Do Wages Fall When Women Enter an Occupation?

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Motivation

Occupation and industry account for 51% of gender wage gap (Blau & Kahn 2017)

- Hypothesis 1: Women choose less demanding occupations (Becker 1985)
  - career interruptions (Görlich & De Grip 2007), flexible hours (Goldin 2014), less competitive (Niederle & Vesterlund 2007)
- Hypothesis 2: Women discriminated against in high-paying occupations, crowding female occupations (Bergmann 1974)
  - promotion (Maume 1999), mentorship (Chen et. al 2015), sexual harassment (Parker 2018)
- Hypothesis 3: The presence of women in an occupation lowers wages
  - Levanon, England and Allison (2009), Goldin and Katz (2011)

I ask:

What is the effect of an increased fraction female in an occupation on wages?

Ideal Experiment

- Divide occupations into treatment and control

- Retire random subset of male workers, clone random subset of female workers to replace males

- Allow workers to enter or exit occupations

- Measure wages for men and women

  – Effect on average wage of **occupation**, not on wage of **individual workers**.

 – Effect of gender + different average characteristics

Causal Mechanisms

- Declining prestige/Discrimination against "Women's Work"

  – Rise in % female may signal decline in difficulty of occupation (Goldin 2014).

  – Lowers average wage by:

    - Lower demand for occupation (devaluation)

    - Disamenity for high-skilled workers → change in workforce composition

- Changing amenity value of the occupation

  – Women value some workplace amenities more than men (Pallais 2017)

  – Provision of amenities responsive to worker demand (Goldin and Katz 2011)

  – More women → higher amenity provision, lower wage (Lee and Thompson 2018)

- Suggestive evidence for both mechanisms

Empirical Strategy

Empirical Strategy

- Panel regression of fraction female on log mean wage
  - Positive Bias: Increased education & workforce engagement
  - Negative Bias: Occupations become less demanding
- Shift-share instrument: increased women's work and education, 1960-2010
- Estimates % female if occupation choices stayed the same, education and labor force decisions changed.
  - Instrument defined from work and education of young workers (22-35)
  - Measure wages of older workers (45-65)
- Data Source: Decennial Census and 2010 American Community Survey

6

% Female of Young Workers by Education
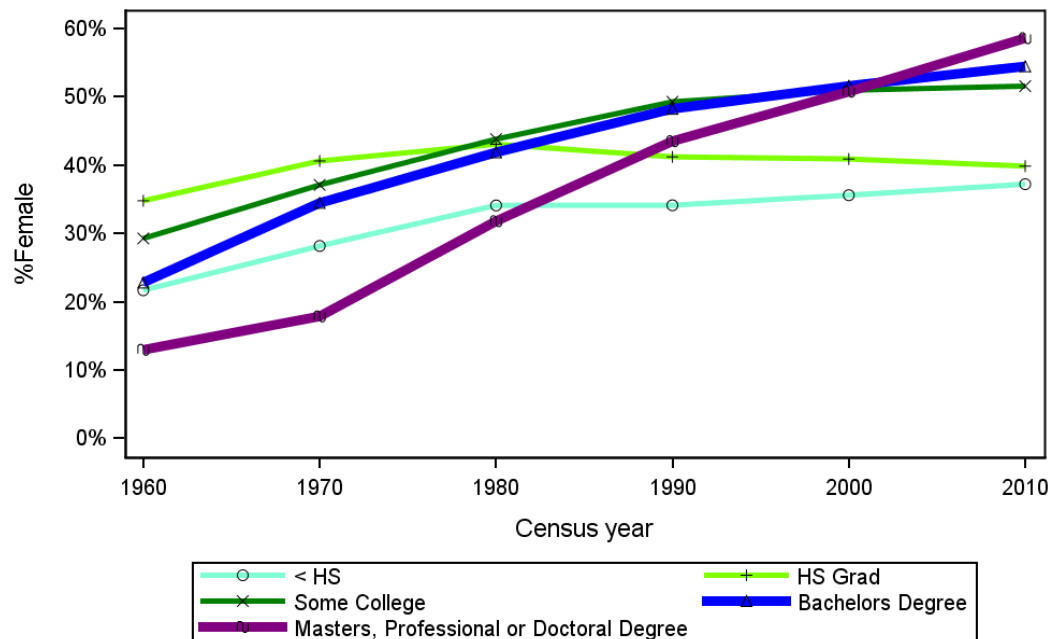
Note: This figure shows the percent of US workers of each education type aged 22-35 who are female in each census year from 1960-2010. Definitions of Education Type are available in the data appendix.

