

# A Cross-Cohort Analysis of Human Capital Specialization and the College Gender Wage Gap

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NBER SI 2020 GENDER IN THE ECONOMY PROGRAM: JULY 24-25, 2020

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LINK TO WORKING PAPER: [HTTPS://WWW.NBER.ORG/PAPERS/W26348](https://www.nber.org/papers/W26348)

# Overview

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## What we do:

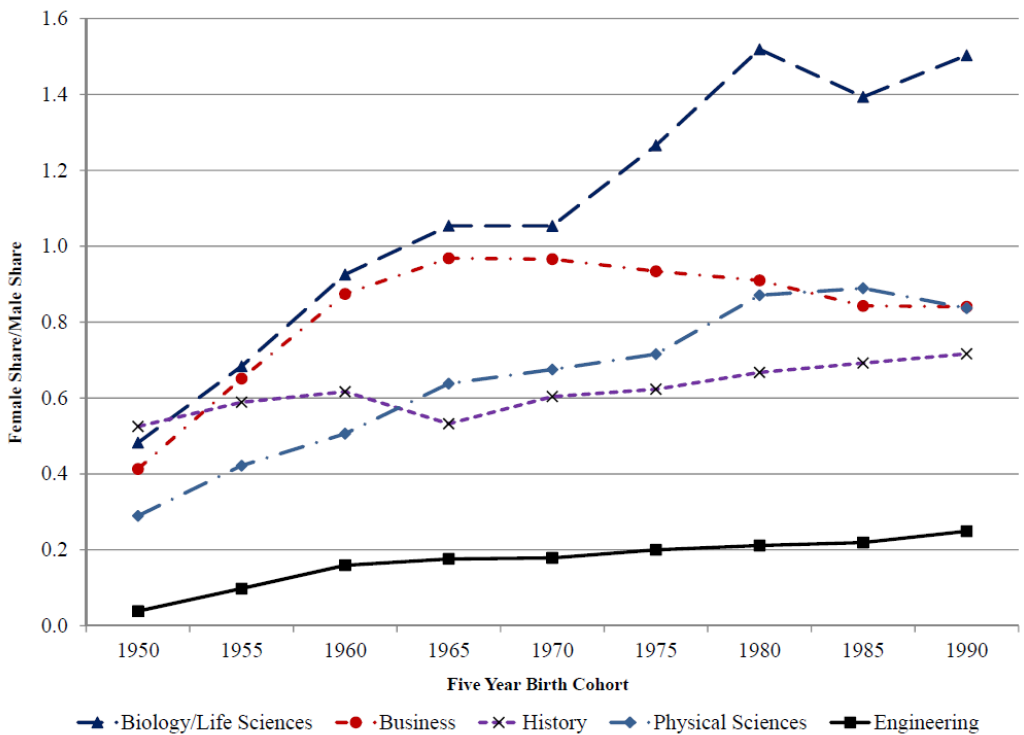
1. Document cross-cohort patterns by gender in pre-market human capital specialization (undergraduate major).
2. Introduce new indices that measure specialization.
3. Examine gender differences in the mapping of college major to subsequent occupation.
4. Assess the contributions of major and occupation choices to gender gaps in employment, hours worked and wages.

\* Data is from the American Community Survey 2014-2017.

