# Labor Supply: Gender and Family

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# Roadmap

1. Introduction

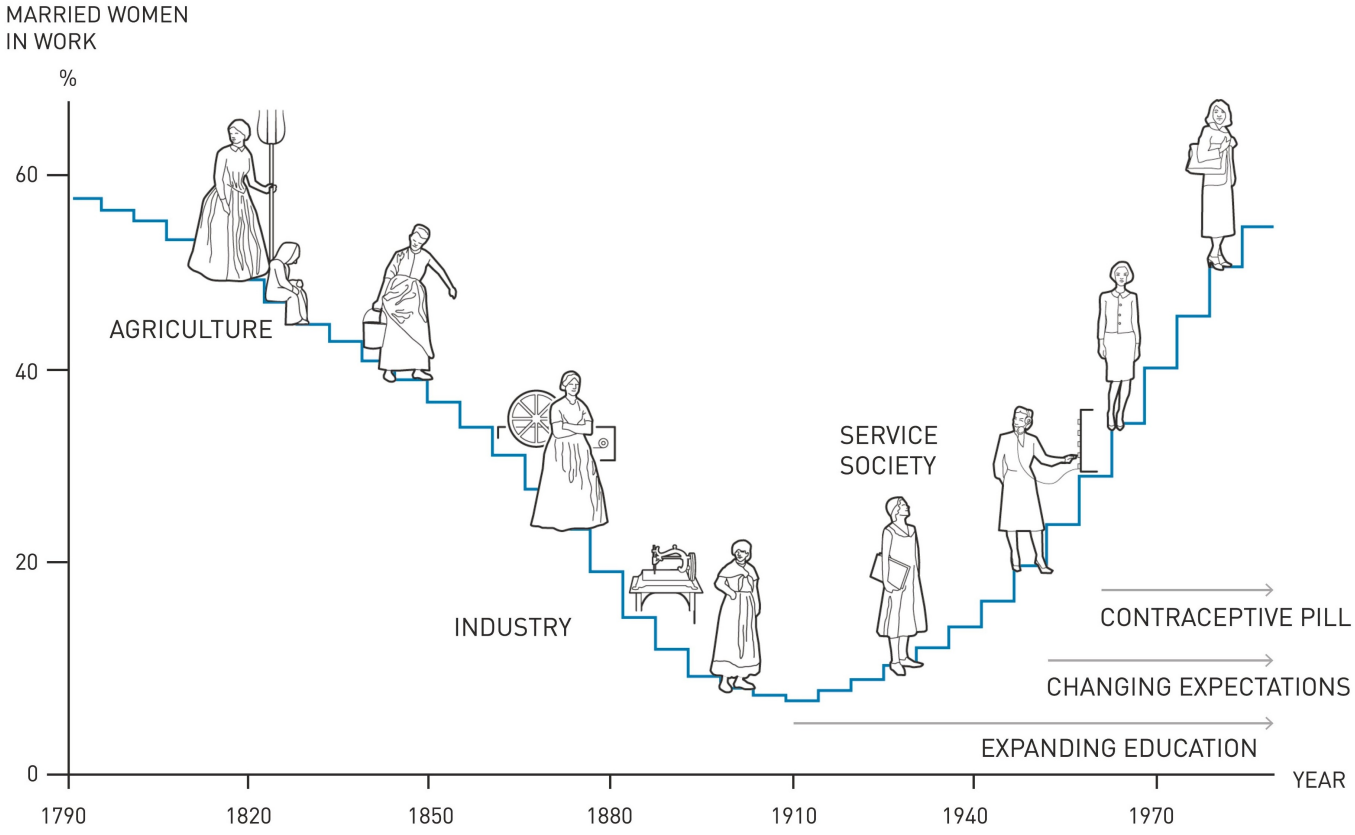
2. Explain Female Labor Supply (Part I)

