When Sarah Meets Lawrence: The Effect of Coeducation on Women's College Major Choices

Avery Calkins [1] Ariel J. Binder [2] Dana Shaat [3] Brenden Timpe [4]

[1]RAND Corporation

[2]U.S. Census Bureau

[3]American Institutes for Research

[4]University of Nebraska - Lincoln

August 2022

Motivation

- Despite overtaking men in college degree attainment, women remain less likely to earn degrees in lucrative fields like STEM

Motivation

- Despite overtaking men in college degree attainment, women remain less likely to earn degrees in lucrative fields like STEM
- Economists have increasingly considered explanations borrowed from the psychology and sociology literature (Bertrand 2011)
  - Aversion to competition (Gneezy et al. 2003; Niederle and Vesterlund 2007, 2008)
  - Marriage market penalties (Bursztyn et al. 2017)
  - Influence of female role models and peers (Carrell et al. 2010; Huntingdon-Klein and Rose 2018; Zolitz and Feld 2018; Bostwick and Weinberg 2021)

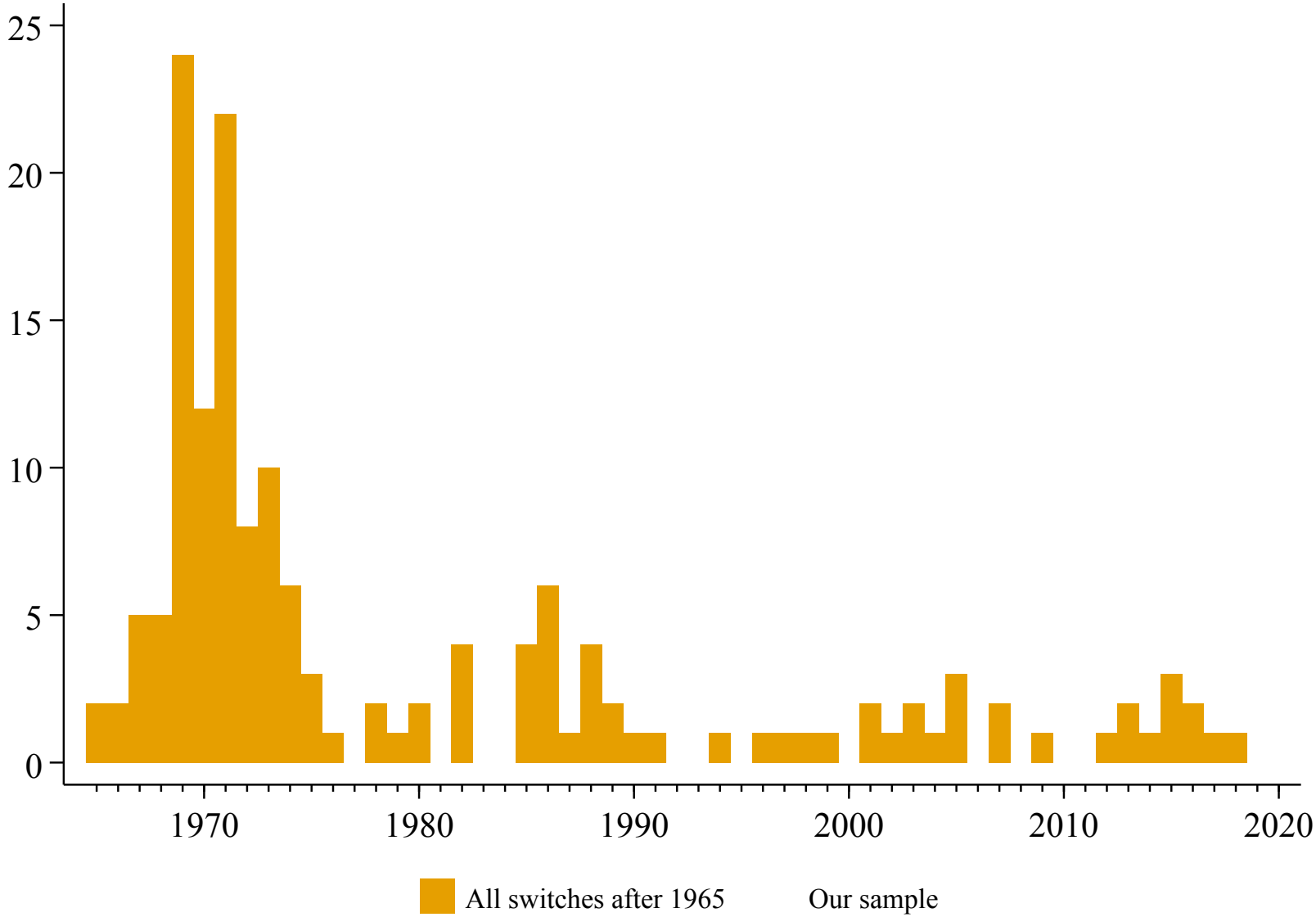
Motivation

- Despite overtaking men in college degree attainment, women remain less likely to earn degrees in lucrative fields like STEM
- Economists have increasingly considered explanations borrowed from the psychology and sociology literature (Bertrand 2011)
  - Aversion to competition (Gneezy et al. 2003; Niederle and Vesterlund 2007, 2008)
  - Marriage market penalties (Bursztyn et al. 2017)
  - Influence of female role models and peers (Carrell et al. 2010; Huntingdon-Klein and Rose 2018; Zolitz and Feld 2018; Bostwick and Weinberg 2021)
- Our question: How do features of the *gendered collegiate environment* affect women's choice of college major?

