Investment over the Business Cycle: Insights from College Major Choice

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Motivation

- Business cycles have important economic consequences
  - **Firms reallocate captial toward more productive uses** (Davis and Haltiwanger 1990, Caballero and Hammour 1994)
  - **Personal exposure changes expectations** (Malmendier and Nagel 2015), **risk preferences** (Malmendier and Nagel 2011), **beliefs about luck vs. work** (Giuliano and Spilimbergo 2014)
- **Large literature on responses along the "extensive margin" of the human capital investment decision** (Betts and McFarland 1995, Light and Strayer 2000, Dellas and Sakellaris 2003, Bedard and Herman 2008, Dynarski 2008, Bound, Lovenheim, and Turner 2010, Barr and Turner 2013)
- **Recent work suggests allocative margin of choice of college major nearly as important for earnings outcomes** (Altonji, Blom, and Meghir 2012)
- **Growing literature examines the determinants of major choice more broadly, especially the role of expected earnings**
  - Altonji, Arcidiacono, and Maurel (2016) synthesize the recent literature
  - Baker et. al. (2017) RCT giving labor market information at 2-year level

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Our Contribution

- Use 50+ cohorts of newly available data to explore one important determinant of the college major decision: personal experience with economic conditions
- Provide a framework for how to separate out the influence of the business cycle on major choice
- Answer two research questions...

Research Questions

Question 1: Does the business cycle affect the distribution of selected majors among college completers?

- Which majors gain and lose share?
- How do responses differ between men and women?

Question 2: What characteristics of majors are associated with a net gain/loss in market share?

- How important are short-run vs. long-run considerations?
- Does anything matter other than labor market prospects?

Implication: How significant is this compensating behavior in attenuating or exacerbating the costs of graduating in a recession?

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Conceptual Framework

Key Question: Why switch?

- Costs from temporary shock small relative to lifetime income
- Substantial switching inconsistent with strong preferences and careful selection of majors
- Literature suggests students' choices not fully "rational"
  - Relatively little information about career prospects (Betts 1996, Arcidiacono, Hotz, and Kang 2011, Zafar 2009, Stinebrickner and Stinebrickner 2011, Zafar 2011, Wiswall and Zafar 2012)
- Most likely explanations:
  - Economic conditions affect the salience of college-as-investment vs. college-as-consumption
  - Students become sensitive to their majors' signal of ability to employers
  - Switching majors helps "recession-proof" post-graduation career