## What we find:

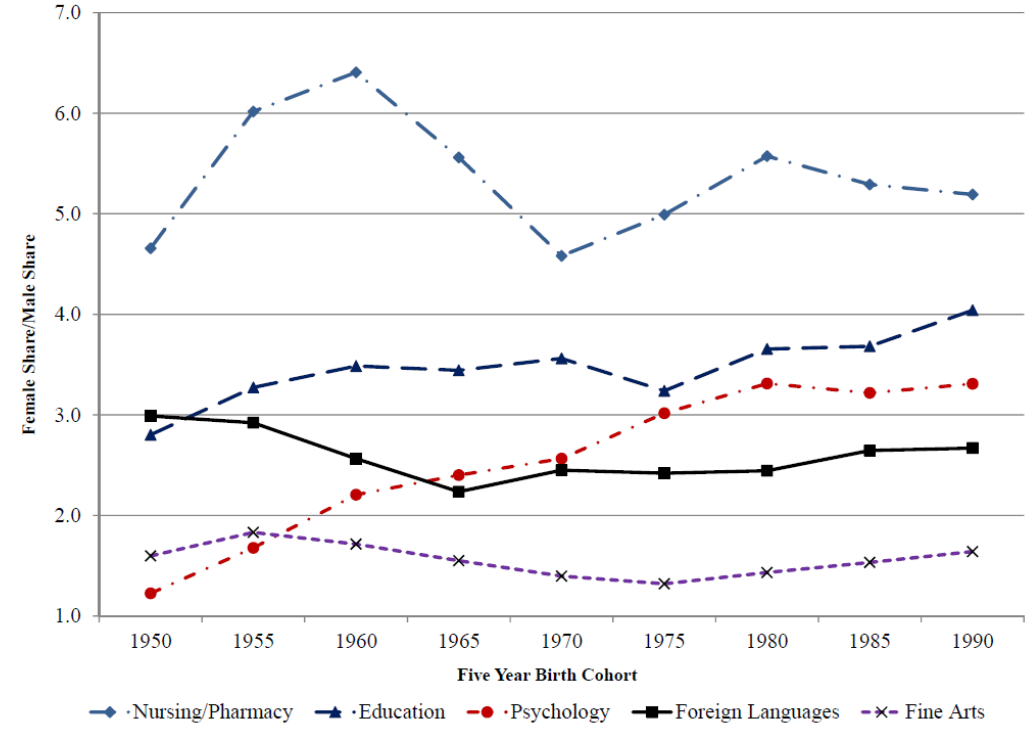
1. Across all birth cohorts, women systematically sort into majors with lower potential wages relative to men.
2. Conditional on major, women subsequently sort into occupations with lower potential earnings.
3. Gender differences in major explain a substantive portion of the gender wage gap among college graduates. This is above and beyond what is explained by gender differences in occupational sorting.
4. Some of the gender differences in occupational sorting conditional on college major can be explained by women choosing occupations with lower potential hours worked.

### Male-dominated Majors



**Convergence:** Engineering, Life Sciences and Physical Sciences  
**Divergence:** Business majors (convergence then divergence)  
**Static:** History