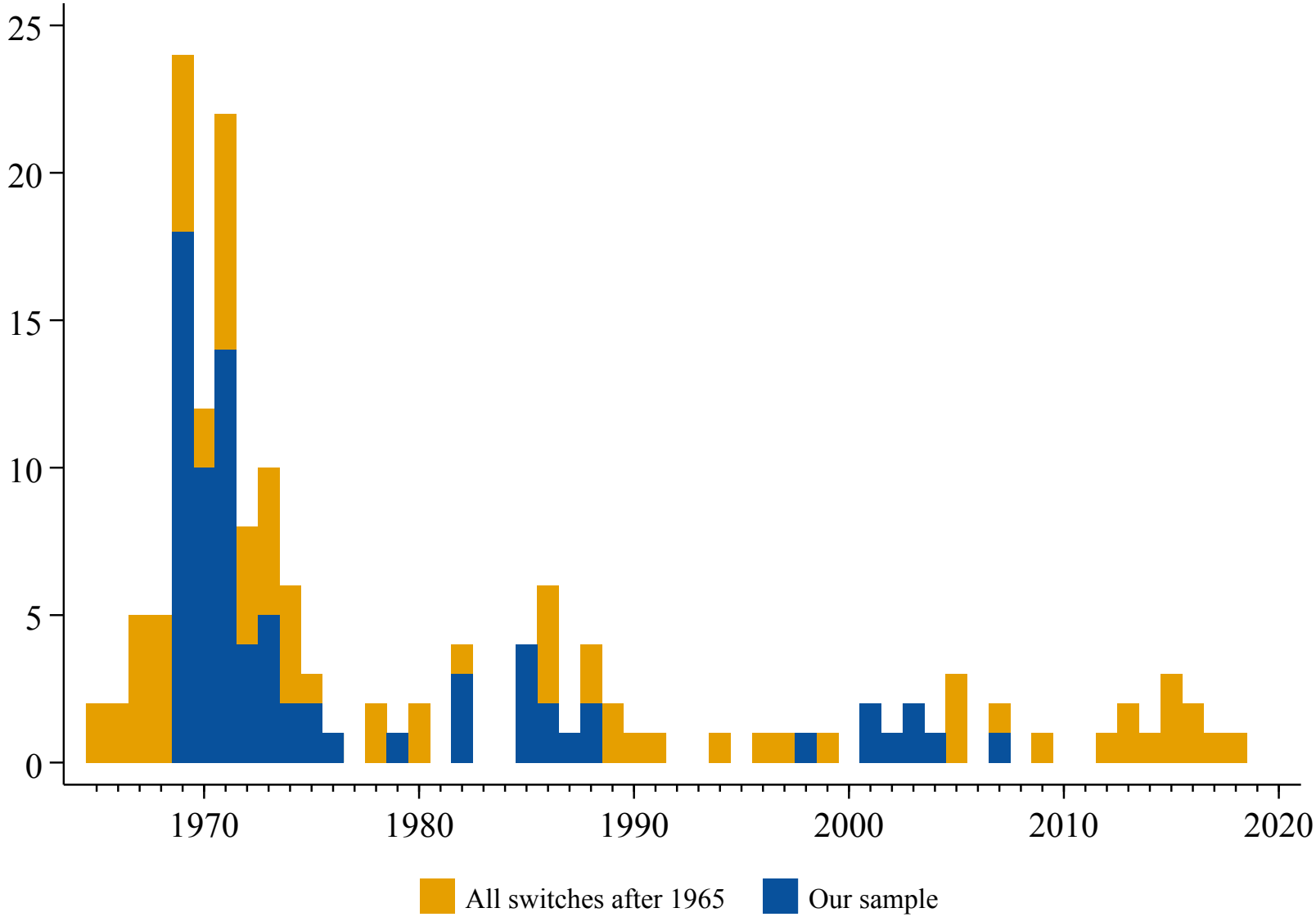
Motivation

- Despite overtaking men in college degree attainment, women remain less likely to earn degrees in lucrative fields like STEM
- Economists have increasingly considered explanations borrowed from the psychology and sociology literature (Bertrand 2011)
  - Aversion to competition (Gneezy et al. 2003; Niederle and Vesterlund 2007, 2008)
  - Marriage market penalties (Bursztyn et al. 2017)
  - Influence of female role models and peers (Carrell et al. 2010; Huntingdon-Klein and Rose 2018; Zolitz and Feld 2018; Bostwick and Weinberg 2021)
- Our question: How do features of the *gendered collegiate environment* affect women's choice of college major?
- Our setting: The decline of women's colleges in the United States

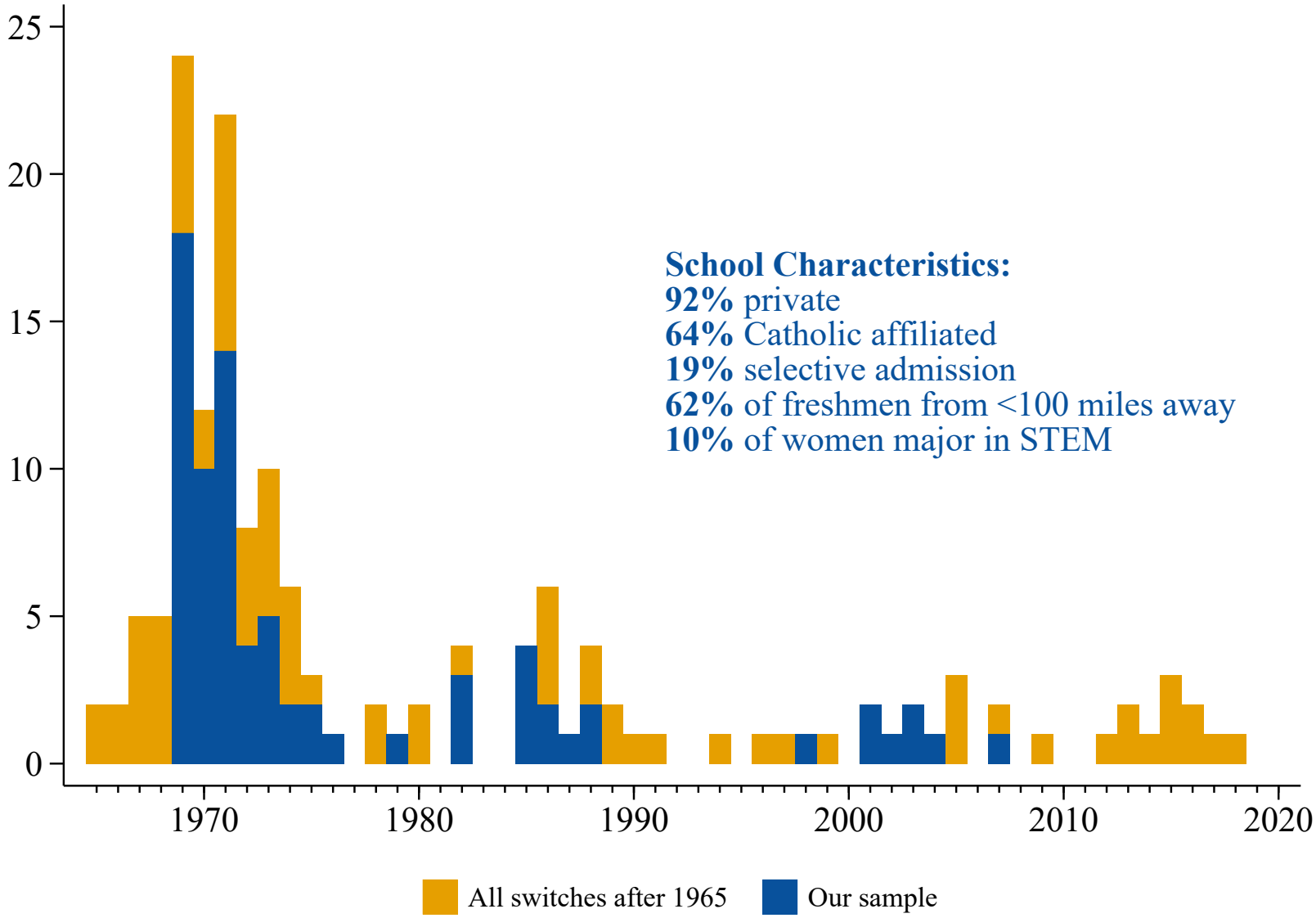
The decline of women's colleges



The decline of women's colleges



The decline of women's colleges



Data and empirical strategy

- Sources of data:
  - IPEDS/HEGIS degree completions by field, sex, institution, and year, 1965-2016

Data and empirical strategy

- Sources of data:
  - IPEDS/HEGIS degree completions by field, sex, institution, and year, 1965-2016
  - HERI Freshman Survey: Characteristics of entering freshmen, 1966-2006

Data and empirical strategy

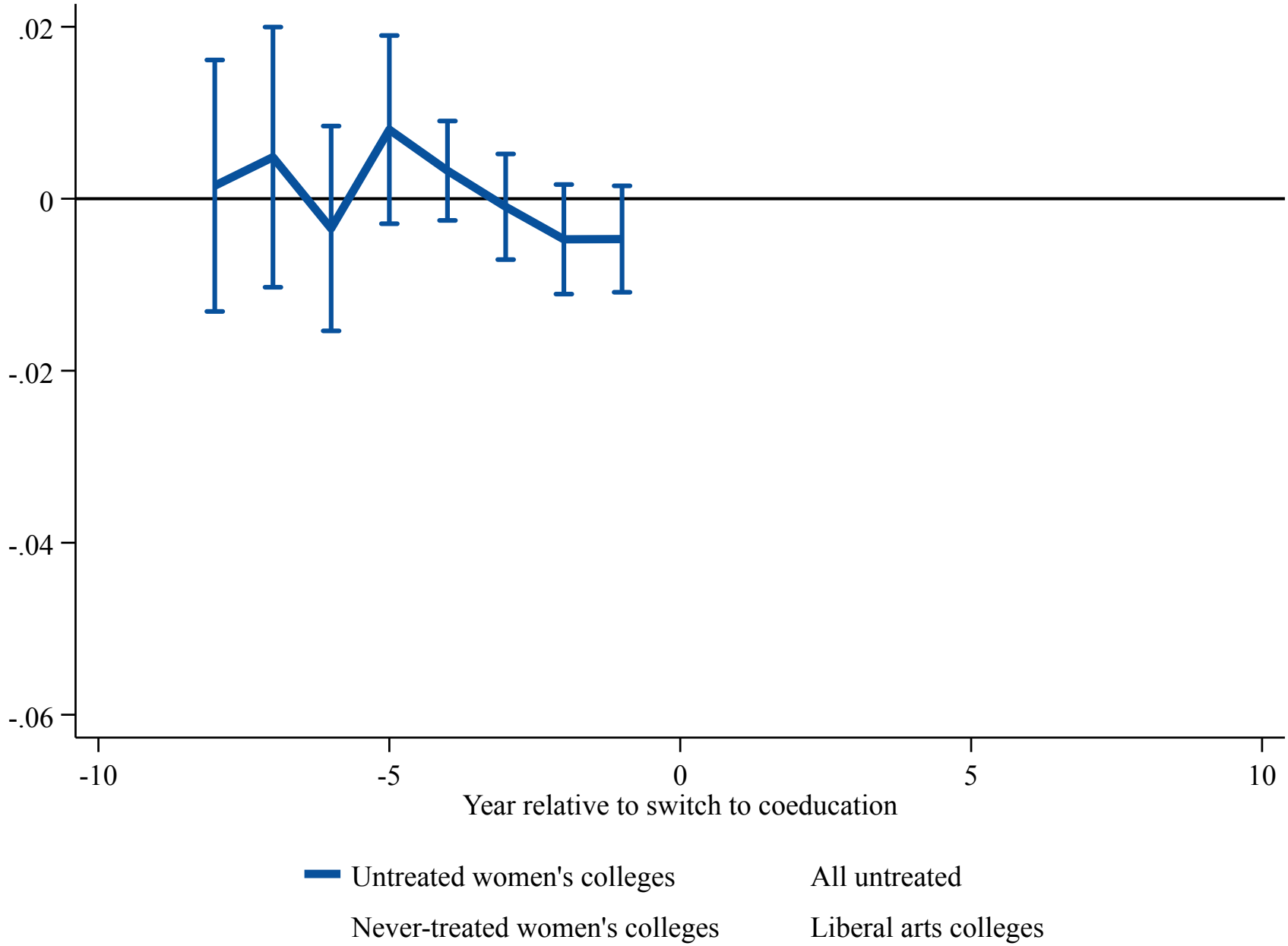
- Sources of data:
  - IPEDS/HEGIS degree completions by field, sex, institution, and year, 1965-2016
  - HERI Freshman Survey: Characteristics of entering freshmen, 1966-2006
- Main outcome of interest: Share of women earning a degree in a given field (e.g., STEM)