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Question 1 - Data

- Data
  - Data from 2009-2013 ACS, sample limited to those with at least a bachelor's degree
  - Key variables: year turned 20 years old (matched to economic conditions), field of degree, gender
    - Pro: Coverage of 50+ birth cohorts
    - Con: Cross-sectional survey; Later life outcomes by major only in 2009-2013; limited covariates measured at time of major selection
- Motivating Example
  - Calculate average mid-career earnings by major (ages 35-45 in 2009-2013)
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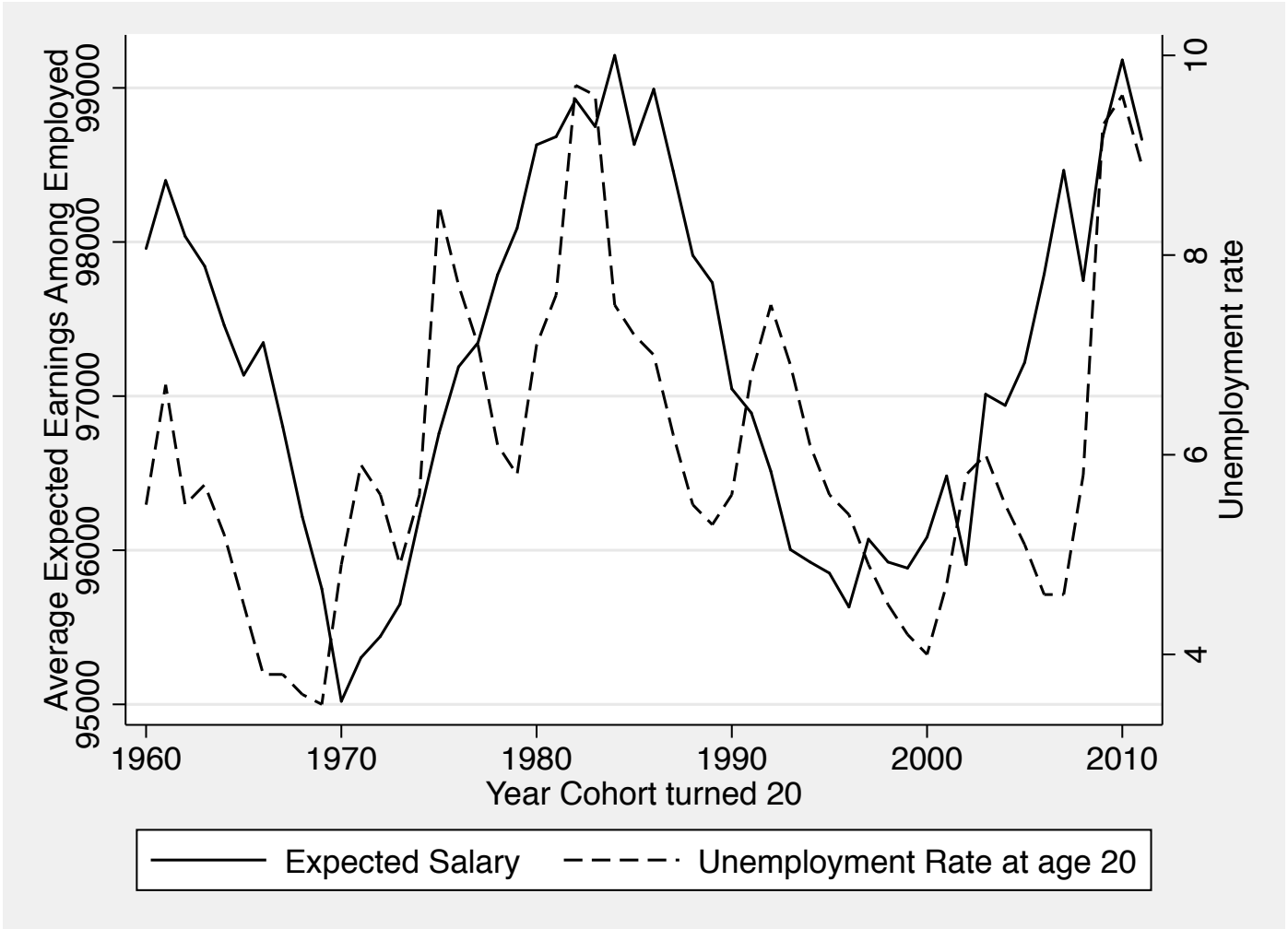
Unemployment Rate and Average Earnings of Chosen Major