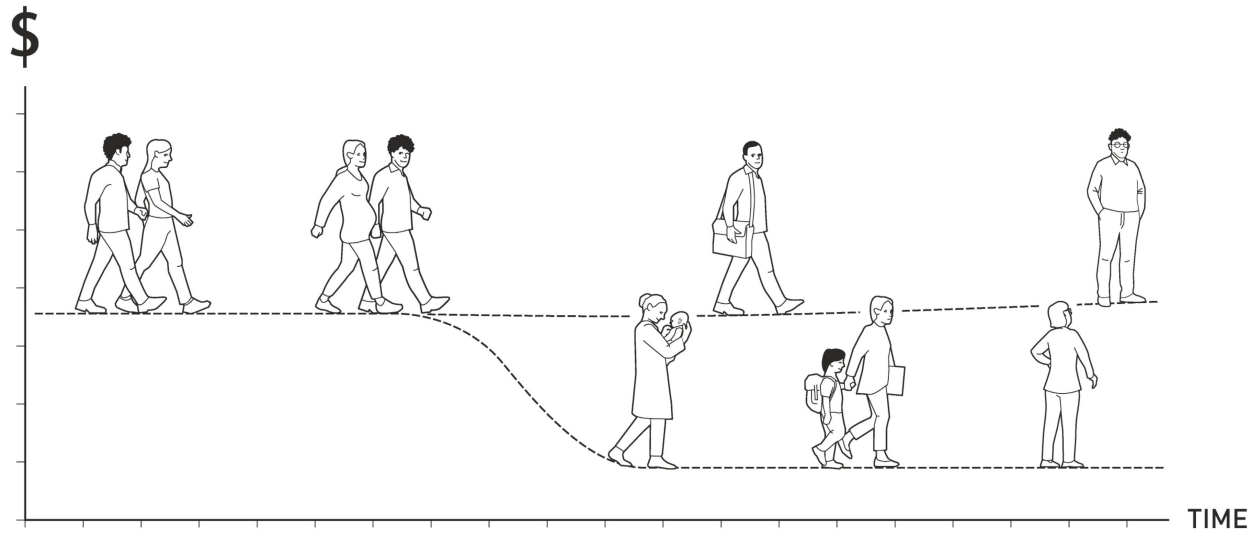
3. Explain Female Labor Supply (Part II)

4. Beyond Unidimensional FLFP

# Last Year's Nobel *(intro for public and for academic)*

# Female Labor Supply & Parenthood Effect



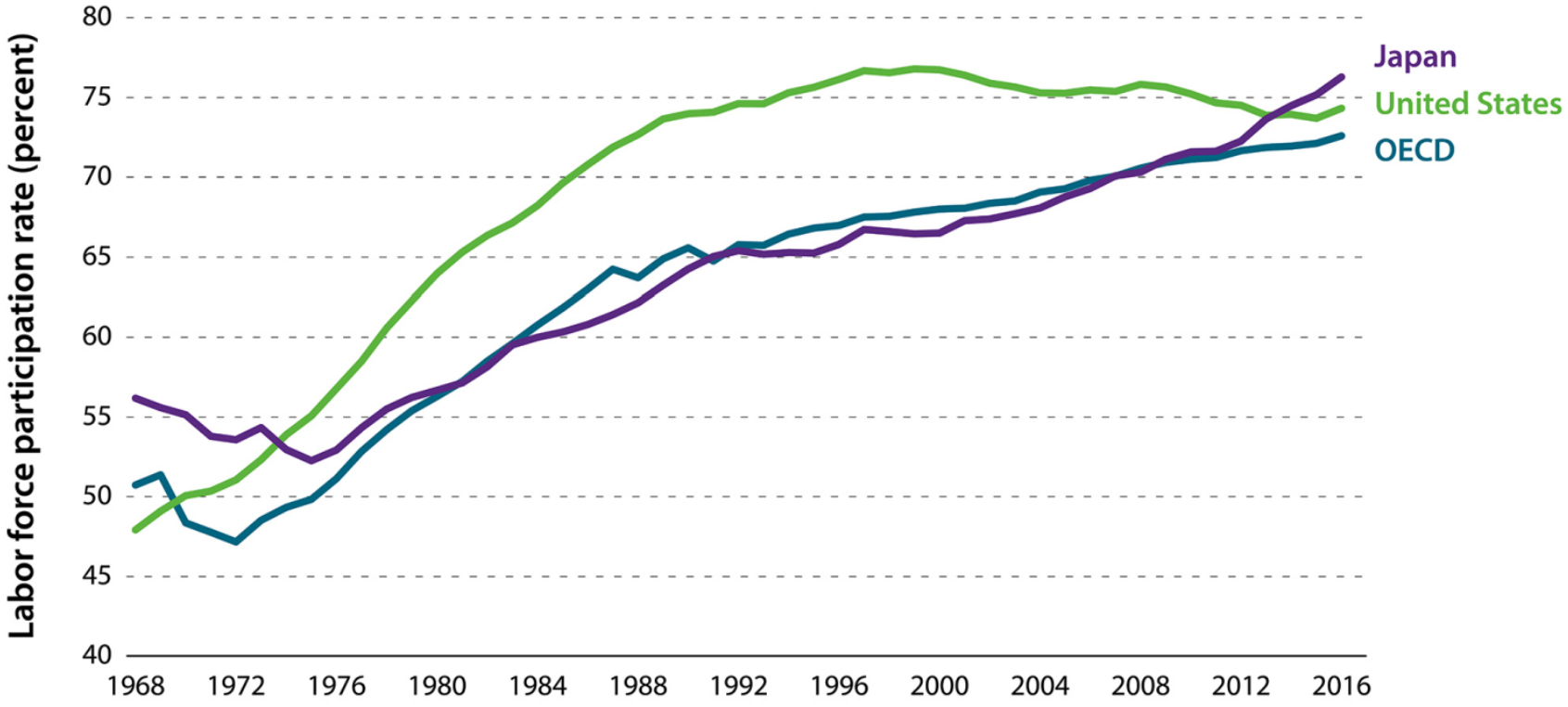



# Female Labor Force Participation Has Increased; But

(Shambaugh et al., 2017)

FIGURE 1.

