

Using Education and Genetic Information to Explore Stability of Risk Preference

Dongyue Ying (ying.133@osu.edu)

Department of Human Sciences, the Ohio State University

Abstract

Individual financial decisions reflect risk preferences in observed tradeoffs between risk and expected returns. I investigate the validity of the assumption that individuals form preferences early, including with respect to risk, and those preferences remain stable. I use data from the Wisconsin Longitudinal Study (WLS) to test the hypothesis that risk preferences vary systematically (and causally) with differences in education, with controls for genetic differences associated with risk preferences (Linnér et al., 2019). To address the potential endogeneity between risk preference and education, I used instrumental variables methods. Preliminary results suggest that entrance of college is uncorrelated with risk preference. However, data quality is a competing explanation that I am exploring. I present and discuss evidence of the (poor) data quality and ideas about alternative data sources that may provide additional insights.

Conceptual Framework

Risk preference

- Key factor in individual's decision-making process
- Standard economic theory assumes that individuals are rational and believes that risk preference will not change

Endogenous risk preference

- A hypothesis or an observation that an individual doesn't have consistent risk preference
 - over different domains (health behavior, financial investment, consumption, ...) and over time

Education

- Provide a unique experience
- Provide extra knowledge & information

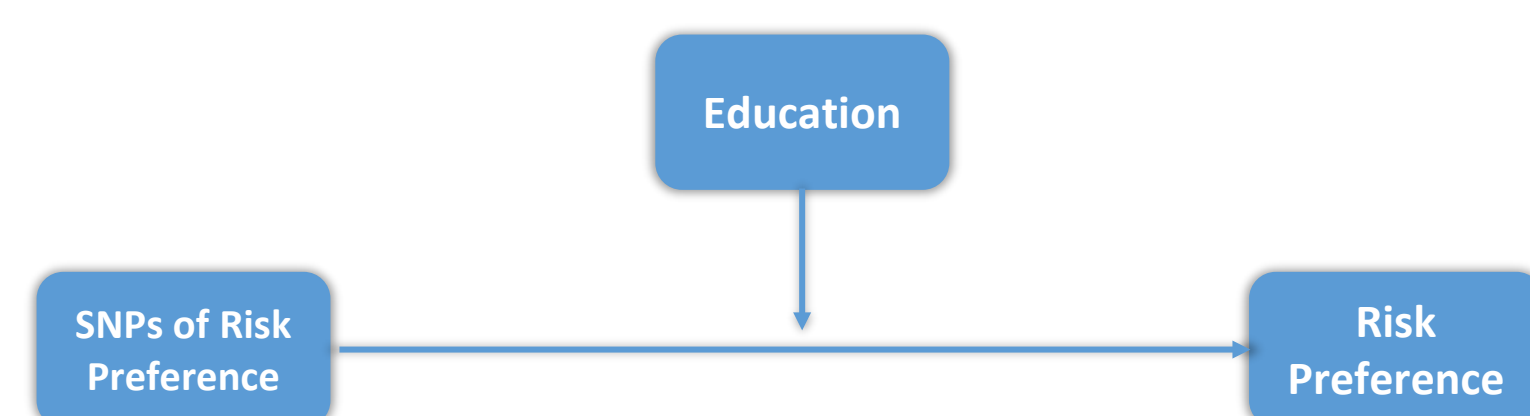
Methodology

Dataset

- We used the Wisconsin Longitudinal Study (WLS) dataset. The WLS surveys Wisconsin high school graduates born primarily in 1939 and constantly observes these elder individuals as well as their siblings. For our analyses, we adopted all households from the Wave 6 (2010-2011), who have valid answers to all variables used in the analyses. The total sample size in the study was 2,867.

Mediation Analysis

- **Purpose:** Whether existed association between risk preference and genes changes with different education attainments



Methodology (Continued)

$$EverCol_i = \pi_0 + \pi_1 DisCol_i + \tau_i \quad (1)$$

$$Risk_i = \alpha_0 + \alpha_1 PGS_i^{Risk} + X'_i \beta + \varepsilon_i \quad (2)$$

$$Risk_i = \beta_0 + \beta_1 PGS_i^{Risk} + \beta_2 EverCol_i + \beta_3 PGS_i^{Risk} * EverCol_i + X'_i \beta + \mu_i \quad (3)$$

- **Gene Variable: Polygenic Score** generated by Single Nucleotide Polymorphisms (SNPs) that correlate with risk preference (Karlsson Linnér et al., 2019) [Third Polynomial]
- **Risk Aversion: Hypothetical Small Gambles.**
 - If you select Choice A, you would have a **100%** chance of getting a certain amount. If you select Choice B, you would have a **50%** chance of getting the dollar amount specified and a **50%** chance of getting **\$0**.
 - 3 Sections of Questions, overall 21 gambles. Calculate an **interval** of **Relative Risk Aversion** based on hypothesis of Constant Relative Risk Aversion (CRRA).
- **Education: Ever Attended College** [z_edelrs], **Geographic availability of college** [avcl57]
- **Other Variables:** Age, Gender, IQ, Self-reported Health, Total Number of Dead Household Members, Total Number of Conditions, Number of Children, Number of Marriage, Whether Married Now, Net Worth.