Data and empirical strategy

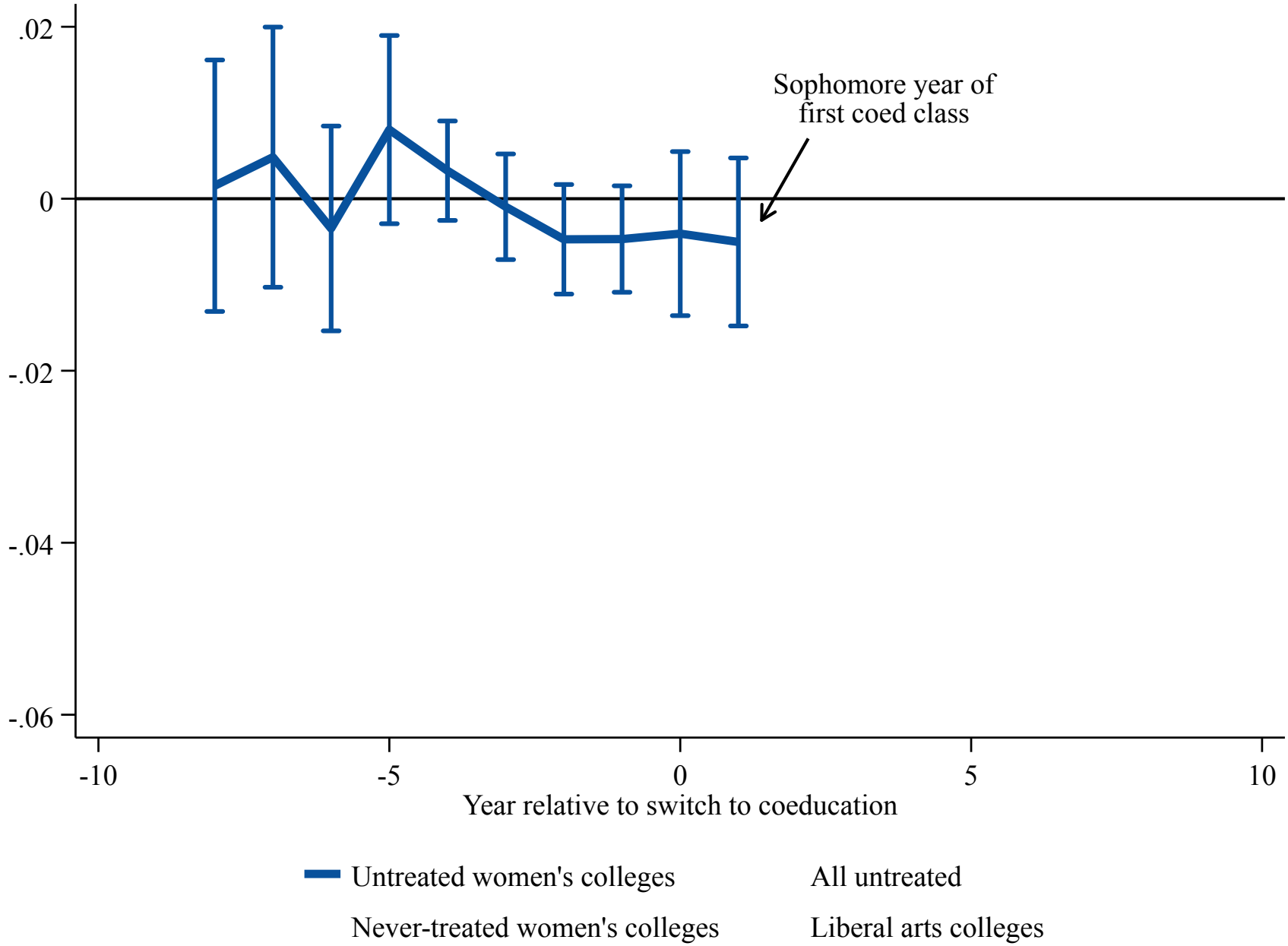
- Sources of data:
  - IPEDS/HEGIS degree completions by field, sex, institution, and year, 1965-2016
  - HERI Freshman Survey: Characteristics of entering freshmen, 1966-2006
- Main outcome of interest: Share of women earning a degree in a given field (e.g., STEM)
- Empirical strategy: Diff-in-diff design using modified version of estimator proposed by Callaway and Sant'Anna (2021):

$$\hat{\alpha}_{jt} = \underbrace{(y_{jt} - y_{jb})}_{\text{Trend at treated school}} - \underbrace{\sum_{k \in C_j} \tilde{\omega}_k \cdot (y_{kt} - y_{kb})}_{\text{Counterfactual trend}}$$