Physicists, Psychologists and Nurses in 1980

	%of Workers With Ed	Workers /10,000 Females	Workers /10,000 Males	Female /Male Ratio
Physicists and astronomers				
3: Associates Degree	8	0	2	0.2
4: College Degree	18	1	5	0.1
5: Advanced Degree	71	3	37	0.1
Psychologists				
3: Associates Degree	5	3	2	1.1
4: College Degree	15	15	9	1.7
5: Advanced Degree	76	178	105	1.7
Registered nurses				
3: Associates Degree	55	740	24	30.4
4: College Degree	30	568	27	21.3
5: Advanced Degree	6	345	24	14.2

*Notes: $\gamma_{(a,1980)}^j$ gives the percent of workers in occupation j with degree a in 1980, $\omega_{(aj,1980)}^F$ gives the number/10,000 of women with degree a working in occupation j, and $\omega_{(aj,1980)}^M$ gives the /10,000 of men with degree a working in occupation j. $\Omega_{(a,j,1980)}$ gives the ratio $(\omega_{(aj,1980)}^M)/(\omega_{(aj,1980)}^F)$.

Physicists, Psychologists and Nurses
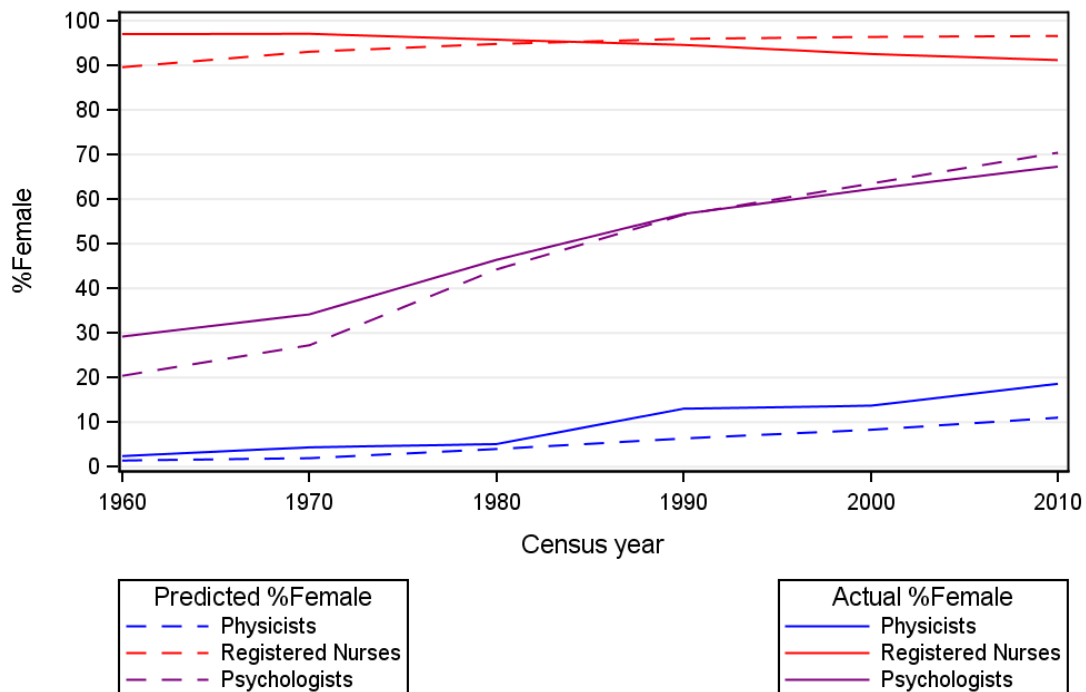
Note: This figure shows the percent female among workers in three occupations, as well as the instrumented percent female for young workers in those occupations

Labor Supply

- Increased women's work and education creates labor supply shock in female-dominated occupations.