Results

Figure 1. Distribution of Calculated Range of Relative Risk Aversion, Calculated Polygenic Score of Risk Preference

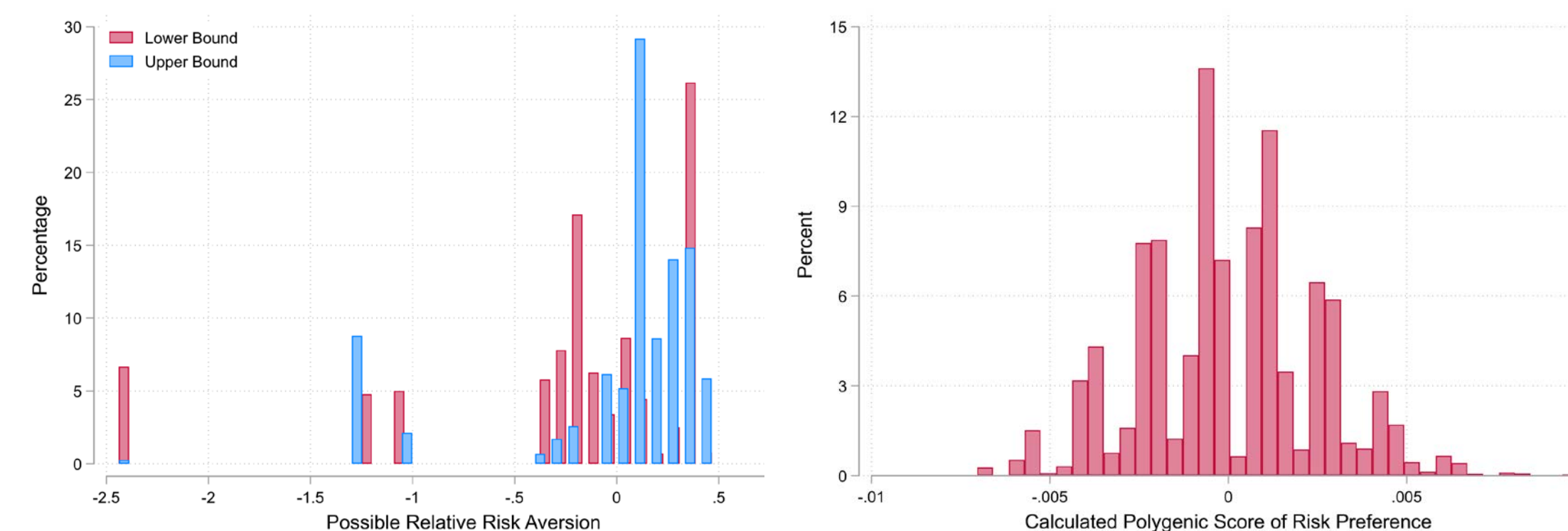


Table 1. Significance of Key Variables in 3 Equations, WLS

	Dependent Variable	Key Variable	Joint F-test [P-val]
Eq. (1)	Ever attend college	Distance to college	30.73 [0.000]
Eq. (2)	Relative risk aversion	PGS for risk preference	2.29 [0.515]
Eq. (3)	Relative risk aversion	PGS for risk*Ever attend college	0.55 [0.459]

Results (Continued)

Table 2. Significance of Ever Smoke and BMI with PGS and Risk Aversion

Dependent Variable	Key Variable	F-test [P-val]
Risk Aversion	Ever Smoke	0.15 [0.697]
Risk Aversion	BMI	0.26 [0.610]
PGS for risk preference	Ever Smoke	4.12 [0.042]
PGS for risk preference	BMI	5.24 [0.022]

Table 3. Interval Regression result of Calculated Risk Aversion on Total Number of Inconsistent Reports

Dependent Variable	Key Variable	Coeff. [P-val]
Risk Aversion	# of Inconsistent Rprts	0.022 [0.002]

Discussion

Result

- No significant relationship found between ever attended college and risk preference
- Data quality issue
 - in WLS, PGS of risk preference cannot explain risk aversion variable

Inconsistent Reports

- missing reports in the middle of the question rounds in this section (7 questions)
- more than one switch from 100% option to 50:50 option within this section
- reports all missing in this section

Small-stakes Gamble

- Due to the small amount of money in the gamble compared to the overall asset the individual owns, in these gambles the individual tends to be less concentrated, and thus the risk aversion derived from these gambles might contain more noises (Khaw et al., 2018)
- Due to the definition of relative risk aversion, the risk preference at small-stake gambles might be exaggerated (Rabin, 2000)

Other Potential Issues

- Ever attended college may not cause significant difference of risk aversion
- Distance to college may correlate with risk preference not only through ever attended college

Improvement of Research

- Other Variables (Major, Completed Years of Education, Policy Change, etc)
- Other Datasets (Twin Studies, Health and Retirement Studies)