

Grades, gender, and early-career returns to educational achievement



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Abstract

Grade Point Average (GPA) is one of only a few costly signals that a university graduate can send to employers to distinguish themselves from other graduates. This study examined the extent to which the association between academic achievement and early-career incomes are different for male and female undergraduate degree recipients.

Undergraduate alumni records for a large state university system were matched to the state's unemployment insurance database from 2004-2014 to determine wage data and industry of employment. Records were also matched to National Student Clearinghouse data that indicate alumni enrollment in a graduate program. I examine several specifications of income for graduates 7-12 months after graduation, when degree attainment and academic achievement is most likely to be a primary signal to employers, and estimate the returns to academic achievement in several industries.

Findings indicate that, on average, GPA is a meaningful signal to employers and graduates with a higher GPA earn an income premium, though there is significant heterogeneity across industries. Industries with higher average incomes also tend to have higher returns to GPA. I do not find evidence that men and women see differential returns to academic achievement within industries.

Keywords: labor market signaling, returns to higher education, gender discrimination
JEL codes: I24, I26, J24, J70

Introduction

- In classic labor market signaling theory (Spence, 1973; Weiss, 1995), there are some—but limited—additional high-cost signals to employers including university (Deming et al., 2016), GPA (Daley & Green, 2014), type of degree (Pietro, 2017).
- Signals sent by women in the labor market are often received differently than those sent by men (e.g. Quadlin, 2018; Sarsons, 2017)
- Quadlin (2018) specifically addresses early career labor market signaling with resume audits. She found that “male” resumes had higher callback rates than “female” resumes with the same GPA, and women in STEM had negative returns to the highest levels of GPA
- Contribution: Several studies provide experimental evidence of differential, gendered returns of academic performance in labor market entry. This paper provides observational evidence of returns once graduates have entered the labor market and matched with an employer.

Data and Methods

Data sources

Construct of interest: Annual salary of first full-time employment after entering the labor market with an undergraduate degree.

Administrative Academic Records: undergraduate degrees awarded by a US public university system from academic years 2004-2014, GPA, sex, field of study, and demographic data.

Quarterly Income: Quarterly earnings for income subject to unemployment insurance taxes and industry of employment earned in the calendar year post graduation. Annualized using best-quarter annualization.

National Student Clearinghouse: Enrollment records for graduates that are enrolled at a US college or university in the calendar year after graduation.

Excluded Graduates:

- Students without administrative data on sex (.2% of graduates)
- Income from outside the state
- Income from federal or military employment
- Income from self-employment, informal sector employment, or otherwise not subject to unemployment tax
- Graduates enrolled at a college or university
- Graduates in the labor force part-time (as measured by state minimum wage)

Methods

OLS model with log-linear outcome, clustered on campus of degree:

$$\ln(\text{Income}_i) = \beta_0 + \beta_1 \text{GPA}_i + \beta_2 \text{Sex}_i + \beta_3 \text{Discipline}_i + \beta_4 \text{GPA}_i \times \text{Sex}_i + \beta_5 \text{GPA}_i \times \text{Discipline}_i + \beta_6 \text{Sex}_i \times \text{Discipline}_i + \beta_7 \text{GPA}_i \times \text{Sex}_i \times \text{Discipline}_i + \beta_8 \text{Industry}_i + \beta \bar{X}_i + \epsilon_i$$

