

The gender gap in university participation:

What role do skills and parents play?

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- Women outnumber men in university across most OECD countries (OECD 2016)
 - In 2013, 60% of Bachelors degrees in Canada were awarded to women
- This paper: investigate the university participation gap using YITS-A
- Gap in 2006, among cohort of 21 year olds:
 - 15 percentage points, Women: 53% Men: 38%
 - Participation means ever having enrolled in program that leads to degree

- US data: Wage premiums (Jacob 1992) , non-cognitive or personality skills (Jacob 1992, Becker et al. 2010), aspirations and job opportunities (Goldin et al. 2006, Fortin et al. 2015)
- Canadian data: Frenette and Zeman (2007) decompose gap in YITS-A (Cycle 3, 19 year olds)
 - Important variables: Grades (30%), Reading scores (14%), Study habits (11%), Parental aspirations (7-8%)
- Variables reflect many different influences and circumstances

- **Goal:** Identify and quantify the underlying factors determining the gender gap in university participation.
- Use a factor model from Foley, Gallipoli, & Green (2014) based on Carneiro, Hanson, & Heckman (2013) to identify 3 factors:
 - 1 Cognitive skills θ_1
 - 2 Personality, or Non-cognitive skills θ_2
 - *Conscientiousness* – ‘efficient, organized, planful, reliable, responsible and thorough’ (McCrae & John 1992, Borghans, Duckworth, Heckman, and ter Weel 2008)
 - 3 Parental valuation of education v_p (PVE)
 - Related to differences in perceived value of education (pecuniary or non-pecuniary)

Youth in Transition Survey

- Longitudinal survey following a cohort of Canadian youth
 - School based sampling frame representing 10 Canadian provinces
 - Main sample: 9810, Men: 4507 Women: 5303
- Use data from Cycle 1 (2000-age 15) and Cycle 4 (2006-age 21)
- Cycle 1 includes parental survey and high school administrators' survey
- Youth took internationally comparable reading test at Cycle 1 (PISA)

University participation index $g \in \{\text{Male, Female}\}$

$$I^g = \gamma_0^g + \gamma_x X + \lambda_{0\theta_1}^g \underbrace{\theta_1}_{\text{Cognitive}} + \lambda_{0\theta_2}^g \underbrace{\theta_2}_{\text{Non-Cog}} + \lambda_{0v_p}^g \underbrace{v_p}_{\text{PVE}} + u_0^g$$

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Youth Aspirations: 'What is the highest level of education you would like to get'

$$yasp^g = \beta_{10}^g + \beta_{1x}^g X + \lambda_{1\theta_1}^g \underbrace{\theta_1}_{\text{Cognitive}} + \lambda_{1\theta_2}^g \underbrace{\theta_2}_{\text{Non-Cog}} + \lambda_{1v_p}^g \underbrace{v_p}_{\text{PVE}} + u_0^g$$

- Observed outcomes and measurements are linked together by unobserved factors.
- Carneiro, Hanson, & Heckman (2013) give the condition under which covariances between measurements identify factors

System of 8 equations (including participation and youth's aspirations).

- PISA reading scores:

$$PISA^g = \beta_{20}^g + \beta_{2w}^g W + \theta_1 + u_2^g$$

- I complete my homework on time (Always):

$$hmwrk^g = \beta_{30}^g + \beta_{3w}^g W + \theta_2 + \lambda_{3v_p}^g v_p + u_3^g$$

- **Parent question:** What is the highest level of education that you hope your child will get (University):

$$parasp^g = \beta_{40}^g + \beta_{4X}^g X + \lambda_{4\theta_1}^g \theta_1 + \lambda_{4\theta_2}^g \theta_2 + v_p + u_4^g$$

System of 8 equations (including participation and youth's aspirations).