### Female-dominated Majors



**Convergence:** Nursing/Pharmacy, Foreign Language, Fine Arts  
**Divergence:** Psychology  
**Static:** Education

# Summarizing Overall Similarity (I)

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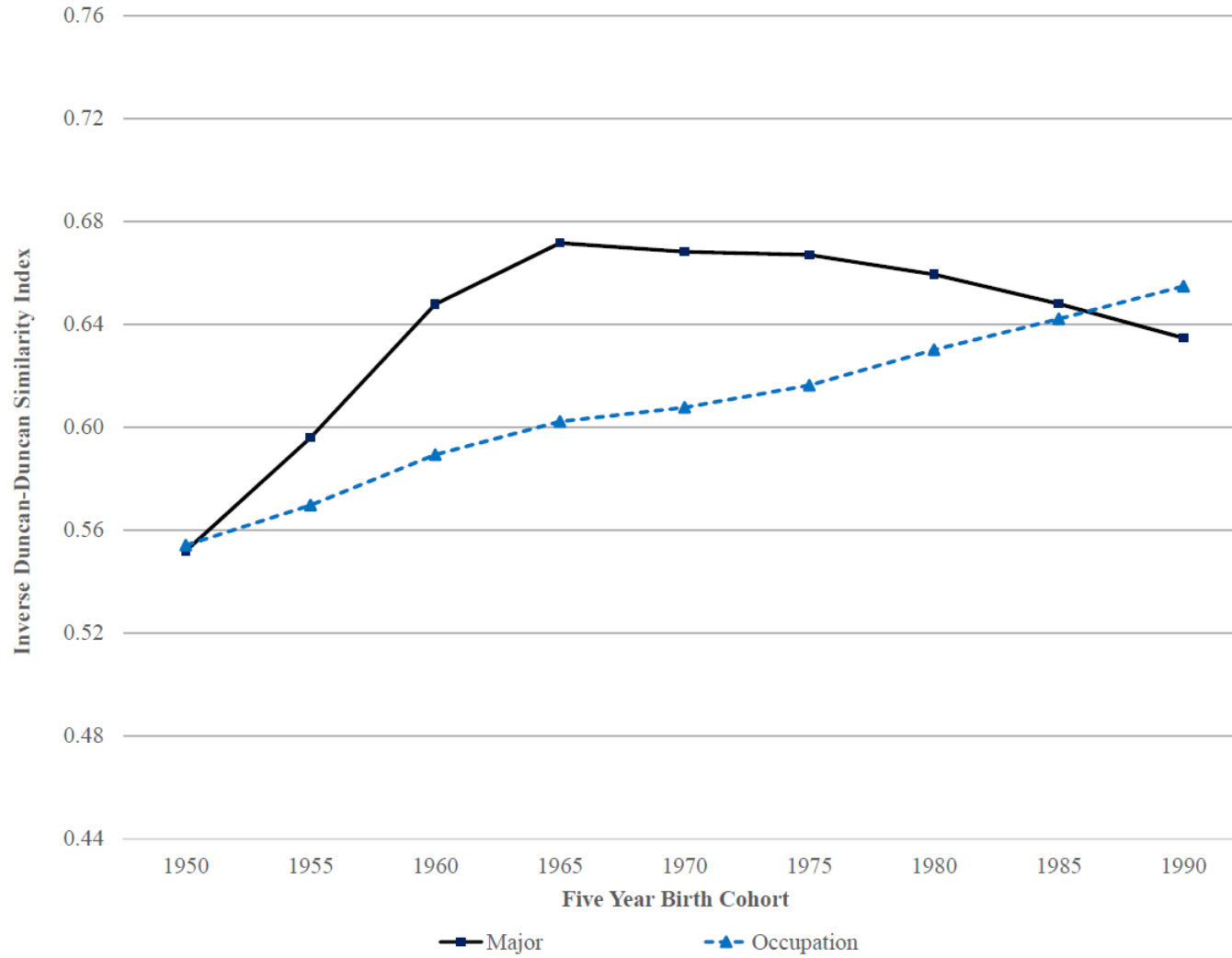
We begin with an Inverse Similarity Index (Duncan, Duncan 1955):

$$I_c^M = 1 - \frac{1}{2} \sum_{m=1}^M |s_{male,c}^m - s_{female,c}^m|$$

where  $s_{g,c}^m$  is the share of gender group  $g$  born in cohort  $c$  who matriculated with undergraduate major  $m$

