Cognitive, Non-Cognitive, and Behavioral Returns to College Quality: Evidence from India

Utteeyo Dasgupta, Wagner College and Fordham University
Subha Mani, Fordham University, University of Pennsylvania &
IZA
Smriti Sharma, UNU-WIDER
Saurabh Singhal, UNU-WIDER

Introduction

Human capital is a multidimensional concept:

- Intellectual capital: completed grades of schooling, math, language proficiency, analytical reasoning.
- Personality traits/non-cognitive skills: Big Five, locus of control, grit, self-esteem.
- Behavioral traits: competitiveness, risk preferences, confidence.

All three aspects of human capital affect labor market outcomes (e.g., Heckman et al. 2006; Borghans et al. 2008; Castillo et al. 2010; Buser et al. 2014; Dasgupta et al. 2015; Almund et al. 2011).

Introduction

Personality traits are potentially malleable during late adolescence and young adulthood: can be affected by major life events, participation in programs, college enrollment etc (Specht et al. 2011; Jackson et al. 2013).

Risk preferences, time preferences and social preferences are not stable (Chuang and Schechter 2015).

Little is known about the role of better quality schools and colleges in improving these skills.

The effects of selective schools and colleges:

- On test scores remain mixed (Pop-Eleches and Urquiola 2013; Lucas and Mbiti 2014; Abdulkadiroglu et al. 2014; Dale and Krueger 2011).
- On labor market outcomes is positive (Hoekstra 2009; Saavedra 2009; Sekhri 2011).

Objective

Examine the impact of eligibility to enroll in a selective college on:

- Cognitive outcomes (test scores from standardized university level semester examinations)
- Behavioral outcomes (competitiveness, confidence, risk preference)
- Non-cognitive outcomes (Big Five personality traits)

We exploit the admissions criterion in a regression discontinuity framework: gets around the selection problem.

We use a large sample of college students from University of Delhi, India.

Preview of results

What are the effects of exposure to better quality colleges?

- − Dynamic impact on test scores - initial positive impact for females.
- − Reduction in risk-aversion among females.
- − Males become less conscientious and less extrovert.
- − Heterogeneity results indicate that females from low SES backgrounds experience greater reductions in risk aversion.

Context

College admissions in India are highly competitive, esp. more so at prestigious universities such as the University of Delhi (DU).

Delhi University received around 0.4 million applications in 2015 and has a capacity of only 54,000 seats (NDTV 2015).

DU consists of 79 affiliated colleges.

Tremendous pressure to enroll in a "better quality" college:

- Exposure to high-achieving peers.
- Infrastructure, teacher, extra-curricular activities.
- Prestige and brand value.

College Admissions Process

- Centralized admission process - students apply to colleges and disciplines (within those colleges) based on average score on standardized national high school exit examinations.
- Then, each college announces its discipline-gender-stream specific cutoff.
- Those above the cutoff are eligible for admission.
- In case of vacancies, cutoffs are sequentially lowered till seats are filled. Better quality colleges are more oversubscribed and thus fill seats faster.
- More demand for better quality colleges -> higher cutoffs -> higher ability peers.

Identification Strategy

The DU admission process allows us to exploit a regression discontinuity design:

— The cutoff cannot be manipulated by the student

— Assignment to a college depends solely on the student's performance on standardized national high school exit examinations (double-blind grading)

— Ex-ante, students who are just above the cutoff must be similar to students just below the cutoff in all other pre-determined factors

— Compare outcomes of students just below the cutoff to students just above the cutoff

— Assignment does not necessarily imply enrollment - we report both intent-to-treat effects and IV estimates

Data

- Second and third year college students enrolled in 3-year undergraduate programs in Economics and Commerce in University of Delhi

- Restricted to co-educational, full-time colleges that offer humanities and social sciences and rely solely on the high school exit examination scores for admission

- Using admission cutoffs for 2011-2013, we identified 18 colleges that had consistently ranked cutoffs. 15 colleges and 2065 students surveyed

- Restrict sample to 1329 students who belong to the "general" admission category. We exclude those who gained admission based on criteria other than high school scores

- Incentivized experiments followed by socioeconomic surveys: 60 sessions, 75 mins each.