- Overall grades in Grade 10:

$$grades^g = \beta_{50}^g + \beta_{5W}^g W + \lambda_{5\theta_1}^g \theta_1 + \lambda_{5\theta_2}^g \theta_2 + \lambda_{5v_p}^g v_p + u_5^g$$

- I do as little work as possible; I just want to get by. (Never):

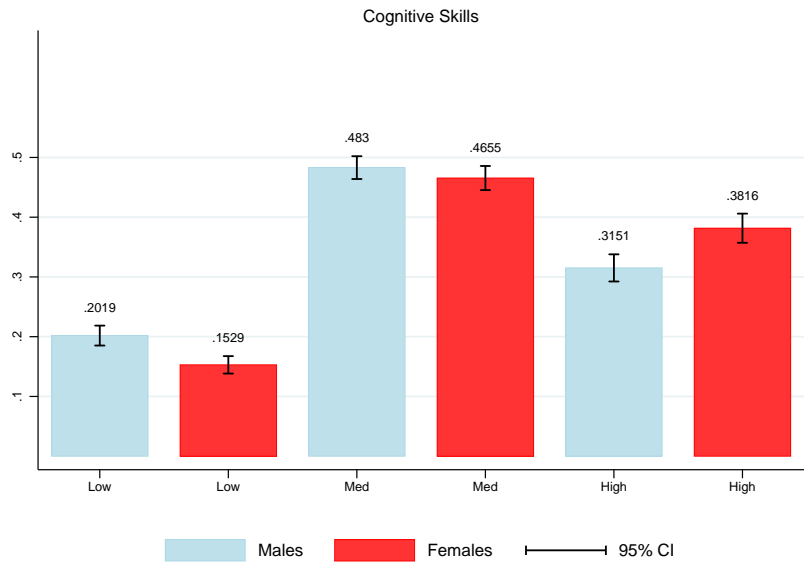
$$getby^g = \beta_{60}^g + \beta_{6W}^g W + \lambda_{6\theta_2}^g \theta_2 + \lambda_{6v_p}^g v_p + u_6^g$$

- **Parent question:** Saved to prepare for child's education:

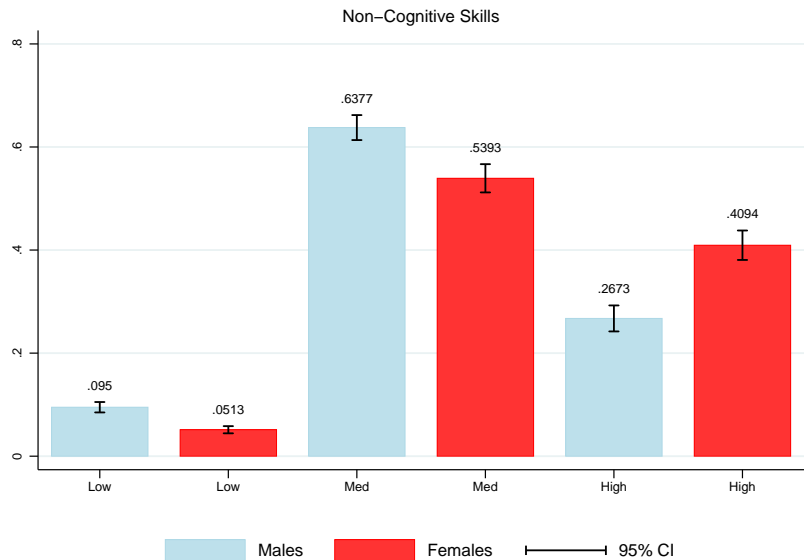
$$saved^g = \beta_{70}^g + \beta_{7X}^g Z + \lambda_{7\theta_1}^g \theta_1 + \lambda_{7\theta_2}^g \theta_2 + u_7^g$$

- Maximum likelihood estimation
- Factors are finite and discretely distributed, one point of support for each factor is normalized to zero
 - Three points of support for cognitive and non-cognitive skills, 2 points of support for the PVE factor
- Parameters:
 - Factor locations (same for male and female)
 - Probabilities (differs by sex)
 - Factor loadings (differs by sex)
- Observed covariates: Parental education, family income, province, distance to nearest university, rural, immigrant, family structure

