

Gender Economics
Session 9
Economics of Education

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Sciences Po Menton



Conceptual Frameworks

● Why study gender in education?

- ▶ Education is a key driver of economic mobility and equality
- ▶ Shapes the occupational segregation

● Human Capital Theory (**Becker, 1981**)

- ▶ Education as investment: costs vs. returns
- ▶ Gender-specific constraints (e.g., expectations of career interruptions)

● Social and Cultural Norms

- ▶ Norms shape educational choices and labor participation
- ▶ Expectations differ for boys and girls (e.g., ambition, caregiving roles)

● Behavioral Economics

- ▶ Preferences and beliefs are endogenous and influenced by social norms -
Next Session

Introduction

Share of women among all tertiary graduates in Science, Technology, Engineering and Mathematics (STEM)

In %, 2021

45

40

35

30

25

20

15

10

5

0



Why are women less likely to work in STEM?

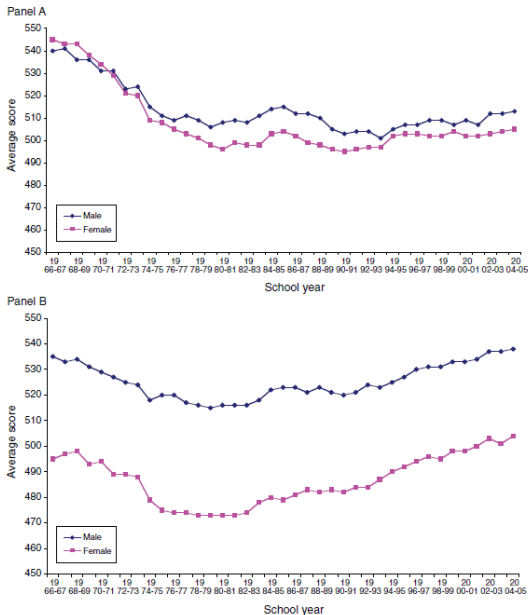


FIGURE I. VERBAL (A) AND MATHEMATICS (B) ACHIEVEMENT ON THE SAT, BY GENDER

Gender gap in math (Fryer and Levitt, 2010)

- **Research Question:**

When and how does the gender gap in math emerge during schooling?

- **Data:** US Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K), 20,000+ students

- **Strategy:** Track standardized test scores in math and reading across five waves (K to grade 5)

- Analyzed timing and dynamics of gender differences, controlled for parental expectations, activities, and background

Gender gap in math (Fryer and Levitt, 2010)

Results

- **No gender gap in math at school entry**
- **Gap emerges and widens by grade 5**
- Gap persists across all subgroups: race, SES, geography
- No support for explanations based on parental investment, teacher bias, or expectations
- Cross-country: Gender equality index doesn't consistently predict gap

Math & Readings (Breda and Napp, 2019)

- **Research Question:**

Can girls' comparative advantage in reading over math explain their underrepresentation in math-intensive fields?

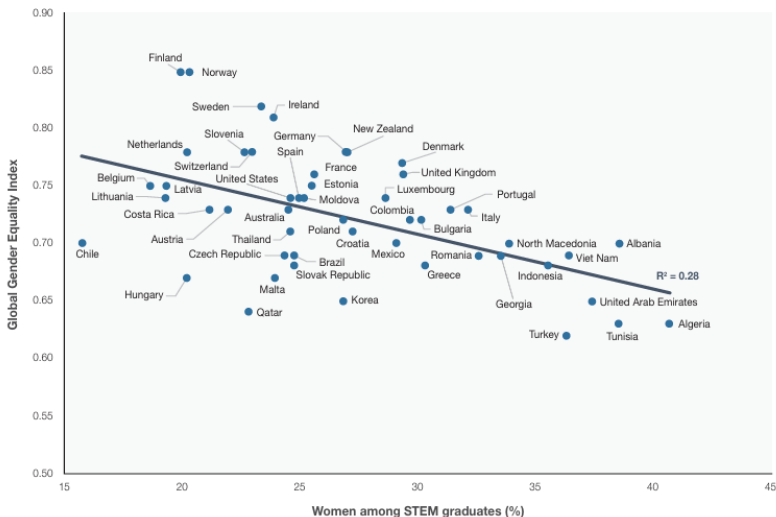
- **Data:** PISA 2012 data on 300,000 15-year-old students across 64 countries
- **Strategy:** Compare students' individual-level performance in math vs. reading ("math-minus-reading" score)
- Analyze how this relative performance (MR) affects intentions to pursue math-related studies and careers