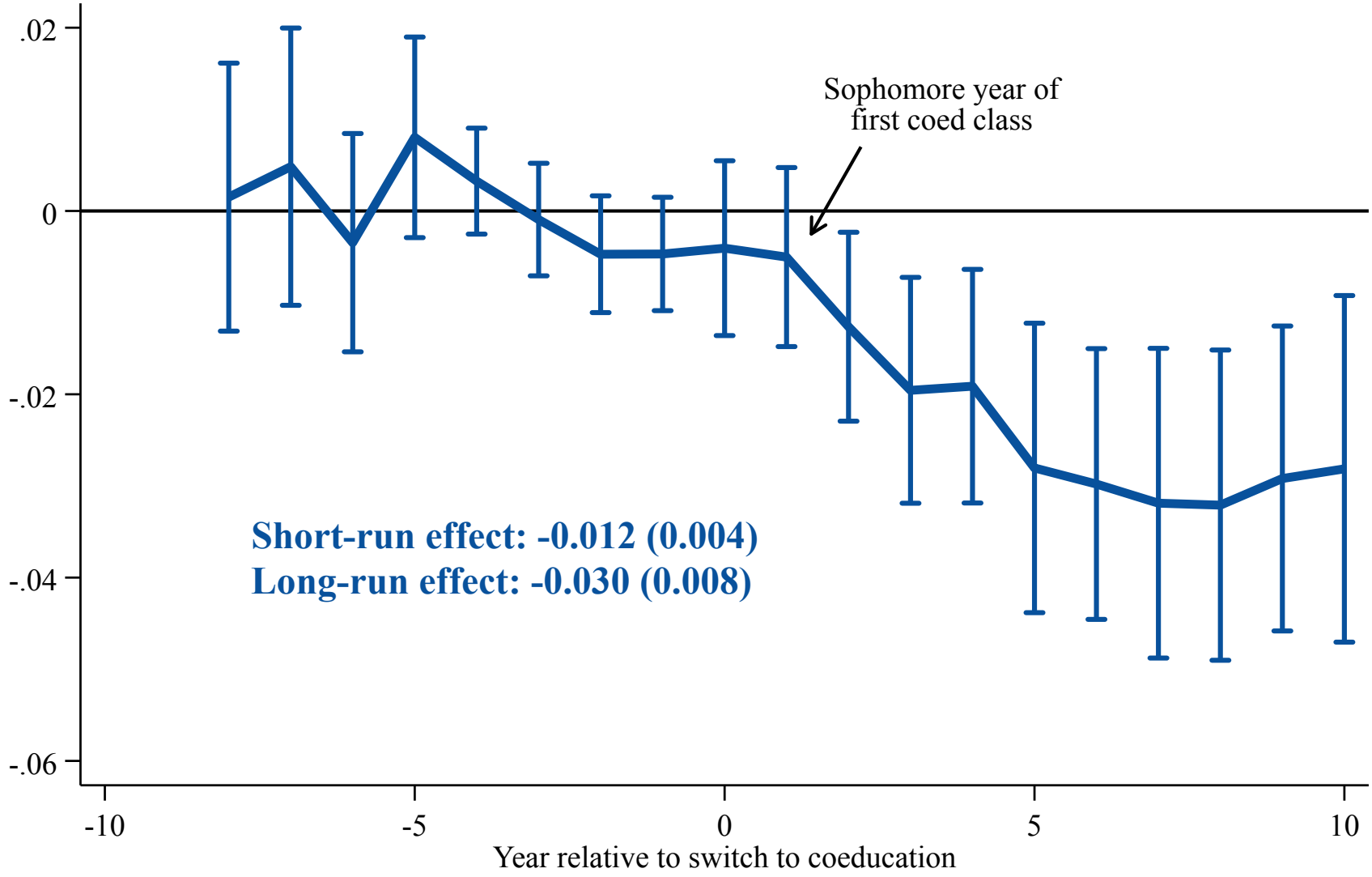
Effect on share of women majoring in STEM



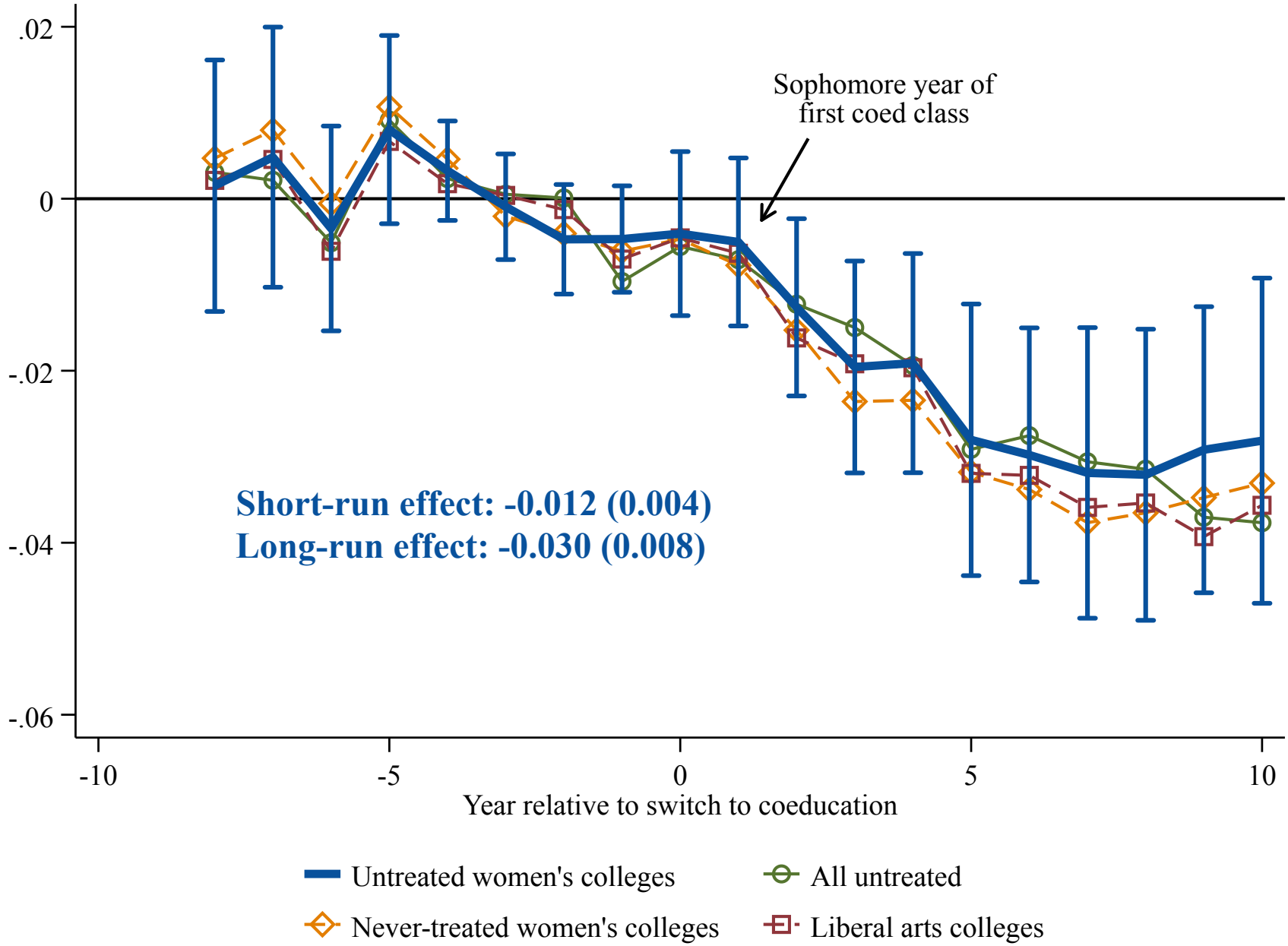
Effect on share of women majoring in STEM



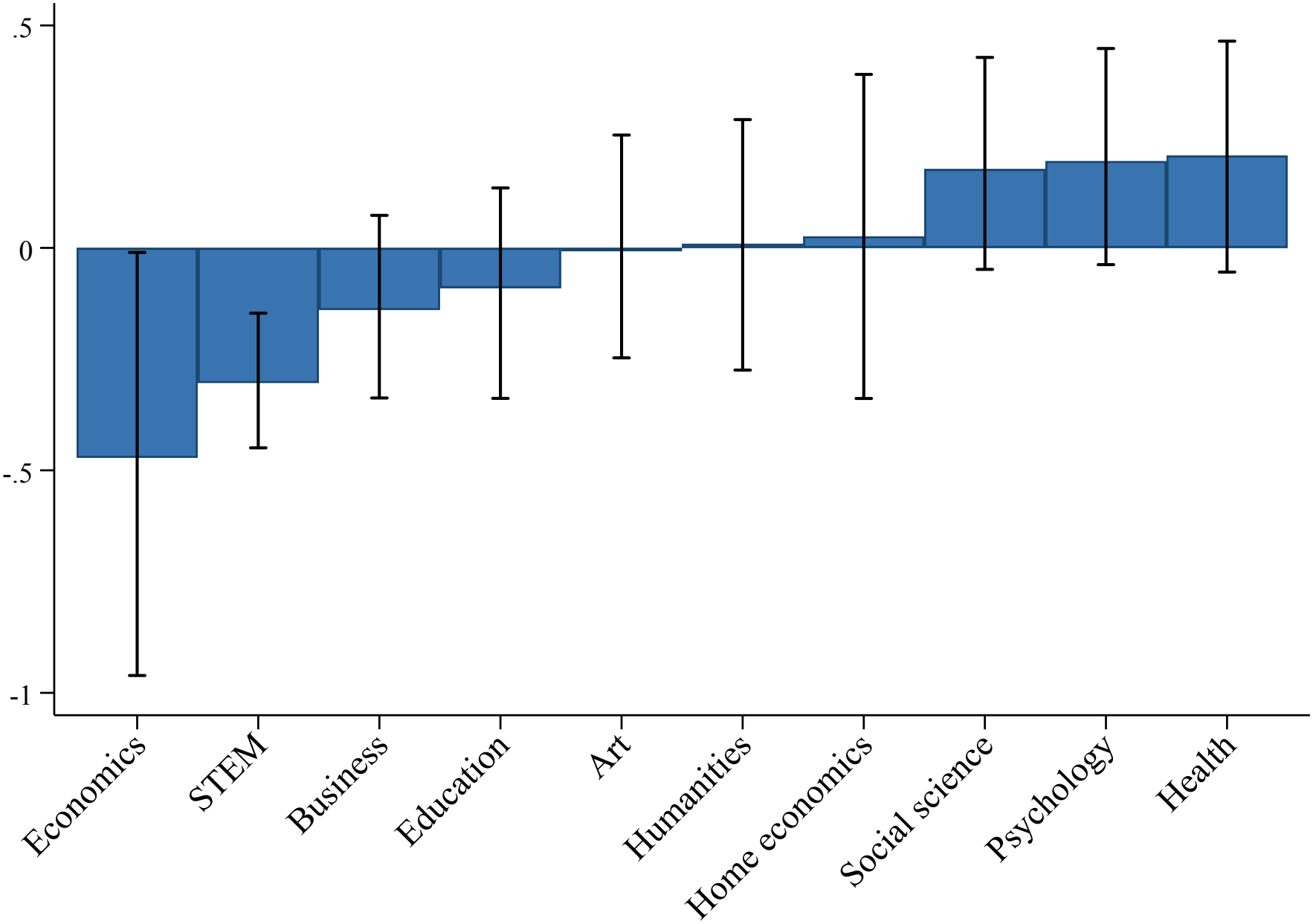
Effect on share of women majoring in STEM