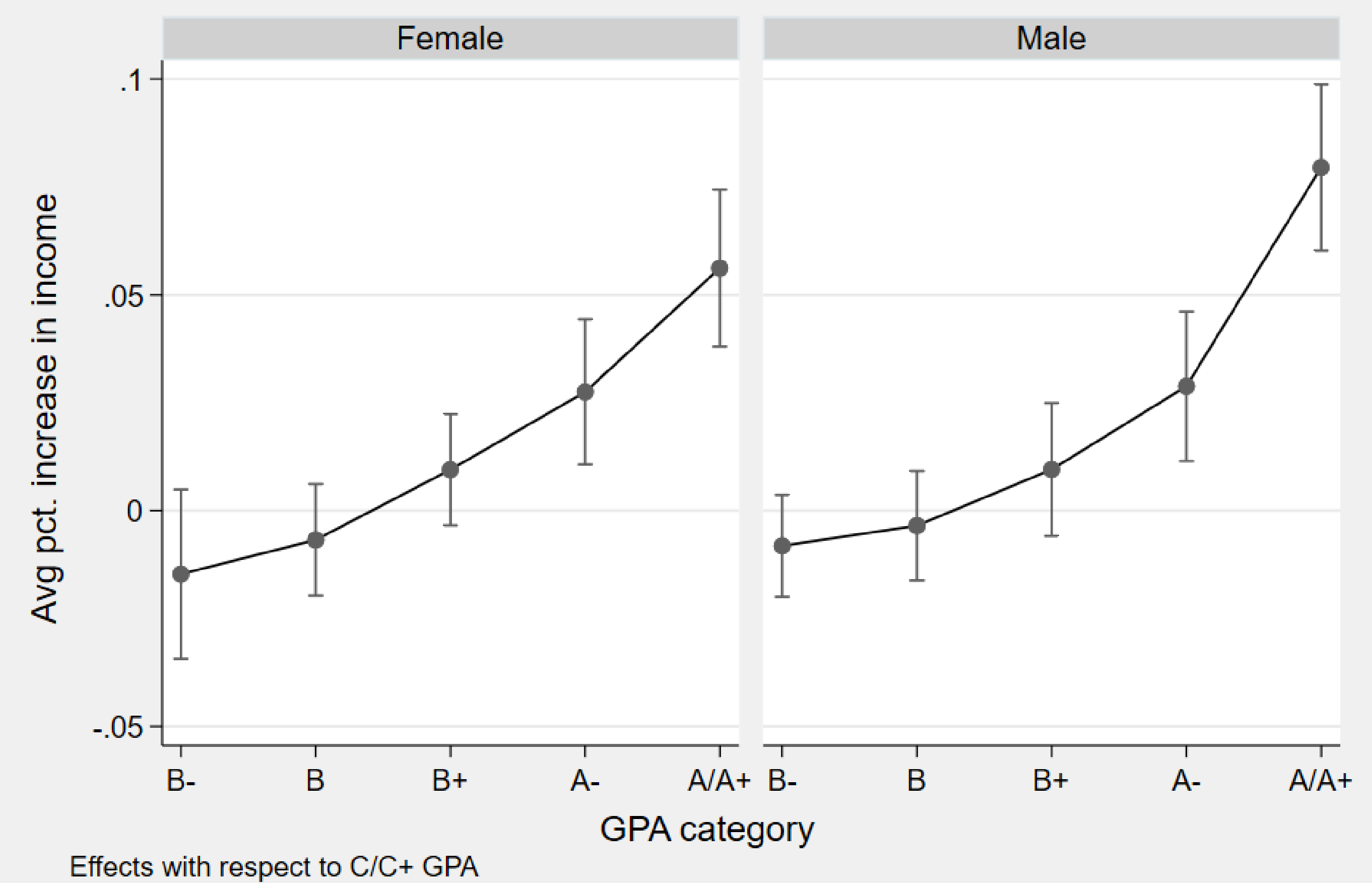
- GPA:** Vector of indicator variables for GPA levels. C/C+ is the reference group.
C/C+ ≤ 2.5; B- ≤ 2.8; B ≤ 3.2, B+ ≤ 3.5; A- ≤ 3.7; A/A+ > 3.7
- Sex:** Binary indicator for sex as indicated on undergraduate admissions file
- Discipline:** Primary field of undergraduate study (e.g. life sciences, humanities)
- Industry:** Industry of employment (e.g. internet and computer systems, business services)
- \bar{X}_i : Individual covariates: Race/ethnicity, administrative low-income indicator, campus, primary industry of work, academic year of graduation.

Quadlin (2018) indicated that the observed returns to academic achievement are likely non-linear and potentially non-monotonic. Using discrete categories obviates the assumption of (log)linearity and monotonicity.