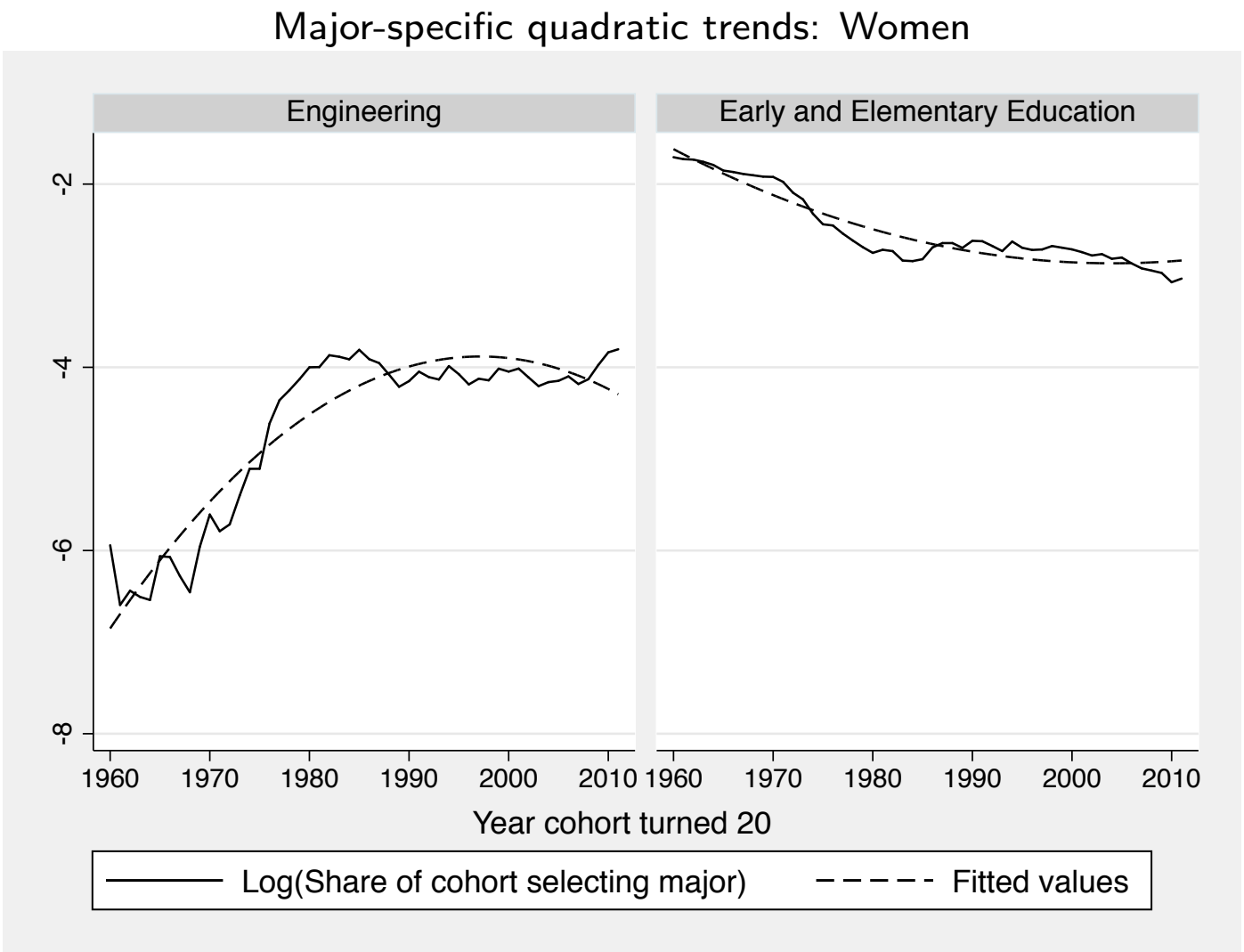


Formal Estimation

$$log(S_{cm}) = \beta_m * unemp\_20_c + \eta_m + \delta_{1m}c + \delta_{2m}c^2 + \epsilon_{cm}$$