- Control: share of labor force in occupation if:

  - fraction working in occupation, given education and gender **fixed**

  - fraction of workforce with education and gender **vary**

- Labor Supply grows in occupations that hire educated female workers

- Illustrate by showing log average gender ratio of each education group.

Gender ratio on change in predicted fraction female, predicted labor supply
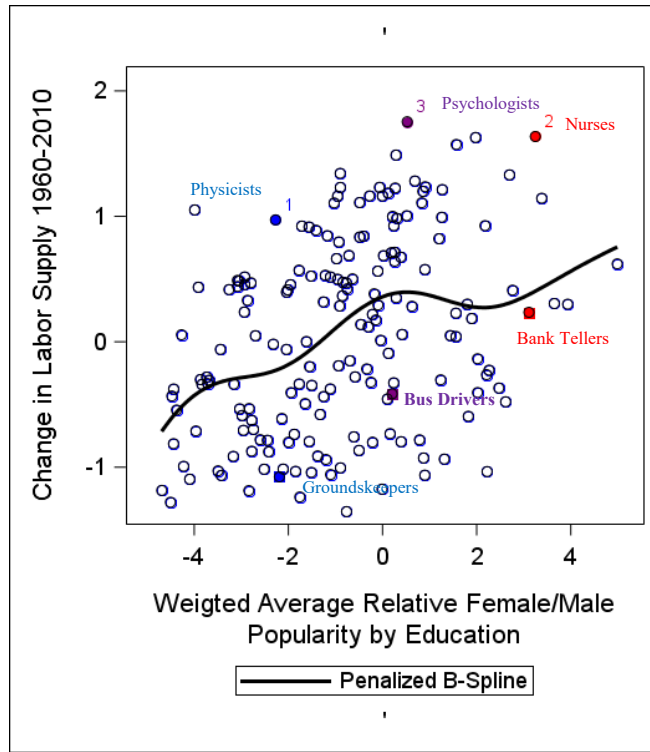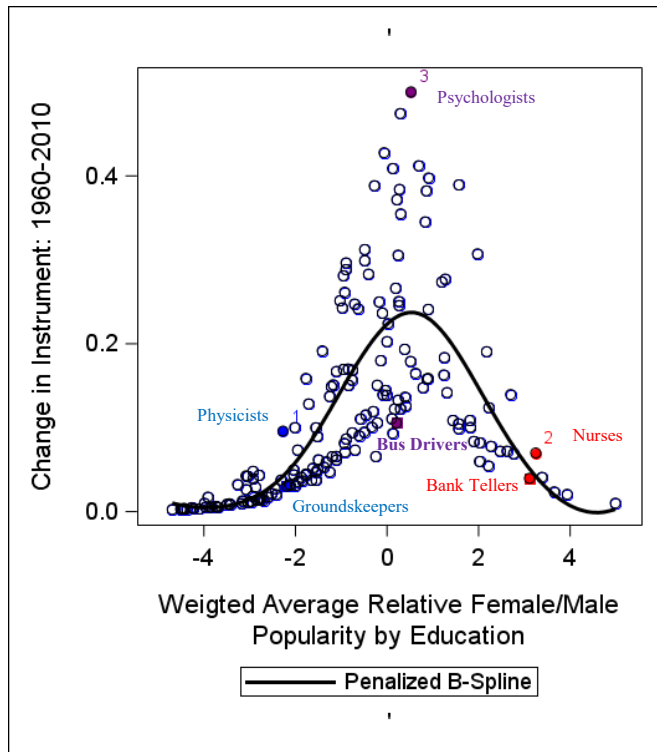
Estimation Equations

$$f_{j,t} = \alpha + \beta_{1k}\widetilde{f_{j,t}} + \beta_{2fk}W_{f,j,t} + \beta_{2mk}W_{m,j,t} + \beta_{3k}\widetilde{l_{j,t}} + \delta_{fk}X_{f,j,t} + \delta_{mk}X_{m,j,t} + \gamma_{jk} + \sigma_{tk} + \varepsilon_{j,t}$$

$$W_{g,j,t+k} = \alpha + \vartheta_{1k}\widehat{f_{j,t}} + \vartheta_{2fk}W_{g,j,t} + \vartheta_{2mk}W_{m,j,t} + \vartheta_{3k}\widetilde{l_{j,t}} + \delta_{fk}X_{f,j,t} + \delta_{mk}X_{m,j,t} + \gamma_{jk} + \sigma_{tk} + \mu_{g,j,t}$$