Math & Readings (Breda and Napp, 2019)

Results

- Girls' advantage in reading leads to a strong comparative disadvantage in math (0.8 SD lower MR score)
- Controlling for MR explains 75% of the gender gap in intentions to pursue math
- Math self-concept and interest gaps nearly vanish when controlling for MR
- Comparative advantage explains more than absolute ability or attitudes
- **Policy implication:** Interventions must target early skill formation and awareness of career benefits in math-intensive fields

Gender Equality Paradox



Gender Equality Paradox (Breda et al., 2020)

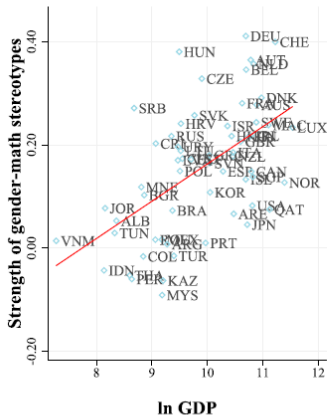
- **Research Question:**

Why is gender segregation in math-intensive fields more pronounced in more developed and egalitarian countries? ("Gender-Equality Paradox")

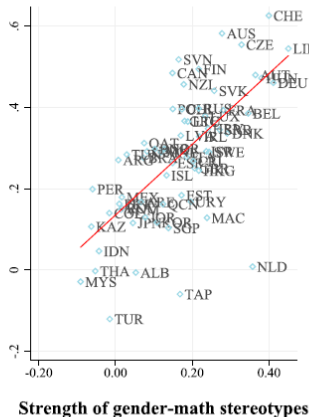
- **Data:** PISA 2012: 300,000 15-year-olds from 64 countries; national GDP, HDI, GINI, GGGI
- **Strategy:** Construct country-level stereotype index (GMS) from gender differences in math attitudes
- Estimate how gender stereotype mediates the relationship between country development/equality and female underrepresentation in math-related fields

Gender Equality Paradox (Breda et al., 2020)

B



C



Gender Equality Paradox (Breda et al., 2020)

⇒ **Gender-math stereotypes (GMS) stronger in more egalitarian/developed countries**

- **GMS highly predictive of gender gaps in math study intentions**
- **GMS fully mediates the paradox:** when included in regressions, effect of development/equality disappears
- **Suggests deeper, horizontal gender norms persist despite gains in traditional gender equality**
- **Implication:** Development alone won't eliminate segregation; targeted policy needed

Teacher Bias (Lavy, 2008)

- **Research Question:**

Do teachers' gender stereotypes affect student evaluation and achievement?

- **Data:** Matriculation exams in Israel with dual grading: blind (external) vs. non-blind (teacher)
- **Strategy:** Differences-in-differences design using blind vs. non-blind score gaps across subjects
- Compares male and female students' scores across nine subjects in humanities and sciences

Teacher Bias (Lavy, 2008)

Results

- Contrary to expectations, male students are systematically under-evaluated
- Anti-male bias observed in all subjects and across score distributions
- Bias is sensitive to teachers' characteristics: gender, experience, family size
- Bias not explained by behavior, mean reversion, or test content
- Evidence consistent with discrimination by teachers, not statistical discrimination or stereotype threat

Teacher bias (Carlana, 2019)

- **Research Question:**

Do teachers' implicit gender stereotypes affect student achievement and educational choices?

- **Data:** Linked administrative data from Italy: 1,400 teachers + 10,000 students + Implicit Association Test (IAT)
- **Strategy:** Exploit quasi-random assignment of students to teachers with varying stereotype intensity
- Measure effects on math test scores, track recommendations, and self-confidence

Teacher bias (Carlana, 2019)

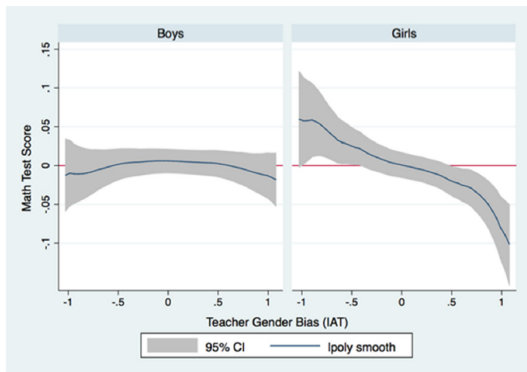


FIGURE III

Effect of Teacher Bias on Student Math Performance by Gender

This figure shows the effect of teacher stereotypes on student achievement by gender. The variable on the y-axis is the residualized standardized test score in grade 8, after controlling for school by cohort fixed effects, and student- and teacher-level controls. The variable on the x-axis is the raw IAT score. A higher value of implicit bias indicates a stronger association between scientific-males and humanistic-females. The regression includes student and teacher controls.