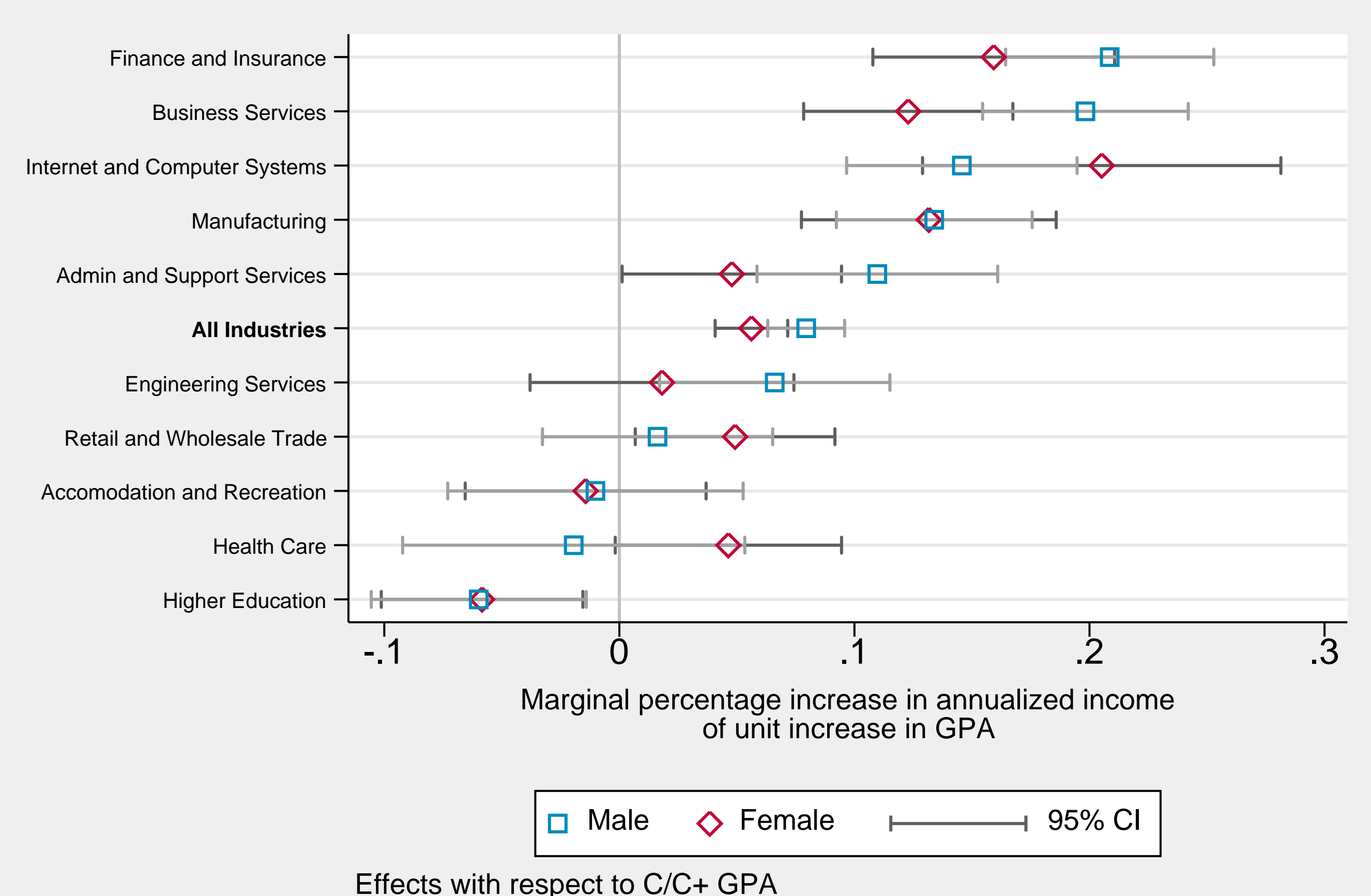
Summary main results

- Undergraduate academic achievement is a relevant signal to employers, but the importance of that signal is heterogeneous across industries.
- Higher income industries (e.g. finance and insurance, internet and computer systems, manufacturing) have higher rates of return to GPAs.
- I did not find statistically significant differences in returns to educational achievement across men and women in any single industry or across industries.

Marginal effects of GPA category on income by gender



Industry specific returns to A/A+ GPA



Regression margins from main and industry specific models

Industry x Gender	Average percentage change in income (C/C+ reference group)				
	B-	B	B+	A-	A/A+
All Industries (n=162,441)					
Female	-0.015	-0.007	0.009	0.027***	0.056***
Male	-0.008	-0.004	0.010	0.029***	0.079***
Accommodation and Recreation (n=9,060)					
Female	-0.014	-0.025	-0.036*	-0.025	-0.014
Male	-0.013	-0.051**	-0.061***	-0.037	-0.010
Administration and Support Services (n=13,152)					
Female	0.016	0.004	0.022	0.034	0.048**
Male	0.001	0.026*	0.004	0.043*	0.110***
Business Services (n=14,897)					
Female	-0.008	0.025	0.067***	0.128***	0.159***
Male	0.032	0.066***	0.125***	0.156***	0.209***
Finance and Insurance (n=12,754)					
Female	-0.031	-0.020	0.027	0.084***	0.123***
Male	-0.016	0.006	0.083***	0.102***	0.198***
Manufacturing (n=12,898)					
Female	0.004	0.035*	0.073***	0.092***	0.132***
Male	0.018	0.020	0.062***	0.075***	0.134***
Retail and Wholesale (n=18,831)					
Female	-0.010	0.001	0.008	0.011	0.049**
Male	-0.035**	-0.008	-0.022	-0.041*	0.016

Notes: All regression include the full set of control variables. Coefficients are statistically significant different from zero at * p<0.10, ** p<0.05, and *** p<0.01. Robust standard errors; errors were clustered on campus. For industry specific analysis, the sample is restricted to graduates employed in a specific industry.

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