- Where:

- For k={0,10,20}, g={m,f}:

- $\widetilde{f_{j,t}}$=Instrument

- $\widetilde{l_{j,t}}$=Labor supply index

- $X_{j,t}$=Time-varying controls, **plus time-varying effect of base-year education level**

- γ_{jk}, σ_{tk} = occupation, year FE

Results

Main Contemporaneous Results

	Log Female Wage (t)		Log Male Wage	
2SLS:	(1)	(2)	(3)	(4)
Fraction Female	**-0.86*** **(0.59)**	**-0.72**** **(0.39)**	**-0.92***** **(0.34)**	**-0.82***** **(0.28)**
Labor Supply		-0.04 (0.10)		-0.03 (0.05)
First-Stage:				
Fraction Female	0.51 *** (0.11)	0.72*** (0.12)	0.51 *** (0.11)	0.72*** (0.12)
Sample Size	1816	1816	1816	1816

*Note: Standard errors are in parenthesis and are clustered at the occupation level. *** p<0.01, ** p<0.05, * p<0.10

14

Main Results: 10-Year Lag

2SLS:	Log Female Wage (t+10)			Log Male Wage (t+10)		
	(1)	(2)	(3)	(4)	(5)	(6)
Fraction Female	**-2.09***** **(0.71)**	**-1.47***** **(0.42)**	**-1.30***** **(0.42)**	**-1.12 ***** **(0.40)**	**-1.01***** **(0.30)**	**-0.87***** **(0.27)**
Labor Supply		-0.23** (0.11)	-0.22 ** (0.11)		-0.04 (0.08)	-0.03 (0.08)
Male Wage			0.23 ** (0.1)			0.13** (0.08)
Female Wage			-0.01 (0.08)			0.06** (0.04)
Sample Size	1456	1456	1456	1466	1466	1466

*Note: Standard errors are in parenthesis and are clustered at the occupation level.
*** p<0.01, ** p<0.05, * p<0.10

15

Main Results: 20-year Lag

2SLS:	Female Wage (t+20)			Male Wage (t+20)		
	(1)	(2)	(3)	(4)	(5)	(6)
Fraction Female	-1.16 ** (0.52)	-0.78 ** (0.33)	-0.86 *** (0.34)	-0.43 (0.35)	-0.46* (0.31)	-0.45* (0.31)
Labor Supply		-0.16** (0.09)	-0.16** (0.09)		0.01 (0.09)	0.02 (0.08)
Male Wage			0.02 (0.08)			-0.09 (0.09)
Female Wage			0.02 (0.08)			-0.09 (0.09)
Sample Size	1097	1097	1097	1116	1116	1116

*Note: Standard errors are in parenthesis and are clustered at the occupation level. *** $p<0.01$, ** $p<0.05$, * $p<0.10$

16

Main Tests of Validity

- Major Concern: Base-year gender shares related to changes in returns to skills, demand, etc.

- **Control for Skill Requirements:** Control for time-varying effects of Math/Analyitical Skill, Social Skill, Routine skills and service requirements of each occupation (Autor, Levy and Murnane, 2017)

- **Control for Time Lags**: Magnitude of effects unchanged by adding 10 and 20 year leads of instrument, but large standard errors.

Conclusion

Conclusions

Effect of increased % female on wage is large and robust

- Not fully accounted for by labor supply

- Effects large relative to cross-sectional relationship

Broader implications:

- Lower return to preferences/skills associated with female occupations

- Harder to close wage gap by changing women's occupation choice

- Occupations change in response to worker characteristics

Thank you!!

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