Teacher bias (Carlana, 2019)

Results

- Girls taught by more biased math teachers score lower in standardized math tests
- Effect size: 0.03 SD increase in gender gap per 1 SD in IAT stereotype
- Greater impact on low-achieving girls; no effect on boys
- Biased teachers more likely to recommend low-tier tracks for girls
- Mechanism: lower math self-confidence among girls

Gender composition (Breda and Ly, 2015)

- **Research Question:**

Are professors in male-dominated fields biased against women in entrance exam assessments?

- **Data:** École Normale Supérieure (France), 2004–2009 entrance exams combining written (blind) and oral (non-blind) evaluations across disciplines
- **Strategy:** Difference-in-difference-in-differences using within-student variation across subjects, comparing oral vs. written score gaps by field gender balance
- **Key feature:** Written exams are blind, oral exams are not, allowing inference of potential bias

Gender composition (Breda and Ly, 2015)

Results

- In male-dominated fields (e.g., math, philosophy), women receive a bonus in oral vs. written assessments
- In female-dominated fields (e.g., literature, biology), men receive a bonus
- Biases are not driven by examiner gender or student characteristics
- Evaluation bias rebalances gender ratios, not driven by affirmative action
- **Suggests context-specific bias and a form of implicit compensatory discrimination**

Teachers gender and race (Dee, 2006)

- **Research Question:**

Does having a teacher of the same race/ethnicity or gender affect how students are perceived in terms of behavior and performance?

- **Data:** National Education Longitudinal Study of 1988 (NELS:88), over 42,000 teacher-student pairs
- **Strategy:** Comparing how different teachers rate the same student across subjects
- Examines "own-race" and "own-gender" teacher effects on being labeled disruptive, inattentive, or not completing homework

Teachers gender and race (Dee, 2006)

Results

- **Students evaluated more negatively by teachers of a different race/ethnicity or gender**
- Odds of being seen as disruptive, inattentive, or failing to complete homework increase by 20–50% with non-matching teacher
- Effects are largest for low-SES students and in Southern U.S. schools
- Suggests both passive (stereotype threat, lack of role models) and active (bias in teacher expectations) mechanisms
- **Policy implication:** Boosting teacher diversity or training to address bias can reduce disparities in classroom experiences

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Immigrants (Carlana et al., 2022b)

- **Research Question:**

Do teachers' implicit immigrant stereotypes affect high school track recommendations?

- **Data:** Administrative and survey data from 102 schools in Northern Italy; 1,384 teachers; Implicit Association Test (IAT)
- **Strategy:** Link teacher IAT bias scores to their track recommendations for immigrant and native students with similar backgrounds
- Compare outcomes by IAT level, controlling for test scores and demographics

Immigrants (Carlana et al., 2022b)

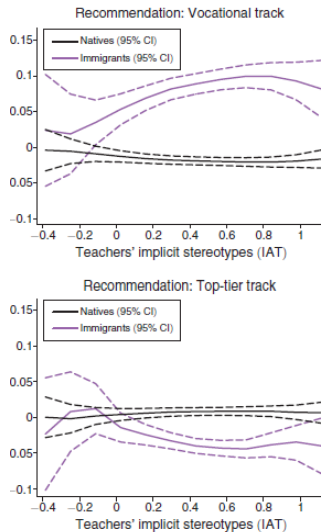


FIGURE 1. TEACHERS' TRACK RECOMMENDATION AND IAT SCORE

Immigrants (Carlana et al., 2022b)

Results

- Teachers with stronger implicit bias recommend vocational tracks more for immigrant students
- Effect persists after controlling for ability and other observables
- No explicit animus required—bias operates through stereotypes
- Implication: Bias training or blinded recommendation processes may reduce inequality

Educational Segregation (Carlana et al., 2022a)

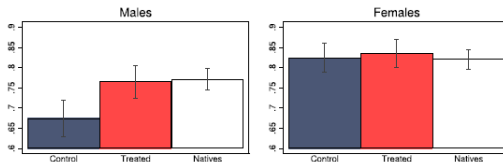
- **Research Question:**

Can mentoring and counseling reduce educational segregation among high-achieving immigrant boys?