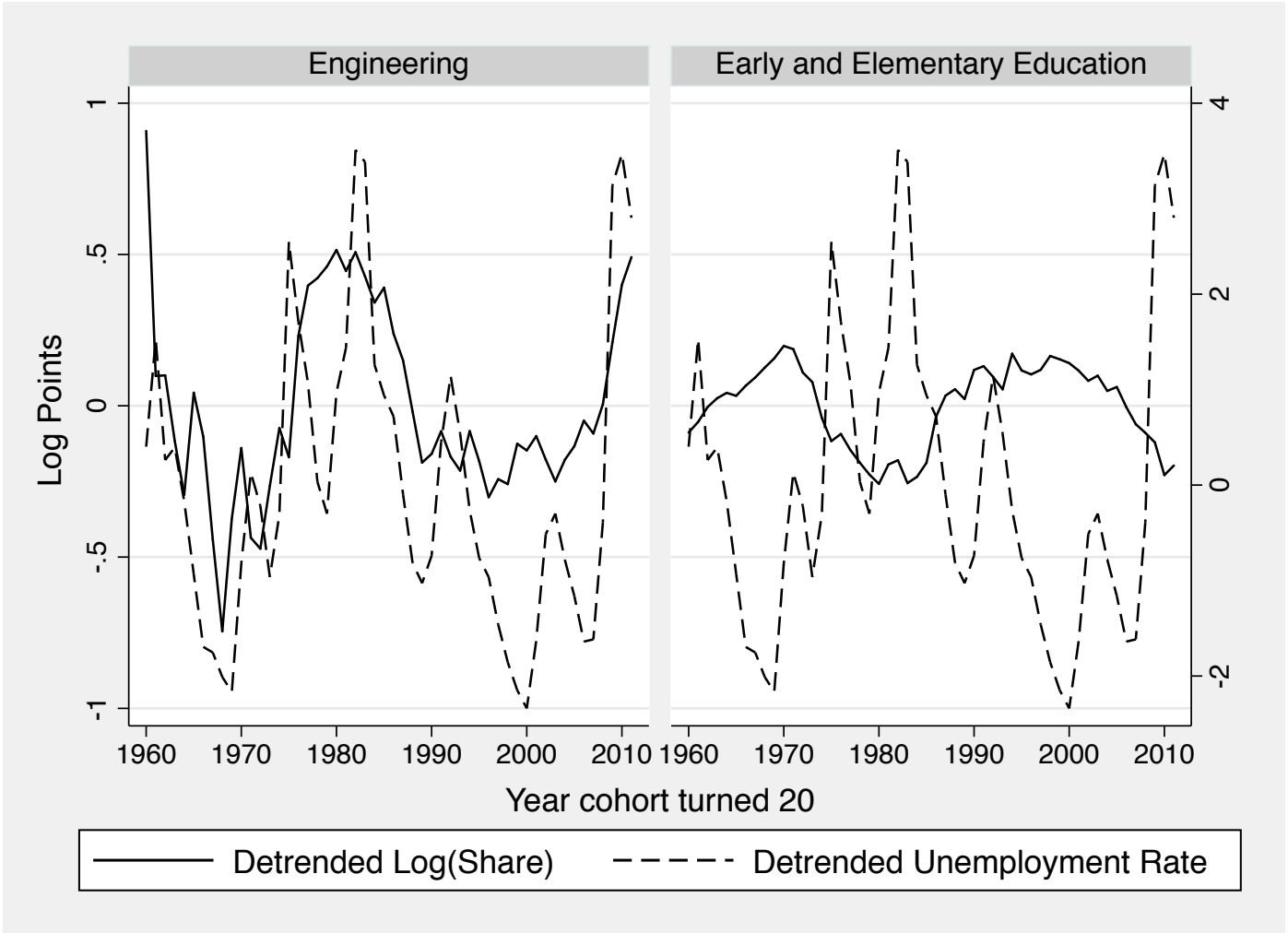
- Observations: cohort-major cells, grouped to be harmonized between ACS and B&B
- Dependent variable: log(share) of a cohort selecting the major, motivated by conditional logit
- Includes major fixed effects and major-specific quadratic terms
- Coefficient of interest is β_m, response in major share to unemployment rate at age 20
- Block-bootstrap standard errors by re-sampling cohorts, the effective level of variation