*As this index approaches 1, we approach gender parity in sorting.*

## Overall Similarity Patterns



# Summarizing Overall Similarity (II)

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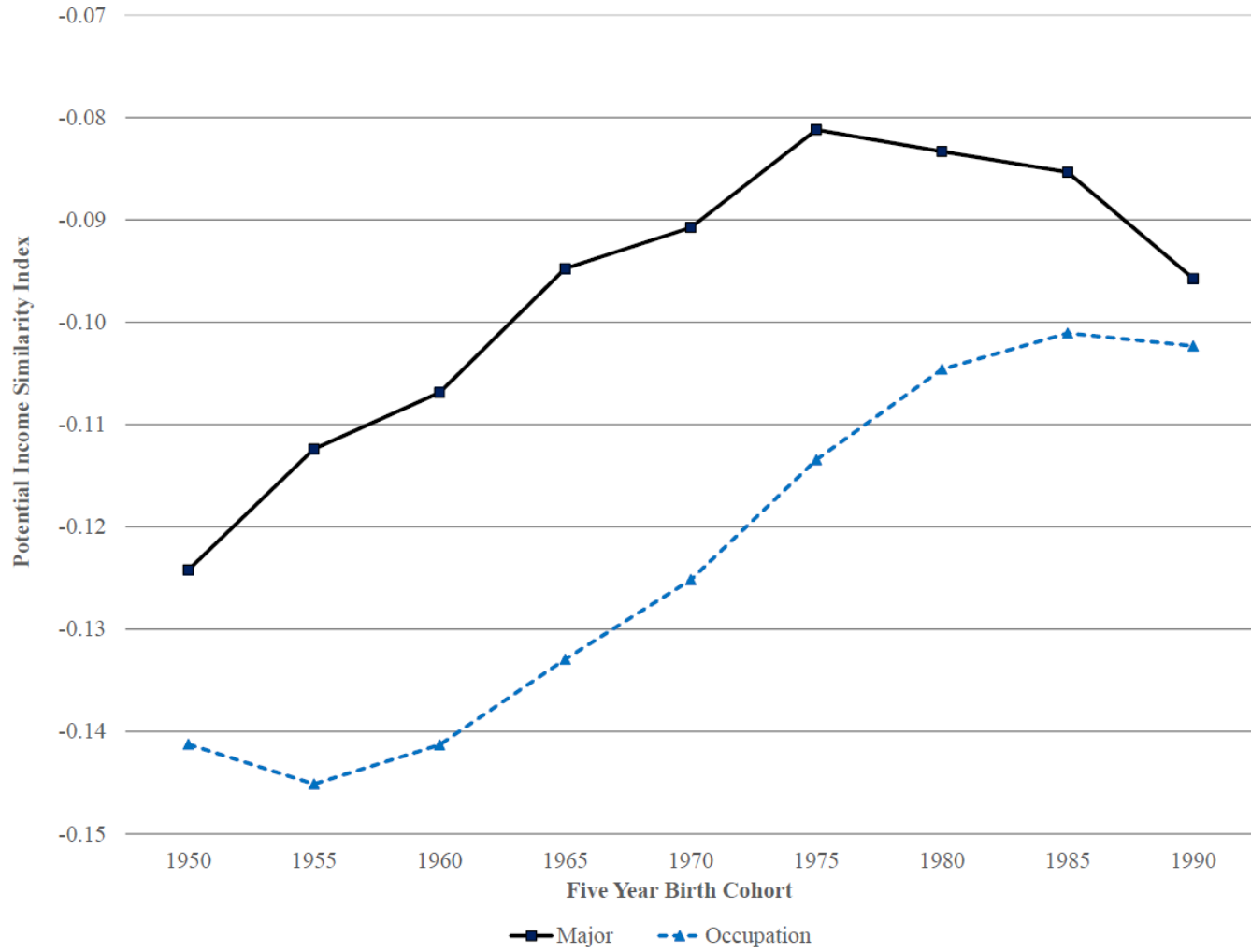
We introduce a potential wage index (similar to Bertrand, 2018):

$$I_c^{P,M} = \frac{\sum_{m=1}^M s_{female,c}^m \bar{y}_{male}^m}{\sum_{m=1}^M s_{male,c}^m \bar{y}_{male}^m} - 1$$

where  $I_c^{P,M}$  measures the differential “potential” log wage of women of cohort  $c$  given that the female distribution of major choice in a given cohort may differ from males in cohort.

At  $I_c^{P,M} = 0$ , major choices of women yield the same potential wage as their male counterparts.