Effect on share of women majoring in STEM



What did women choose instead of STEM?



Mechanisms

- Shift in distribution of women's majors could stem from responses along several margins

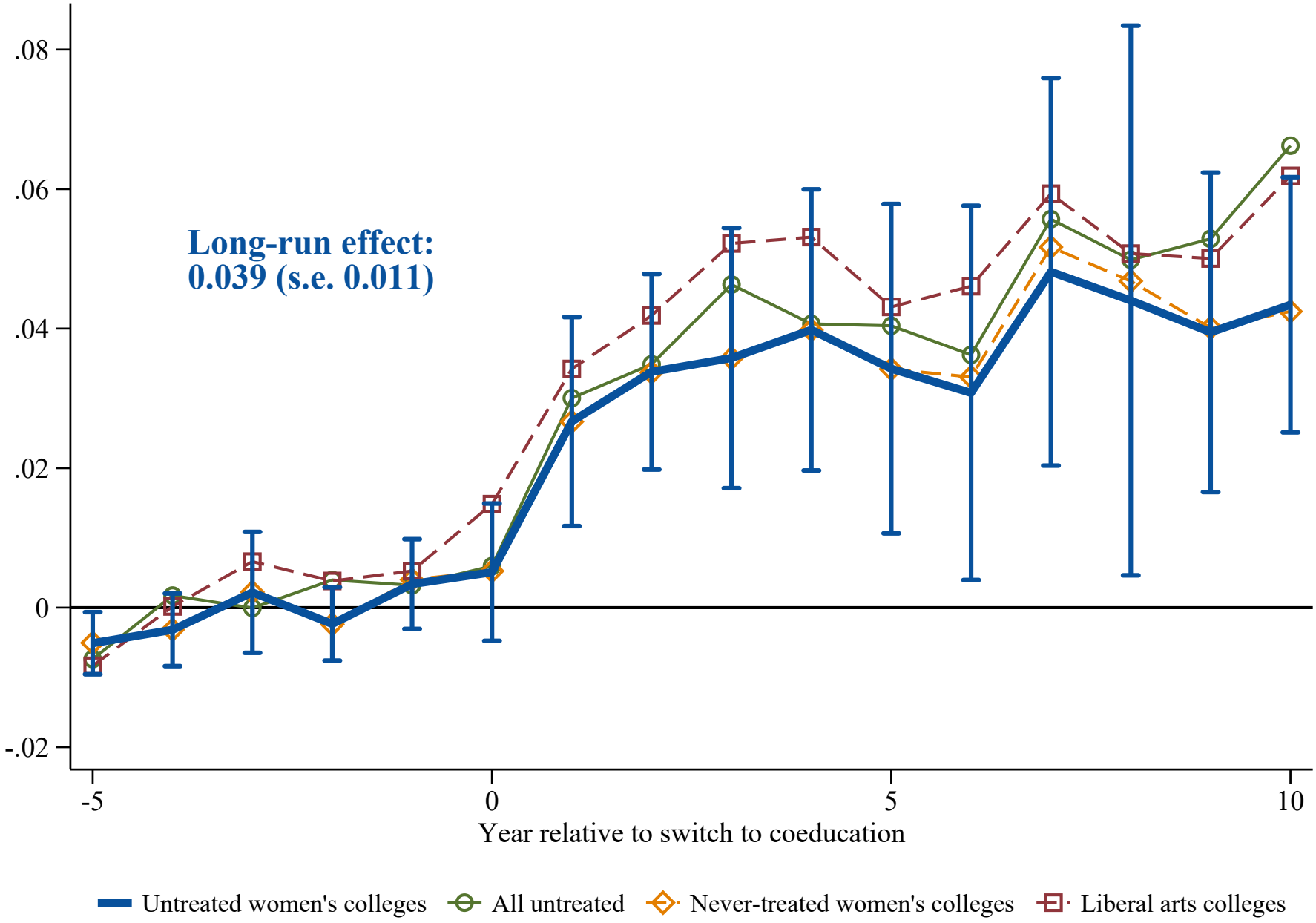
Mechanisms

- Shift in distribution of women's majors could stem from responses along several margins
- **Composition effect:** Women interested in STEM may choose different schools