Question 1: Major-Specific Trends



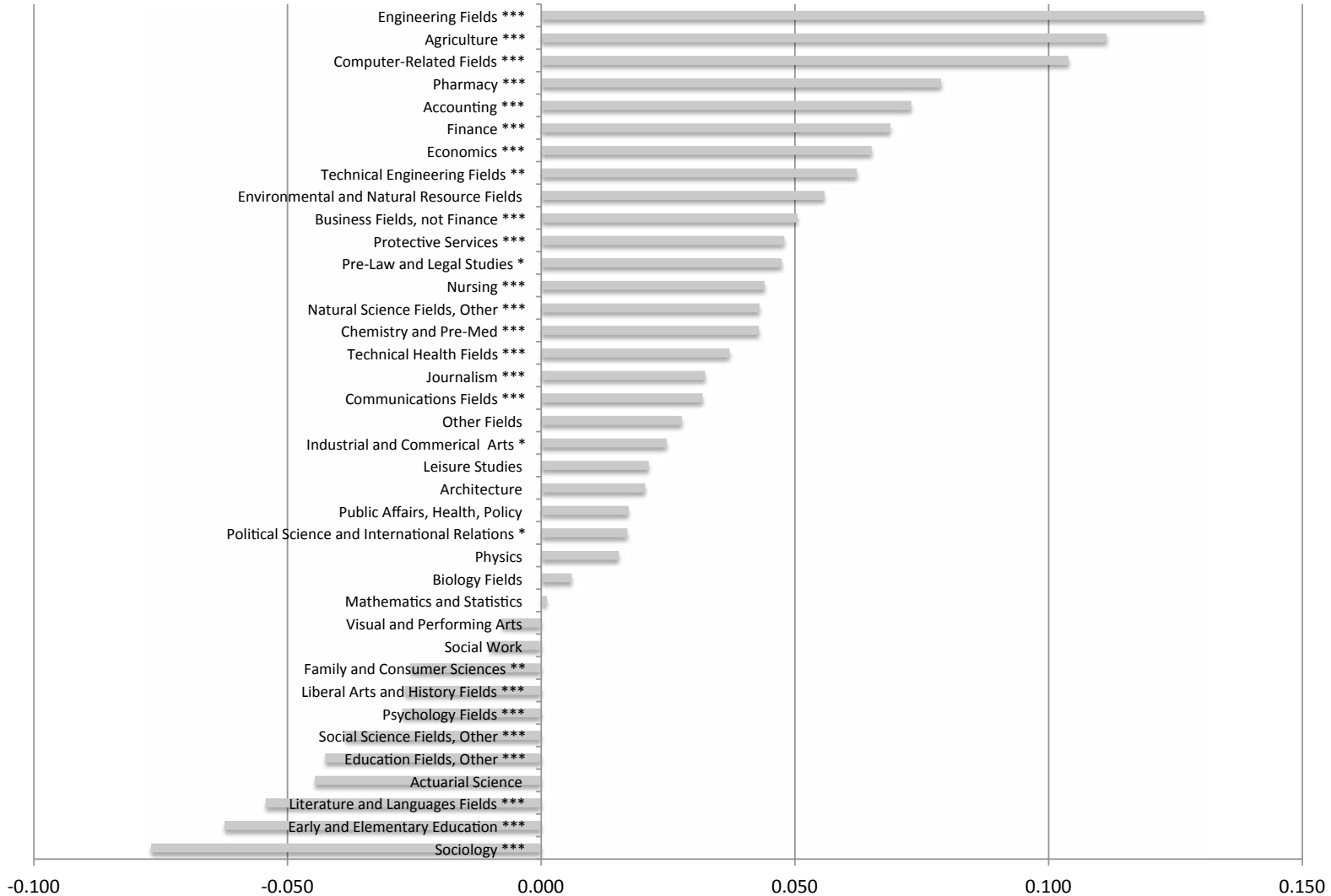
Question 1: Identifying Variation

Log(Share) residuals vs. Unemployment Rate residuals: Women