- Show-up fee: Rs. 150; average additional payment: Rs. 230

Data

Experiments

- Competitiveness game a la Niederle and Vesterlund (2007)
- Investment game by Gneezy and Potters (1997)

Socioeconomic Survey

- Semester-wise test scores, family background, school, and extra-curricular participation
- Big Five inventory
  - Openness: imagination, creativity, intellectual curiosity, and appreciation of aesthetic experiences.
  - Extraversion: reflects sociability, assertiveness, and positive emotionality.
  - Conscientiousness: traits related to self-discipline and organization
  - Agreeableness: comprises traits relating to altruism, empathy and kindness.
  - Neuroticism: tendency to experience negative emotions easily.

Analysis Sample

We follow the methodology of Pop-Eleches and Urquiola (2013) to form the analysis sample

- Sort the colleges into 4 groups based on their average admission cutoff over 2011-13
- Identify the minimum marks required for admission into a (relatively) more selective group of colleges
- Stack all the observations, such that, every student serves as an observation for every cutoff, as a result, we create a sample that is roughly 3 times as large
- However, the treatment effects are computed in ± 5 p.p. interval around the cutoff - so student-level observations usually used only twice (once treated & once control)

Empirical Specification

"Intent-to-treat" effects:

$$Y_i = \beta_0 + \beta_1 T_i + \beta_2 d_i + \beta_3 d_i^2 + \beta_4 d_i T_i + \beta_5 d_i^2 T_i + \sum_{j=6}^{J} \beta_j X_{ji} + \epsilon_i$$

- Y_i: college semester marks, personality traits, and preferences
- T_i: indicator function that takes a value 1 if class 12th examination score is greater than or equal to the cutoff
- d_i: distance from cutoff
- β_1: ITT estimate
- X_{ji}: controls - age, mother's education, father's education, no. of siblings, religion, enrollment in private school, family income
- Year & course FE, standard errors clustered at the session level

Controls Balance

	Age	Mother's education	Father's education	# Siblings	Hindu	Private School	Family Income
Panel A: Full Sample							
1(Above Cutoff)	0.033	0.032	-0.035	-0.023	-0.035	0.036	0.025
	(0.101)	(0.053)	(0.051)	(0.119)	(0.031)	(0.051)	(0.069)
Observations	2368	2393	2393	2393	2393	2393	2393
Panel B: Males							
1(Above Cutoff)	0.025	-0.036	-0.078	-0.208	-0.029	0.008	0.083
	(0.198)	(0.096)	(0.097)	(0.208)	(0.049)	(0.083)	(0.096)
Observations	1043	1059	1059	1059	1059	1059	1059
Panel C: Females							
1(Above Cutoff)	0.079	0.080	-0.015	0.116	-0.053	0.054	-0.041
	(0.096)	(0.076)	(0.062)	(0.113)	(0.042)	(0.061)	(0.087)
Observations	1325	1334	1334	1334	1334	1334	1334

First-stage Relationship

Figure : Probability of enrollment in a better quality college
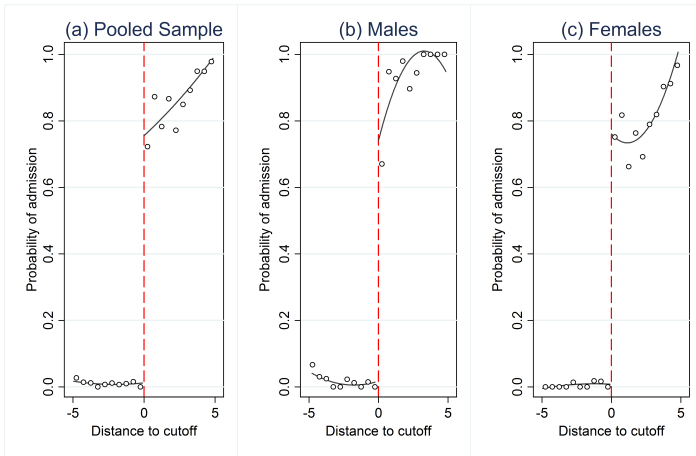
College quality (proxied by peer ability)