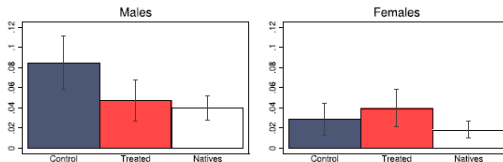
- **Data:** RCT in 70 Italian middle schools; 10 top immigrant students per school selected based on test scores
- **Strategy:** Randomized offer of tutoring, career mentoring, and goal-setting based on Social Cognitive Career Theory
- **Track outcomes:** high school type, grade retention, aspirations, teacher recommendations

Educational Segregation (Carlana et al., 2022a)

Panel A: Probability of choosing the high track



Panel B: Retention rate in grade 7 or 8



Notes: These graphs show the average probability (and associated confidence intervals) of choosing the high track (top graphs) and being retained in grade 7 or 8 (bottom graphs) for treated students, control students, and a group of Italian students that are comparable in terms of schooling ability. Specifically, we match each immigrant student with a native student of the same gender obtaining exactly the same score in INVALSI6.

FIGURE 5.—Track choice and grade retention of immigrants and comparable natives.

Educational Segregation (Carlana et al., 2022a)

Results

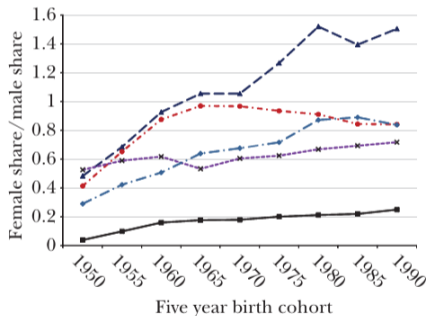
- Treated immigrant boys are 12pp more likely to attend academic/technical track; gap with natives eliminated
- Grade retention drops by 44%
- Effects driven by improved aspirations, motivation, and better teacher recommendations
- Girls show no significant treatment effects—segregation gap smaller to begin with
- Spillover benefits to immigrant classmates

Major choices (Sloane et al., 2021)

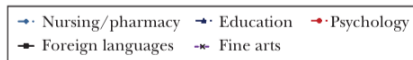
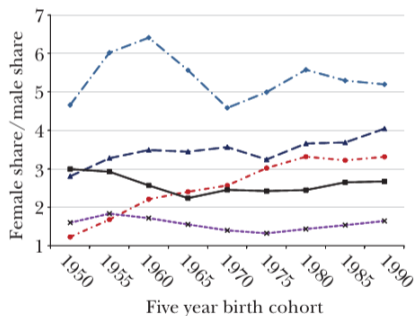
Figure 1

Gender Differences in Selected Majors by Birth Cohort

A: Historically male-dominated majors



B: Historically female-dominated majors



Source: Data from the 2014–2017 ACS and are restricted to those with at least a bachelor's degree. See text and the online Appendix for additional details.

Note: These figures plot the ratio of females to males within major category. The left panel shows trends

Major Choices (Sloane et al., 2021)

- **Research Question:**

How do college major and occupational sorting contribute to the gender wage gap among U.S. college graduates?

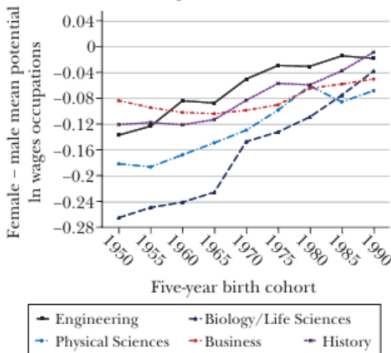
- **Data:** American Community Survey (2014–2017); millions of individuals with information on college major, occupation, and wages
- **Strategy:** Develop indices of sorting in “price space”—potential wage indices based on major and occupation; track trends by birth cohort (1950–1990)
- Analyze within-major sorting into occupations and estimate associated wage penalties

Major Choices (Sloane et al., 2021)

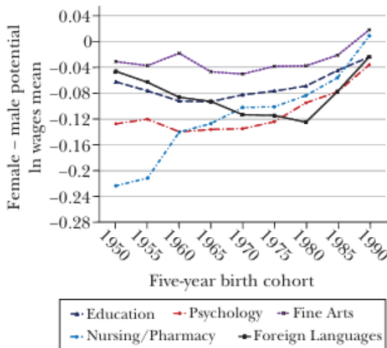
Figure 6

Within-Major Gender Differences in Potential Wage by Occupation, by Gender and Cohort

A: Male-dominated majors



B: Female-dominated majors



Source: 2014–2017 American Community Survey using the log wages of native-born, White men aged 43–57 with strong attachment to the labor market who work in a given occupation.