Estimated Elasticities

Change in Log(Share) due to 1 ppt increase in Unemployment Rate - Women



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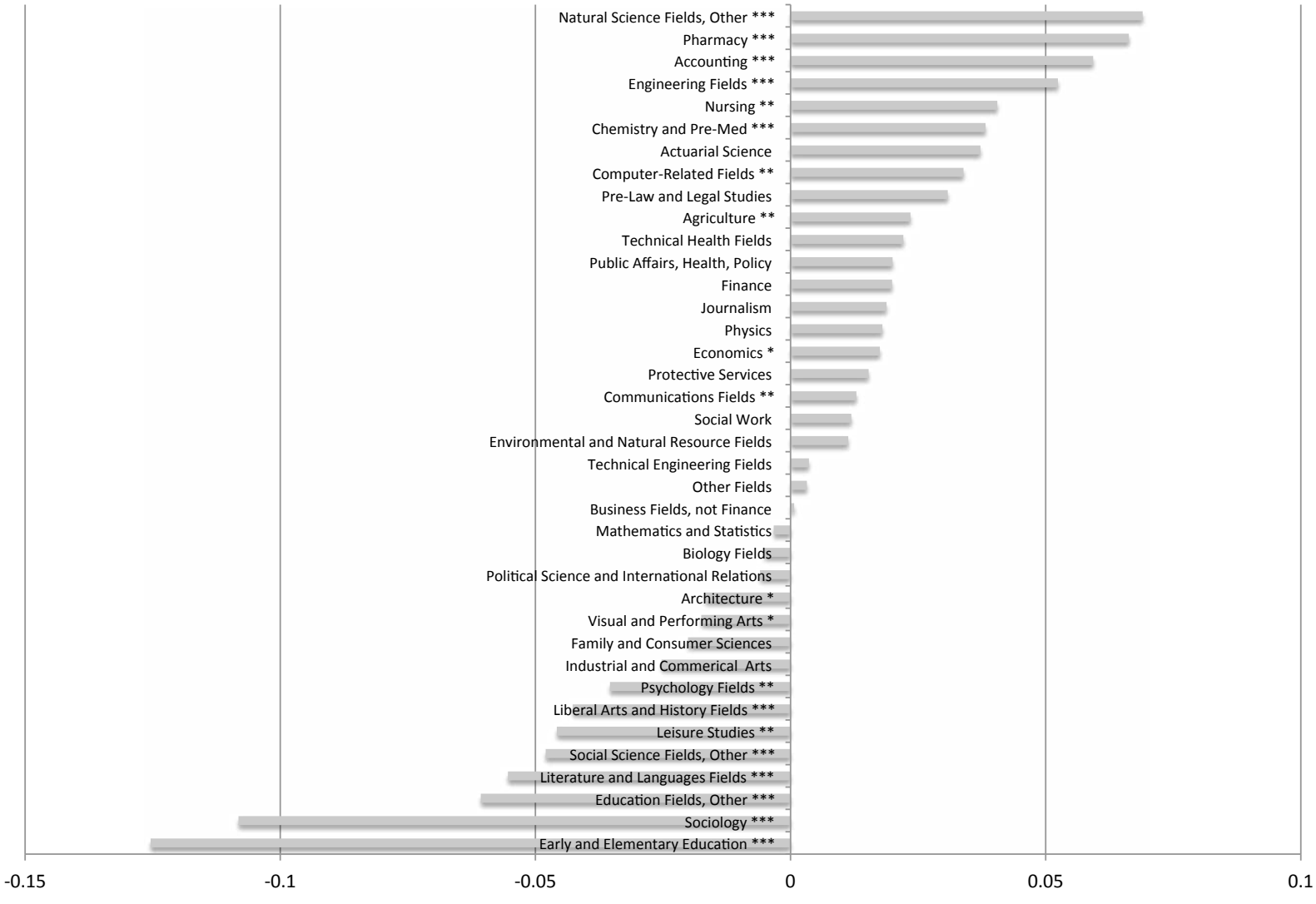