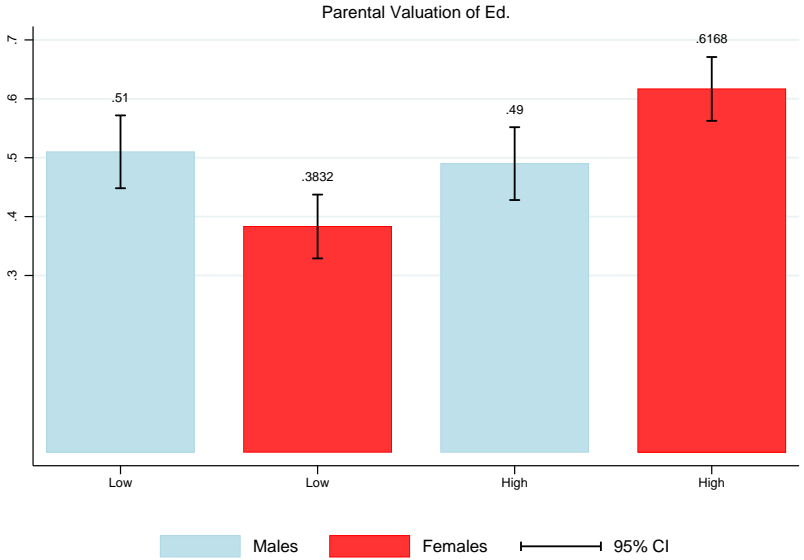
Results: Cognitive distribution



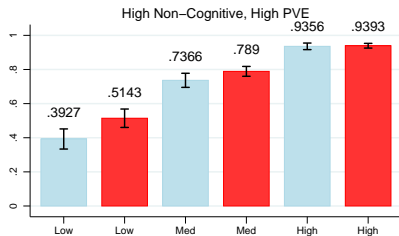
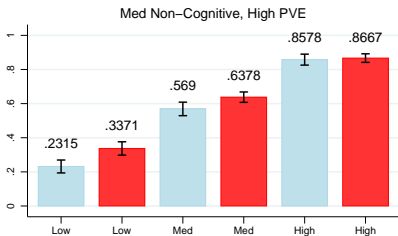
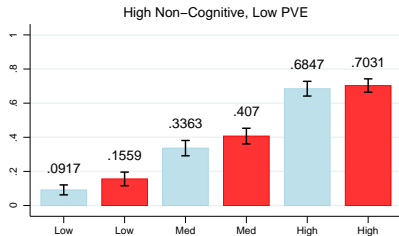
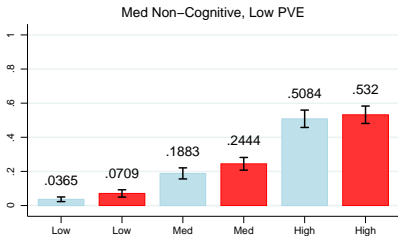
Results: Non-Cognitive distribution



Results: Parental valuation of education distribution



Predicted Probability of Attending University



Each bar represents a level of the Cognitive Factor

Table: Decomposition of Gender Gap in University Participation

Row		Observed Char.	Explained by Parameter(s)	Unexplained
	Predicted gap: .1496			
(1)	Observed Characteristics	-0.0084 (0.0029)		0.1580
(2)	Full factor structure		0.1323 (0.0513)	0.0173 (0.0521)
Both factor loading and distribution				
(3)	Cognitive		0.0613 (0.0177)	0.0711 (0.0478)
(4)	Non-Cognitive		0.0310 (0.0361)	0.1014 (0.0279)
(5)	VPE		0.0426 (0.0257)	0.0897 (0.0427)

Table: Main reasons for Parental Aspirations

	< University Aspirations		University Aspirations	
	Boys	Girls	Boys	Girls
Better job opportunities or pay	0.6111 (0.0122)	0.5707 (0.0131)	0.5325 (0.0090)	0.4790 (0.0082)
Valuable for personal growth and learning	0.0970 (0.0087)	0.1165 (0.0093)	0.1514 (0.0064)	0.1769 (0.0058)
Child's choice	0.1048 (0.0070)	0.1166 (0.0075)	0.0612 (0.0052)	0.0943 (0.0047)
Best match with child's ability	0.0776 (0.0075)	0.0752 (0.0080)	0.1207 (0.0055)	0.1107 (0.0050)
Other	0.1094 (0.0083)	0.1211 (0.0088)	0.1341 (0.0061)	0.1391 (0.0055)

Summary

- All three factors have a sizable impact on university participation and in explaining the gender gap
- Girls have higher levels of all three factors
- No gender gap among youth with high skills
- Parents' role is larger than one would find by looking at socio-economic characteristics or aspirations
 - impact particularly important among mid- and lower-skilled youth
 - points toward programs such as 'Future to Discover' or mentoring programs