Major Choices (Sloane et al., 2021)

- Women systematically sorted into lower potential wage majors and occupations across cohorts
- Potential wage penalty from major sorting: 12.5% (1950 cohort) to 9.5% (1990 cohort)
- Women with same majors sort into lower-paid occupations than men — gap dropped from 14% to 2% for Engineering majors
- Persistent occupational rank effects: men more likely to become executives or physicians, women sort into support roles
- **Gender convergence** occurred mostly from 1950–1975; some divergence since then

Major choices (Zafar, 2013)

- **Research Question:**

What drives gender differences in college major choices?

- **Data:** Original survey of 161 Northwestern University sophomores with detailed subjective expectations about major-specific outcomes
- Decomposes gender gap in major choice into differences in beliefs vs. preferences

Major choices (Zafar, 2013)

Results

- Both genders prioritize enjoying coursework and gaining parental approval
- Females place more weight on non-pecuniary job aspects (work-life balance, meaningfulness)
- Differences in beliefs about earnings and ability explain little of the gender gap
- Main driver is differences in preferences over non-pecuniary job characteristics
- **Policy implication:** Changing preferences and gender role attitudes is key to reducing gender segregation

Why Parents May Invest Less in Girls' Education?

- **Human Capital Theory:** Education is an investment; returns depend on labor market participation
- **Traditional Assumptions:**
 - ▶ Women expected to leave labor force after marriage or childbirth
 - ▶ Lower expected earnings reduced incentive for parents to invest in daughters' schooling
- **Social Norms:** Female roles centered around home production, caregiving
- **Result:** Rational underinvestment in girls' education based on expected returns

Misperceptions of Returns to education (Jensen, 2010)

- **Research Question:**

Can correcting misperceptions of returns to education increase schooling in developing countries?

- **Data:** Panel survey of 8th-grade boys in the Dominican Republic
- **Strategy:** Randomized information intervention: treated students received data on actual earnings returns to secondary schooling
- Compare subsequent school attainment over 4 years between treatment and control groups

Misperceptions of Returns to education (Jensen, 2010)

Results

- Students underestimated true returns to education (expected only 8%, actual over 40%)
- Providing information increased perceived returns and schooling by 0.20–0.35 years on average
- Effects strongest among less-poor students; no impact among the poorest (possibly due to credit constraints)
- Suggests low perceived returns partially explain low schooling rates
- Policy: Low-cost information campaigns may increase school investments where perceptions are incorrect

Marriage & Human Capital (Bursztyn et al., 2017)

- **Research Question:**

Do marriage market incentives discourage single women from investing in careers?

- **Data:** Elite US MBA program; surveys, admin records, and two field experiments

- **Strategy:** Randomize whether career preferences (e.g., desired salary, travel) are public or private

- Observe changes in reported preferences by gender and relationship status

Marriage & Human Capital (Bursztyn et al., 2017)

Results:

- Single women downplay career ambition when responses are public vs. private
- Report lower salary expectations, work hours, travel days when peers (esp. single men) might observe
- No such behavior in married women or men
- Signals of ambition are perceived as detrimental in the dating market (“acting wife” effect)
- Highlights role of social image and marriage market pressures in perpetuating gender gaps

Parents's stereotypes (Carlana and Corno, 2024)

- **Research Question:**

Do parents' gender-stereotypical recommendations influence children's educational field choices?