Question 1 Wrap-Up

Question 1: Does the business cycle affect the distribution of selected majors among college completers?

- Yes - a one ppt increase in the unemployment rate leads to a 3.2 (4.1) ppt total reallocation for men (women)
- People seem to pick harder, more math-intensive, higher paying majors
- Women respond more than men do; looks like diffusion among women.

Question 2 Overview

Question 2: What characteristics of majors (measured in ACS and B&B) are associated with a net gain/loss in market share?

- Labor Market Prospects - Long Run
  - Long-run earnings (proxy for demand changes during recession)
  - Career orientation (FTFY mid-career)
- Labor Market Prospects - Short Run
  - Job search difficulty
  - Employment probability (unconditional and/or relevant to degree)
- Difficulty
  - Math SAT of majors
  - Average math GPA of majors
  - Major-specific GPA
- Other
  - Female share (long-run)
  - Geographical mobility required(or enabled)
  - Narrowness/breadth of job opportunities
  - Pathway to graduate school

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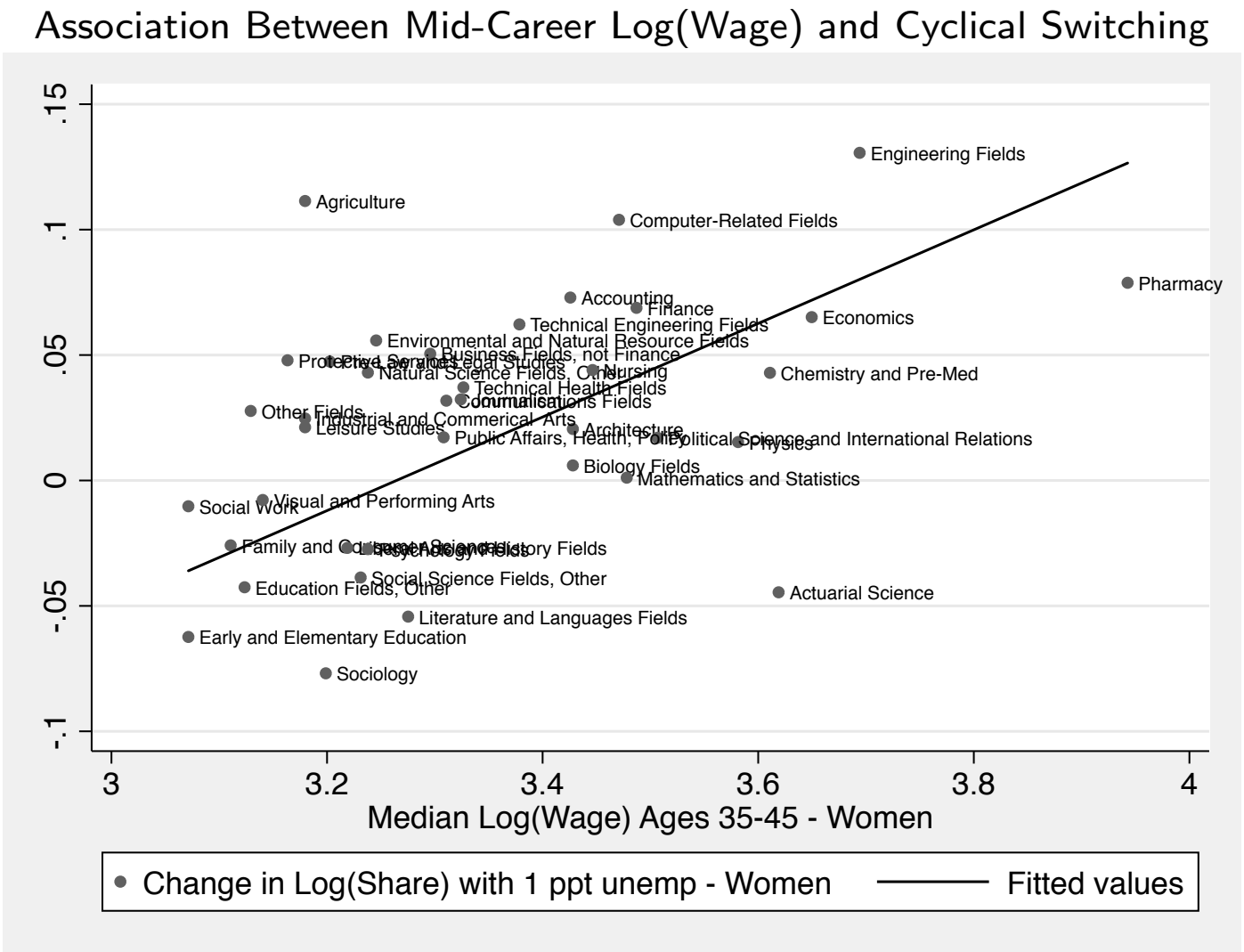
Question 2: Method

$$\hat{\beta}_m = \phi_0 + \phi_1 * X_m + \omega_m$$

- Use coefficient estimates from Question 1 as dependent variables
- Explanatory variables calculated from the ACS and a single wave of B&B (treated as fixed)
- Specification details:
  - Weighted using inverse of sampling variance of dep. var.
  - Bootstrapped standard errors (repeating entire exercise)

Correlates of Switching - Long Run Earnings



Question 2 Results Summary

Question 2: What characteristics of majors are associated with a net gain/loss in market share?

- Robust evidence that recessions alter the distribution of completed college majors toward those that have higher labor market returns.
- Long-run and short-run labor market prospects explain much of the cyclicality, but not all (76 pct for women; 60 pct for men).
- Even *conditional* on labor market prospects, individuals have increasing preferences for more difficult, more career-oriented, and more male-dominated fields (esp. among women)