## Similarity Patterns in Price Space



# Mapping Between Major and Occupation (I)

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We create a cross-occupation Herfindahl-Hirschman Index (HHI) for each gender, cohort and major:

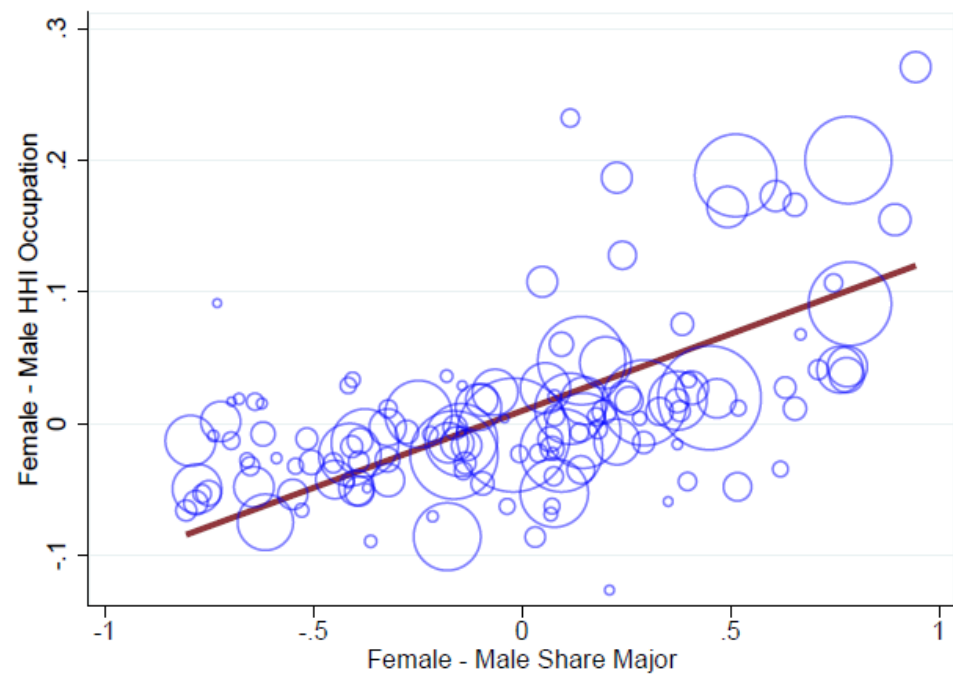
$$HHI_{g,c}^m = \sum_{o=1}^O \left( s_{g,c}^{o|m} \right)^2$$

where  $s_{g,c}^{o|m}$  is the share of gender group  $g$  born in cohort  $c$  working in occupation  $o$  conditional on having matriculated with undergraduate major  $m$

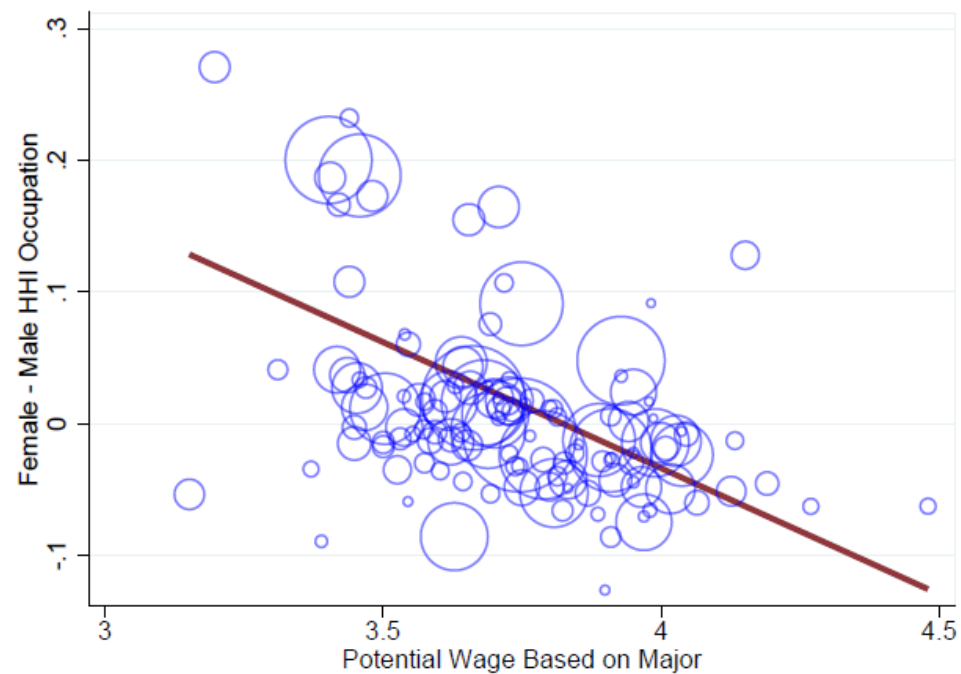
*As this index approaches 1, occupational sorting is more concentrated.*