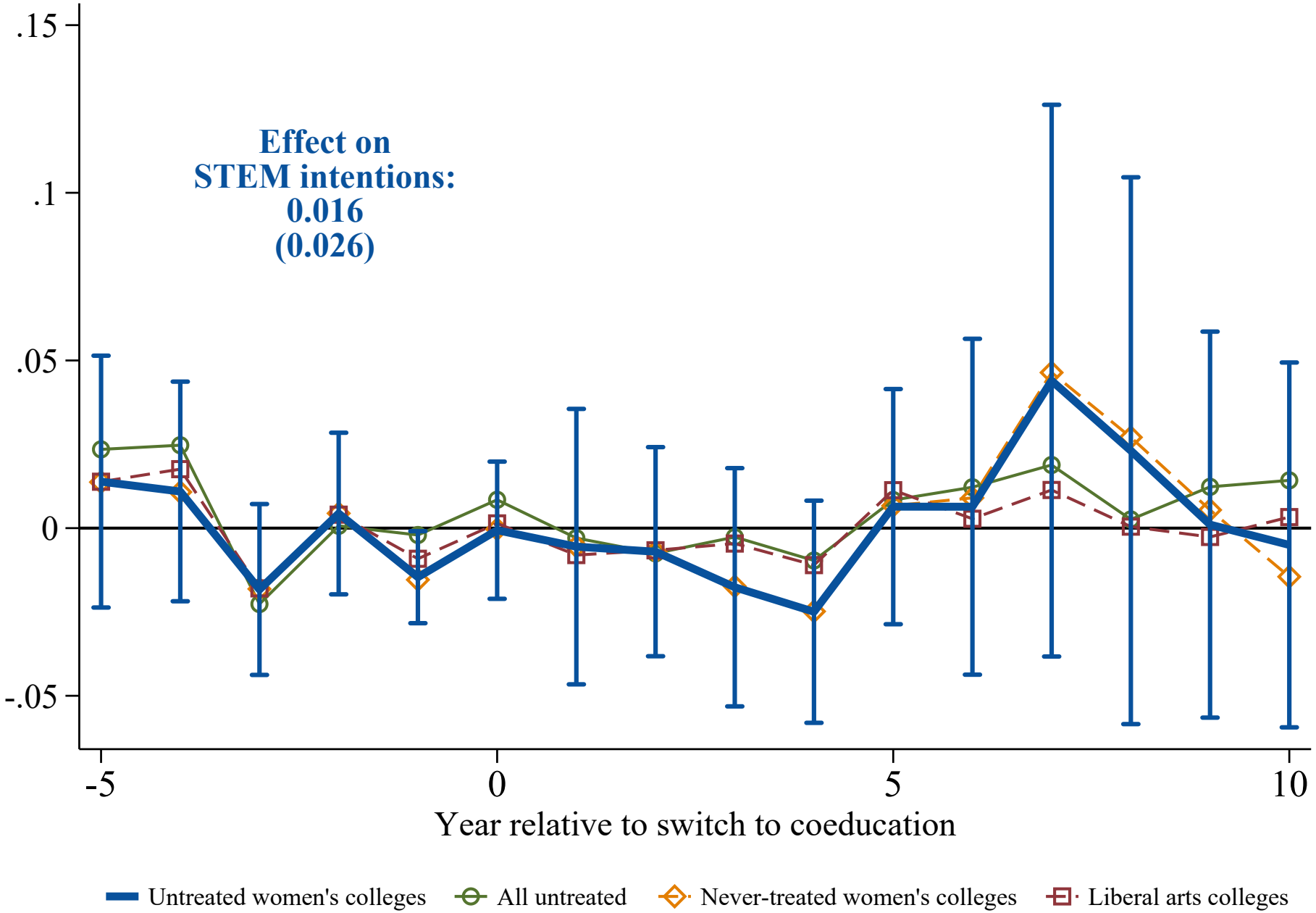
Mechanisms

- Shift in distribution of women's majors could stem from responses along several margins
- **Composition effect:** Women interested in STEM may choose different schools
- **Environmental effect:** The changing social and educational environment may affect choices – *holding enrollment decisions fixed*
  - Gender-neutral factors: class sizes, "ability" of classmates
  - Gender-biased neoclassical factors, e.g., marriage market concerns (Bursztyn, Fujiwara, and Pallais 2017)
  - Gendered "non-cognitive" channels, e.g., reluctance to compete (Bertrand 2011)

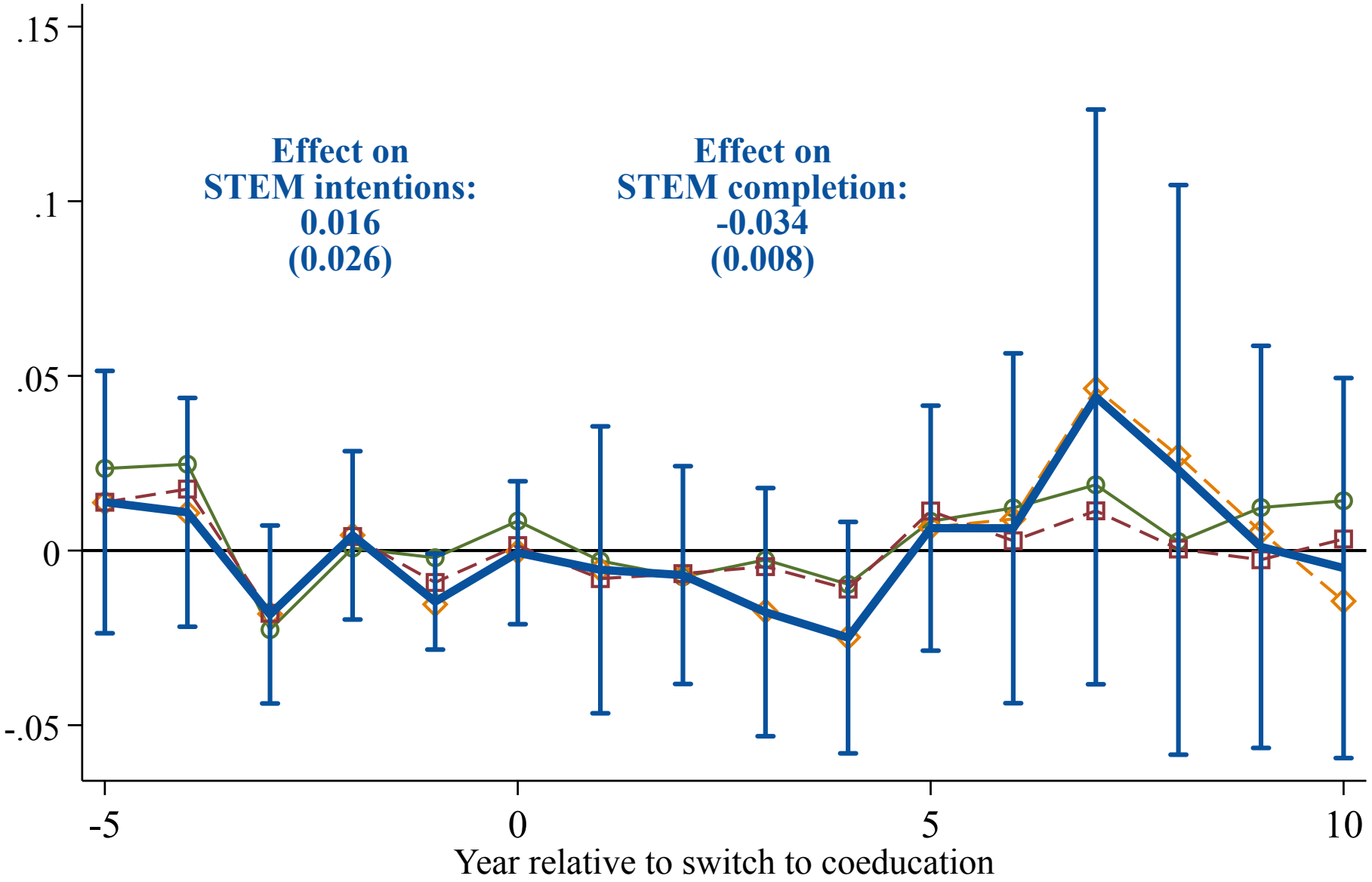
Effects on women's rank in GPA distribution



Share of freshman women intending to major in STEM



Share of freshman women intending to major in STEM



Do freshman characteristics predict STEM degrees?

	(1)	(2)	(3)	(4)
Panel A: Effect of freshman characteristics on women's likelihood of earning STEM degree				
Effect of intent to major in STEM	0.336***	0.333***	0.332***	0.317***
	(0.040)	(0.040)	(0.040)	(0.041)
Covariates:				
Career, family aspirations		X	X	X
Parental education, occupation			X	X
High school grades, coursework				X
R-squared	0.191	0.199	0.205	0.215
Observations	1,235	1,235	1,235	1,235
Panel B: Effect of coeducation on predicted share of female freshmen who will major in STEM, preferred comparison group				
Estimated composition effect	0.005	0.009	0.009	0.012
	(0.008)	(0.010)	(0.010)	(0.011)
Composition effect / Total effect of coeducation on STEM major choice	-16%	-28%	-27%	-37%
Composition effect upper bound	32%	32%	31%	29%