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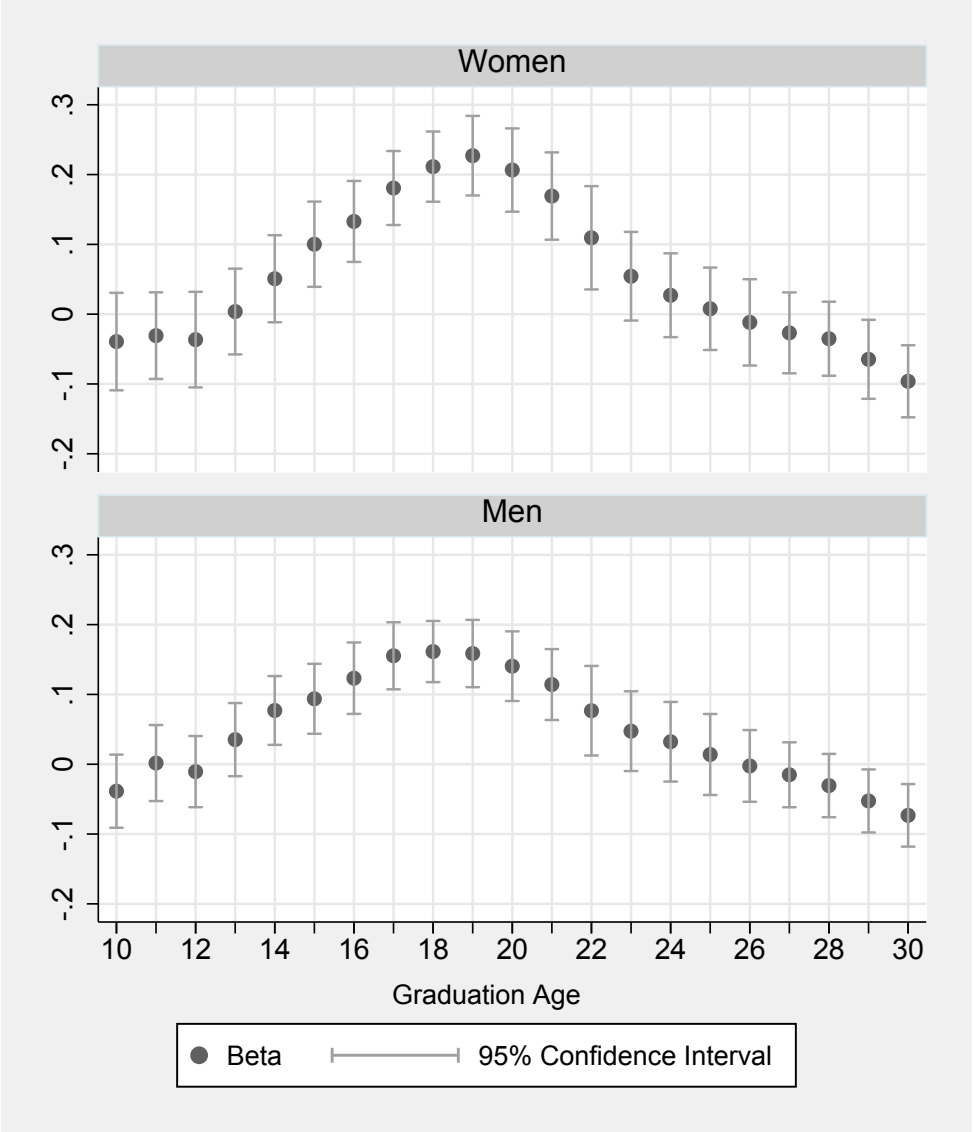
Robustness

- Age for unemployment rate
  - Results strongest using ages 17-21; earlier or later ages weaker and insignificant
- Composition of cohorts
  - Adjust for observables (race x major FEs, birth region x major FEs) - results quite similar
  - Adjust for unobservables (major-specific effects of share of cohort enrolled/completed) - results qualitatively similar; relationship with earnings somewhat smaller

Results Robust to Different Unemployment Ages

Relationship between major cyclicality and long-run earnings



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Extensions

- Geographic variation in economic conditions
  - Results similar when using unemp rate based on state of birth (only geography available)
  - Noisy results when using only spatial variation (within-year) in unemp rates
- Wages of marginal students
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Additional Motivation: Costs of Graduating in a Recession

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- Possibilities for compensating behavior
  - Enroll in and complete more schooling
  - Choose a different major
- Adjustment on the allocative margin could pay off nicely:
  - Variation in earnings across college majors nearly as large as College-HS wage gap (Altonji, Blom, and Meghir 2012)
  - Impact of recession varies substantially by major (Oreopoulos, et al. 2012, Altonji et al. 2013)
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- Back of the envelope using our results: With no major switching, recession effects would be ≈ 10 percent larger.

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Concluding Thoughts

- Temporary shocks have a long-lasting impact on the distribution of human capital in the economy; 3 ppt increase in unemployment rate increases major-based earning potential of a cohort by 1.35 percent.
- College students (especially women) are sufficiently elastic in their major choice to complete more challenging majors such as STEM fields, given initial skill levels
- Graduating in a recession would be ten percent more painful had students not reallocated across majors