Figure 4: Cross Major Variation in Within-Major Gender Differences in Occupational Dispersion, 1968-1977 Birth Cohort



PANEL A: GENDER  
COMPOSITION OF MAJOR



PANEL B: POTENTIAL  
INCOME OF MAJOR

Table 1: Gender Differences in Occupational Choice, Selected Majors, 1968-77 Birth Cohort

Panel A: Education Majors					
	Teachers	Executive/ Manager	Sales	Admin Support	$HHI_{q,c}^m$
Men	0.50	0.18	0.06	0.03	0.29
Women	0.68	0.09	0.03	0.07	0.48
Panel B: Nursing/Pharmacy					
	Nurses/ Health	Executive/ Manager	Sales	Health Technicians	$HHI_{q,c}^m$
Men	0.46	0.15	0.07	0.06	0.25
Women	0.63	0.09	0.03	0.05	0.42
Panel C: Social Sciences					
	Executive/ Manager	Sales	Lawyers/ Judge	Admin Support	$HHI_{q,c}^m$
Men	0.26	0.13	0.11	0.06	0.11
Women	0.20	0.07	0.08	0.13	0.10
Panel D: Business					
	Executive/ Manager	Sales	Accountant/ Underwriter	Admin Support	$HHI_{q,c}^m$
Men	0.31	0.18	0.12	0.07	0.16
Women	0.24	0.11	0.17	0.18	0.14
Panel E: Engineering					
	Executive/ Manager	Engineer	Other Technicians	Architects/ Civil Engin.	$HHI_{q,c}^m$
Men	0.28	0.23	0.09	0.08	0.16
Women	0.27	0.18	0.05	0.07	0.13