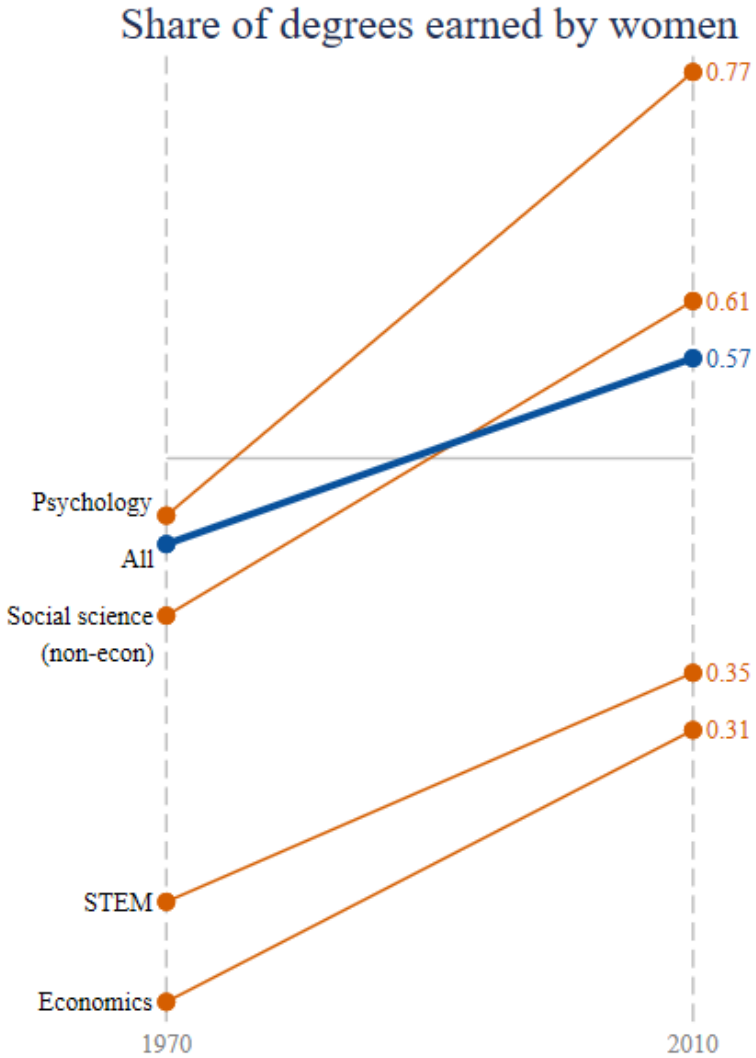
Conclusion

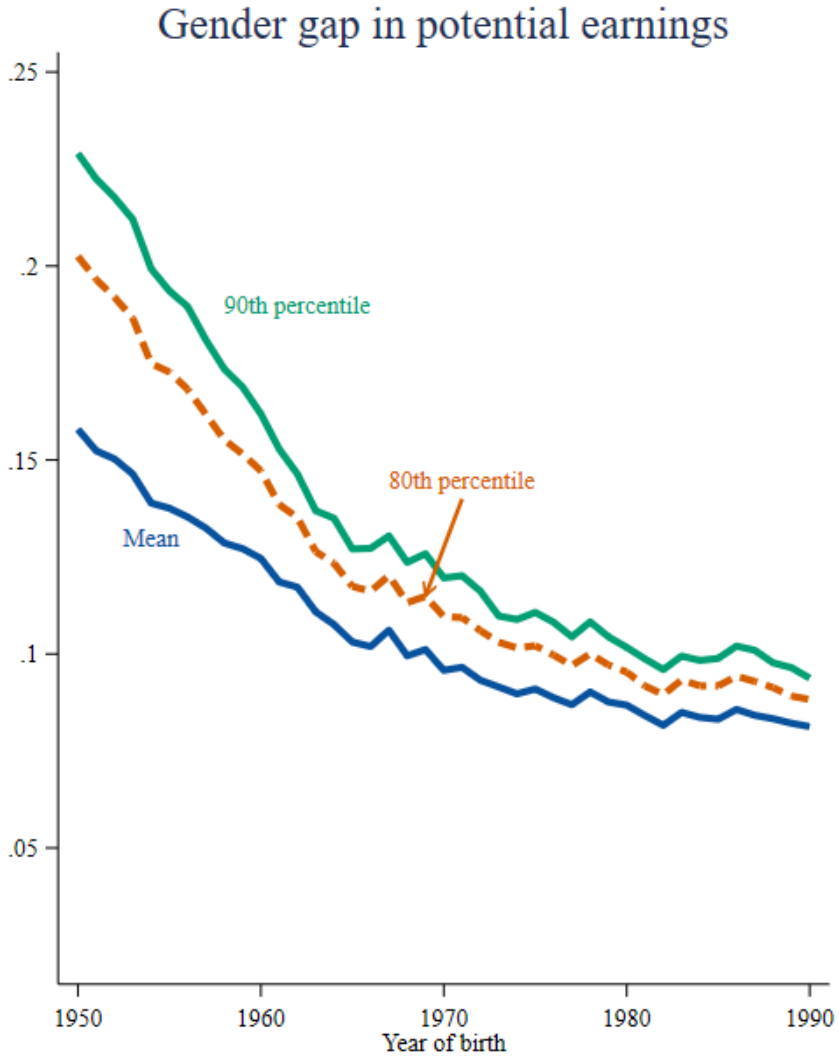
- We develop a new setting to examine the impact of the gender mix of the college environment on women's choice of major
- We find that the introduction of male classmates leads to a 3pp (30%) decrease in the share of women earning a degree in STEM
- Analysis of mechanisms finds no evidence of changes in composition of female students, but is most consistent with effects of gendered peer and role model effects
- Back-of-the-envelope calculation: Exposure to male classmates can explain 36 percent of the 16.5pp gender gap in STEM.
- These results suggest that consequential decisions about women's careers can be impacted in a significant way by the gender composition of the classroom and social environment

Thank you!