	High school exit exam scores of peers
Panel A: Full Sample	
1(Above Cutoff)	2.454***
	(0.799)
Observations	2359
Panel B: Males	
1(Above Cutoff)	2.151***
	(0.746)
Observations	1040
Panel C: Females	
1(Above Cutoff)	2.664***
	(0.908)
Observations	1319

ITT effects: Cognitive outcomes

	Av. score	Semester scores				
		Sem I	Sem II	Sem III	Sem IV	Sem V
Panel A: Full Sample						
1(Above Cutoff)	1.918	2.496	1.822	1.492	2.751*	4.743*
	(1.609)	(1.949)	(1.679)	(1.546)	(1.541)	(2.510)
Observations	2346	2333	2328	2318	1089	1085
Panel B: Males						
1(Above Cutoff)	-0.574	-1.214	-1.171	-1.163	3.420*	4.513
	(1.754)	(2.454)	(2.035)	(1.926)	(1.800)	(2.909)
Observations	1030	1030	1027	1022	449	448
Panel C: Females						
1(Above Cutoff)	3.226*	5.180***	3.635*	3.136*	1.898	4.041
	(1.695)	(1.819)	(1.818)	(1.773)	(1.689)	(2.467)
Observations	1316	1303	1301	1296	640	637

– Females test scores improve by 3 p.p.

– Dynamic effects

ITT effects: Behavior

	Competitiveness	Confidence	Investment
Panel A: Full Sample			
1(Above Cutoff)	0.055	-0.064	2.070
	(0.065)	(0.063)	(2.203)
Observations	2365	2368	2359
Panel B: Males			
1(Above Cutoff)	0.079	0.065	-1.940
	(0.085)	(0.100)	(4.184)
Observations	1043	1043	1038
Panel C: Females			
1(Above Cutoff)	0.100	-0.079	7.644***
	(0.072)	(0.077)	(2.693)
Observations	1322	1325	1321

− Females are becoming less risk-averse

ITT effects: Personality Traits

	Big Five				
	Extraversion	Agreeable	Conscientiousness	Emotional Stability	Openness
Panel A: Full Sample					
1(Above Cutoff)	-0.189	0.066	-0.164	0.061	-0.064
	(0.138)	(0.115)	(0.152)	(0.120)	(0.115)
Observations	2331	2318	2340	2329	2328
Panel B: Males					
1(Above Cutoff)	-0.359*	0.019	-0.421*	-0.015	-0.134
	(0.205)	(0.217)	(0.223)	(0.185)	(0.199)
Observations	1021	1013	1029	1018	1018
Panel C: Females					
1(Above Cutoff)	-0.126	-0.015	0.065	0.185	0.032
	(0.187)	(0.145)	(0.185)	(0.164)	(0.142)
Observations	1310	1305	1311	1311	1310

– Males become less conscientious and less extrovert

Mechanisms

	Males		Females	
	Attendance	External Tutorial	Attendance	External Tutorial
1(Above Cutoff)	-0.106	0.012	0.220**	-0.029
	(0.082)	(0.123)	(0.087)	(0.084)
Observations	1043	1043	1325	1325

- Females attend classes more, thus more likely to benefit from their environment.

Conclusion

What are the effects of access to better quality colleges ?

— Positive and dynamic effects on test scores for females.

— Females attend classes more regularly.

— Reduce risk-averse behavior among females, implications for gender gap in risk preferences.

— Conscientiousness and extraversion of males declines.

— Heterogeneity results indicate that females from low SES backgrounds experience greater reductions in risk aversion.

— Results are robust to all standard checks.