)	0.068 (0.61)	0.058 (0.51)	0.048 (0.23)
<b>Technical school</b>	-0.133 (1.00)	-0.177 (1.19)	-0.413 (1.56)	0.010 (0.09)	-0.004 (0.03)	-0.057 (0.24)	0.127 (0.98)	0.058 (0.41)	0.136 (0.56)
<b>College-and-above</b>	-0.211* (1.73)	-0.214 (1.44)	<b>-0.520**</b> <b>(2.09)</b>	-0.116 (1.09)	-0.188 (1.45)	<b>-0.382*</b> <b>(1.70)</b>	0.290** (2.49)	0.152 (1.09)	0.208 (0.92)
<b>Parental education</b>	No	Yes		No	Yes		No	Yes	
<b>Observations</b>	140	140	140	140	140	140	130	130	130
<b>Twin pairs</b>			70			70			65
<b>R-squared</b>	0.13	0.16	0.10	0.07	0.10	0.07	0.23	0.31	0.02

  

	Dependent variables								
	Dread			Hopefulness			Anxiousness		
	OLS		FE	OLS		FE	OLS		FE
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
<b>High school</b>	-0.301*** (2.84)	-0.284** (2.55)	-0.220 (1.14)	-0.201* (1.71)	-0.186 (1.51)	-0.225 (1.08)	-0.062 (0.64)	-0.069 (0.67)	-0.130 (0.60)
<b>Technical school</b>	-0.215* (1.70)	-0.233 (1.65)	<b>-0.515**</b> <b>(2.22)</b>	-0.367*** (2.64)	-0.336** (2.15)	<b>-0.440*</b> <b>(1.80)</b>	0.011 (0.09)	-0.013 (0.10)	0.036 (0.14)
<b>College-and-above</b>	-0.132 (1.17)	-0.214 (1.56)	<b>-0.389*</b> <b>(1.81)</b>	-0.069 (0.56)	-0.145 (0.99)	<b>-0.478**</b> <b>(2.14)</b>	0.079 (0.74)	0.044 (0.34)	-0.085 (0.35)
<b>Parental education</b>	No	Yes		No	Yes		No	Yes	
<b>Observations</b>	136	136	136	128	128	128	140	140	140
<b>Twin pairs</b>			68			64			70
<b>R-squared</b>	0.08	0.11	0.07	0.14	0.19	0.07	0.11	0.14	0.01

- Measurement errors
  - Instrumental variable within-twin-pair fixed-effects estimator (co-twin's report on education)
- Omitted variables
  - Conditional on birth weight
  - Restricted to MZ twins
- Other potential biases of within-twin-pair fixed-effects estimates
  - Empirically establishing within-twin-pair fixed-effects estimates are at least less biased than the OLS ones

- Small sample
- How to economically or behaviorally rationalize our (counter intuitive in places) empirical findings?
  - Why and how does education affect preference in different dimensions in different ways?
  - Does knowledge/information play a role?

*Thank you !*

Q & A