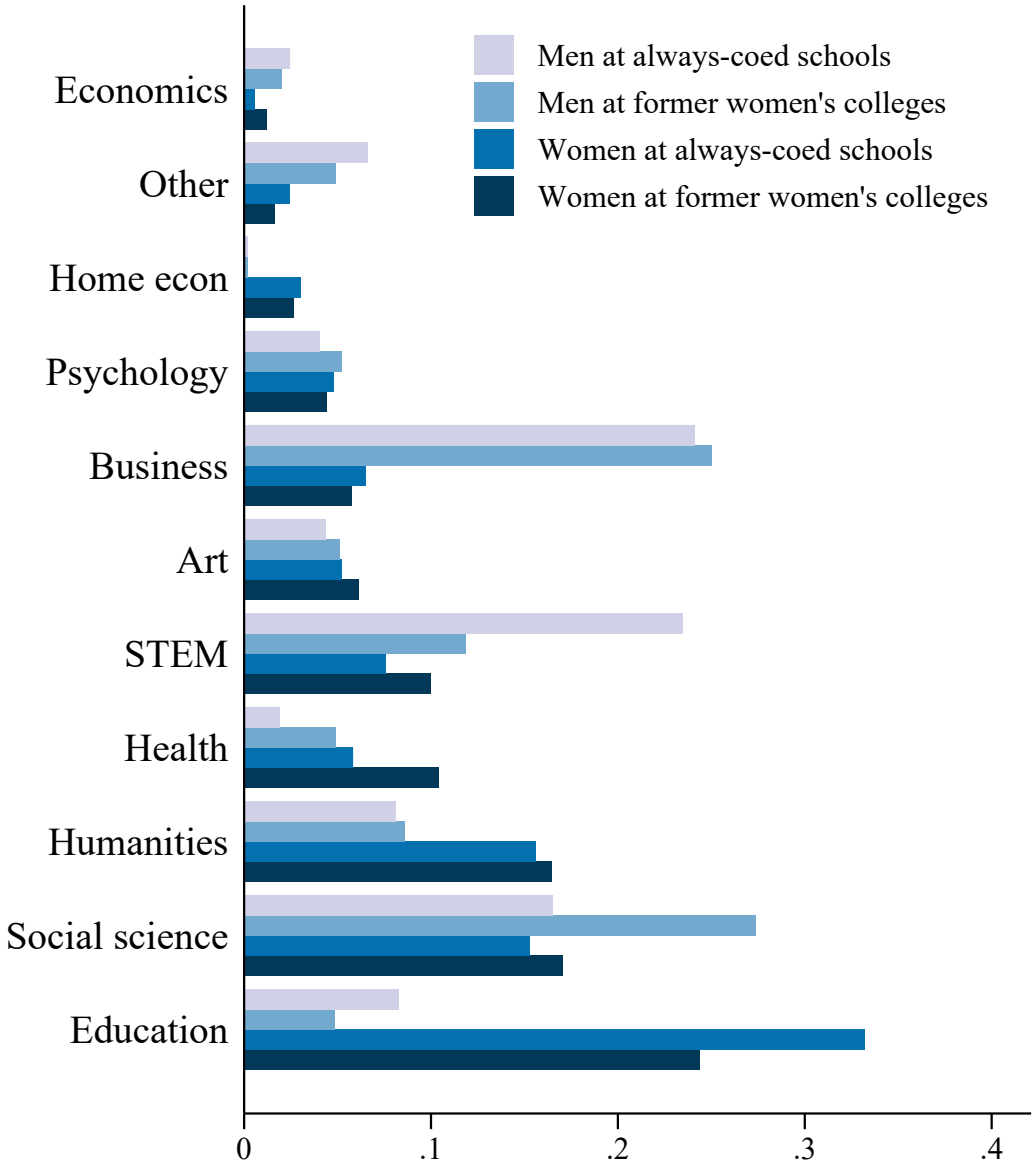
Appendix

Trends in gender differences

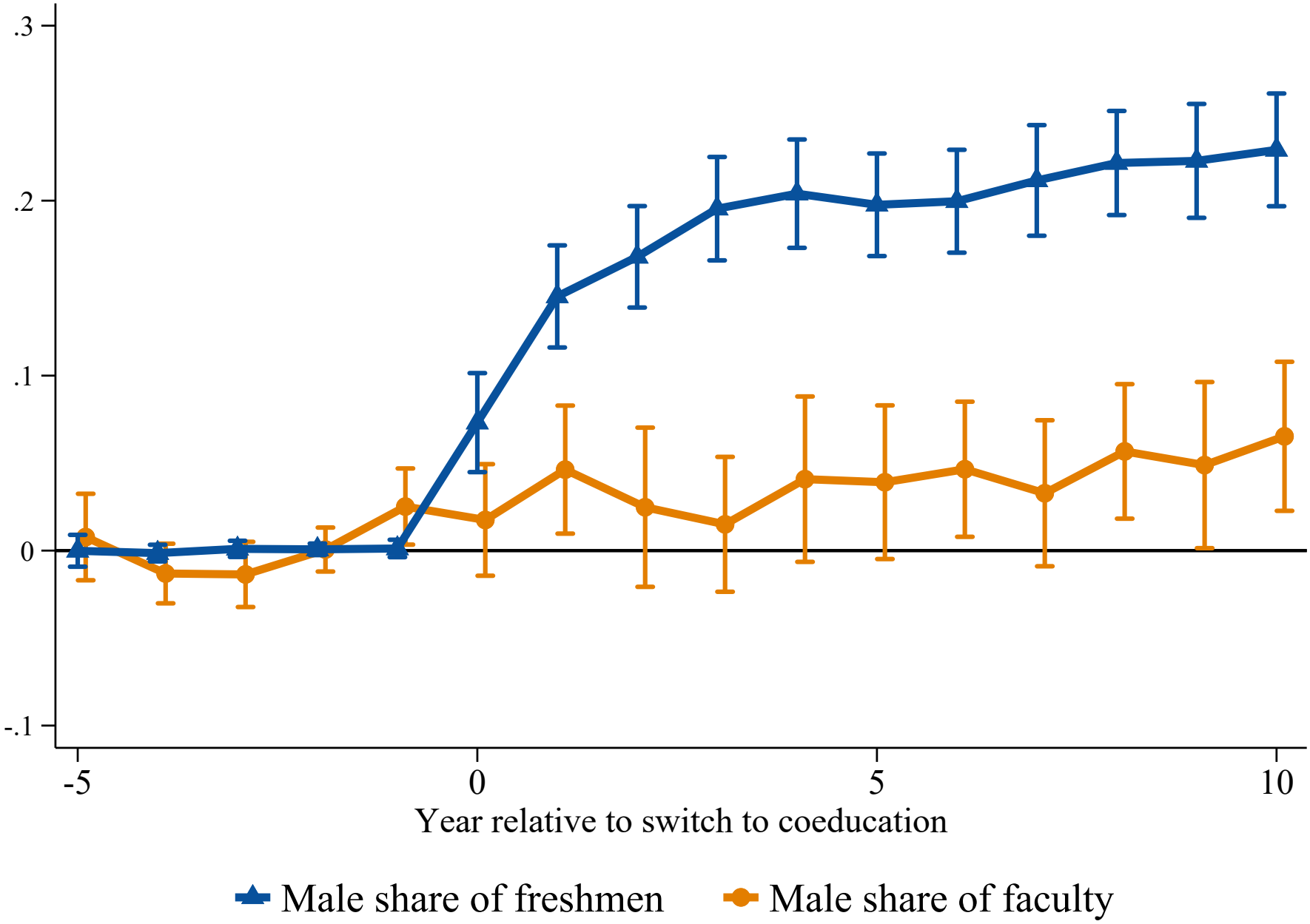




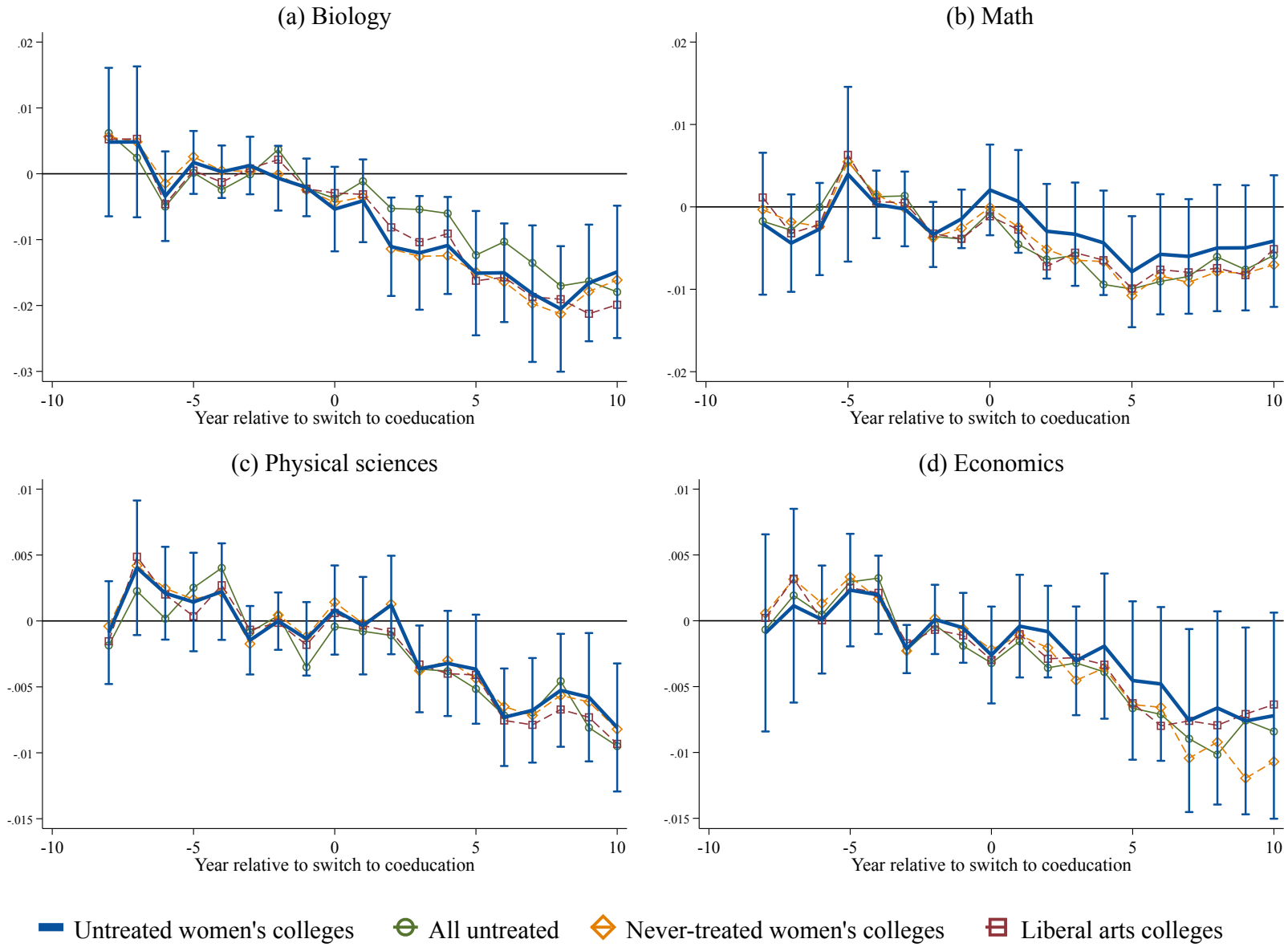
Student characteristics



Changes in the gender mix of students, faculty



Effects similar in all major quantitative fields



Intended career: Science