- **Data:** Lab-in-field experiment with 2,000+ students from 14 middle schools in Italy
- **Strategy:** Randomized treatments: students primed with mothers' or fathers' field recommendations or told choices would be disclosed to parents
- **Outcomes:** comparative advantage perceptions, choice of math vs. literature

Parents's stereotypes (Carlana and Corno, 2024)

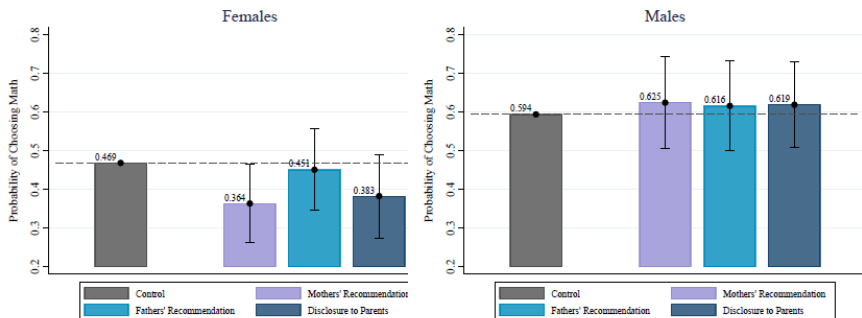


Figure 1. : Treatment Effect

Note: This figure shows the mean of the probability of choosing math for students in the control group, treatment group 1 (Mothers' Recommendation), treatment group 2 (Fathers' Recommendation), and treatment group 3 (Disclosure to Parents). The coefficients are obtained from a regression including class fixed effects and all baseline controls. We also report the 95% confidence intervals for each estimate.

Parent's stereotypes (Carlana and Corno, 2024)

Results:

- Girls perceive lower parental support for math than boys, despite similar ability
- Thinking about mothers' recommendation reduces girls choosing math by 10pp (21%)
- Fathers' impact is weaker and not significant; disclosure treatment has modest effects
- Shows powerful influence of parental beliefs on children's field sorting
- **Implication:** Counter-stereotypical interventions must engage parents early

Conclusion

- Gender gaps in education emerge early and are shaped by family, teacher, and societal expectations
- Stereotypes and implicit biases influence student performance, aspirations, and track choices
- Field of study and occupational sorting explain persistent gender wage gaps
- Recent trends show a reversal in educational attainment, with women outpacing men in many contexts
- Effective interventions require early engagement, inclusive practices, and targeted policy design

References

- Becker, G. S. (1981). *A Treatise on the Family*. Harvard University Press.
- Breda, T., Jouini, E., and Napp, C. (2020). Gender stereotypes can explain the gender-equality paradox. *Proceedings of the National Academy of Sciences*, 117(49):31063–31069.
- Breda, T. and Ly, S. (2015). Gender and competition: Evidence from school grading systems. *American Economic Journal: Applied Economics*, 7(4):133–165.
- Breda, T. and Napp, C. (2019). Girls' comparative advantage in reading can largely explain the gender gap in math-related fields. *Proceedings of the National Academy of Sciences*, 116(31):15435–15440.
- Bursztyn, L., Fujiwara, T., and Pallais, A. (2017). Acting wife: Marriage market incentives and labor market investments. *American Economic Review*, 107(11):3288–3319.
- Carlana, M. (2019). Implicit stereotypes: Evidence from teachers' gender bias. *Quarterly Journal of Economics*, 134(3):1163–1224.

References

- Carlana, M. and Corno, L. (2024). Parents' recommendations and gender stereotypes in education. *AEA Papers and Proceedings*, 114:228–232.
- Carlana, M., La Ferrara, E., and Pinotti, P. (2022a). Goals and gaps: Educational careers of immigrant children. *Econometrica*, 90(5):2139–2177.
- Carlana, M., La Ferrara, E., and Pinotti, P. (2022b). Implicit stereotypes and immigrant students' tracking recommendations. *AEA Papers and Proceedings*, 112:362–366.
- Dee, T. S. (2006). A teacher like me: Does race, ethnicity, or gender matter? *American Economic Review*, 95(2):158–165.
- Fryer, R. G. and Levitt, S. D. (2010). An empirical analysis of the gender gap in mathematics. *American Economic Journal: Applied Economics*, 2(2):210–240.
- Jensen, R. (2010). The (perceived) returns to education and the demand for schooling. *Quarterly Journal of Economics*, 125(2):515–548.

References

- Lavy, V. (2008). Do gender stereotypes reduce girls' or boys' human capital outcomes? evidence from a natural experiment. *Journal of Public Economics*, 92(10-11):2083–2105.
- Sloane, H., Hurst, E., and Black, S. E. (2021). College majors, occupations, and the gender wage gap. *Journal of Economic Perspectives*, 35(3):191–210.
- Zafar, B. (2013). College major choice and the gender gap. *Journal of Human Resources*, 48(3):545–595.