# Mapping Between Major and Occupation (II)

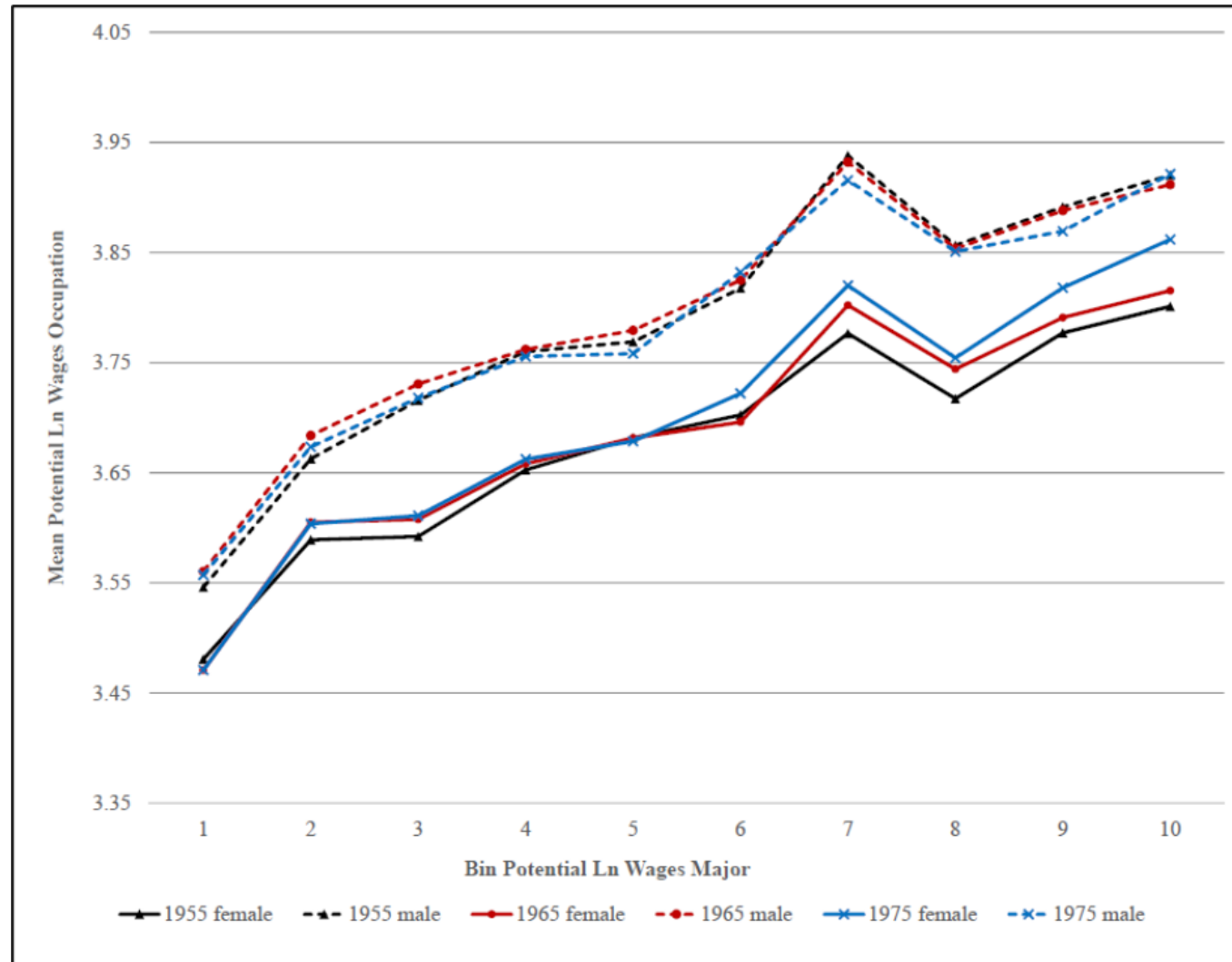
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We introduce a potential wage index:

$$I_c^{P,O|m} = \sum_{m=1}^M (s_{female,c}^o | m) \bar{Y}_{male}^o - \sum_{m=1}^M (s_{male,c}^o | m) \bar{Y}_{male}^o$$

where  $s_{g,c}^o | m$  is the share of gender  $g$  choosing occupation  $o$  conditional on having matriculated with undergraduate major  $m$

At  $I_c^{P,O|m} = 0$ , occupations of women yield the same potential wage as their male counterparts who majored in the same subject.



(a) Log Wage and Employment Rate Regressions, Pooled Cohorts

Variable	Log Wages				Employment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
$Female_i$	-0.233 (0.006)	-0.158 (0.004)	-0.143 (0.004)	-0.114 (0.003)	-0.088 (0.003)	-0.083 (0.003)
$\bar{Y}_i^m$		0.807 (0.015)		0.408 (0.012)		0.045 (0.003)
$\bar{Y}_i^o$			0.757 (0.011)	0.677 (0.009)		
Controls	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.22	0.27	0.36	0.37	0.13	0.13

(b) Log Wage Regressions, Separately By Cohort

Variable	1958-1967 Birth Cohorts			1978-1987 Birth Cohorts		
	(1)	(2)	(3)	(4)	(5)	(6)
$Female_i$	-0.322 (0.008)	-0.198 (0.005)	-0.168 (0.004)	-0.155 (0.005)	-0.093 (0.004)	-0.065 (0.004)
$\bar{Y}_i^m$			0.411 (0.016)			0.443 (0.010)
$\bar{Y}_i^o$		0.909 (0.015)	0.823 (0.012)		0.599 (0.008)	0.513 (0.007)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.13	0.32	0.33	0.13	0.25	0.27