Labor Force Participation of Prime-age Women from 1968–2016, by Country




Source: OECD Labour Force Statistics.
Note: Prime-age indicates 25–54.

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*(i) The shrinking of the gender gap has decelerated*

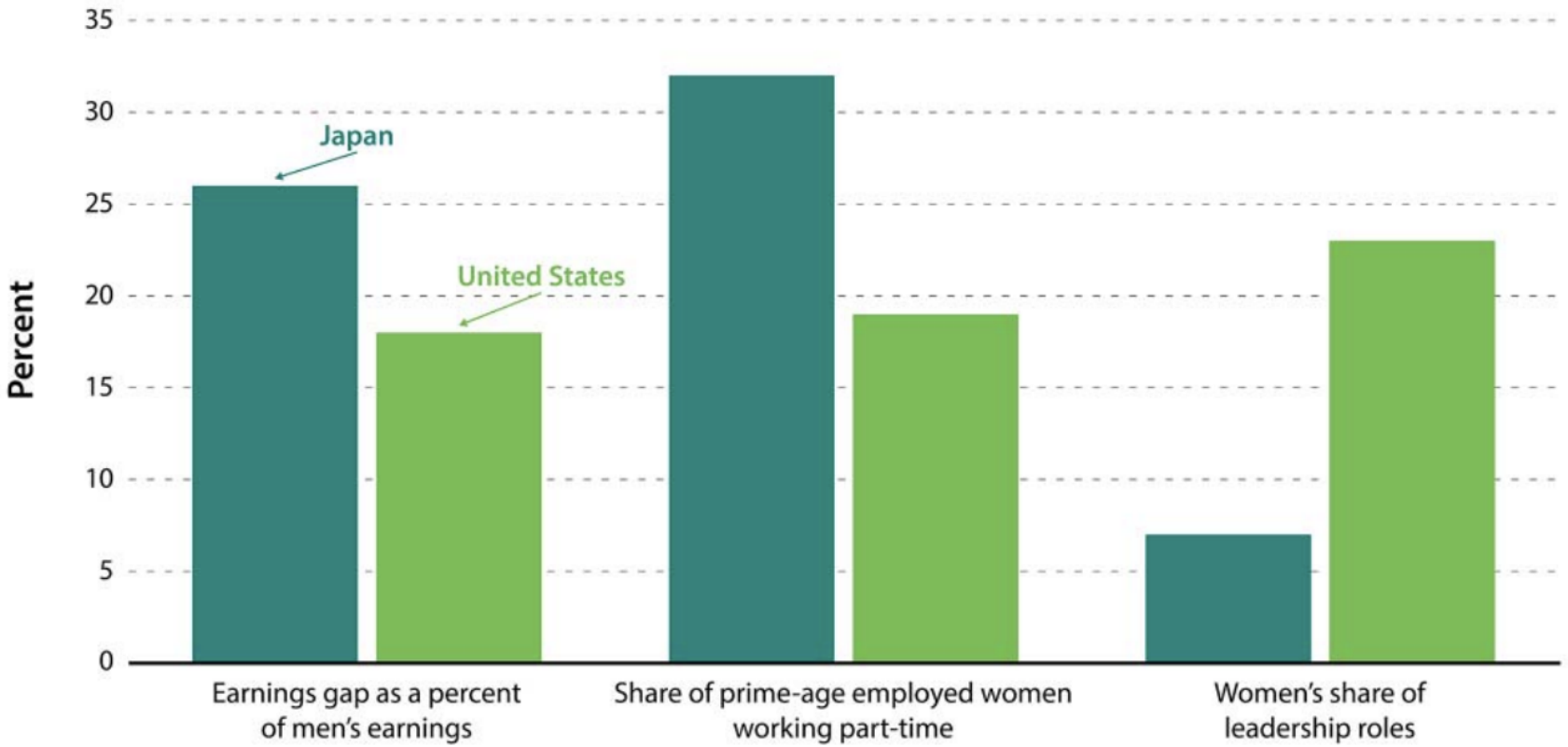
*(ii) There are also remaining gender gaps beyond the FLFP rates*

# Gender Gap in The ”Quality” of Labor Supply

(Shambaugh et al., 2017)

FIGURE 7.

Earnings Gap, Part-time Employment, and Female Share of Leadership Roles in Japan and the U.S.




Source: OECD Data; OECD Labour Force Statistics; Catalyst 2017.
Note: Women's share of leadership roles is for 2015.

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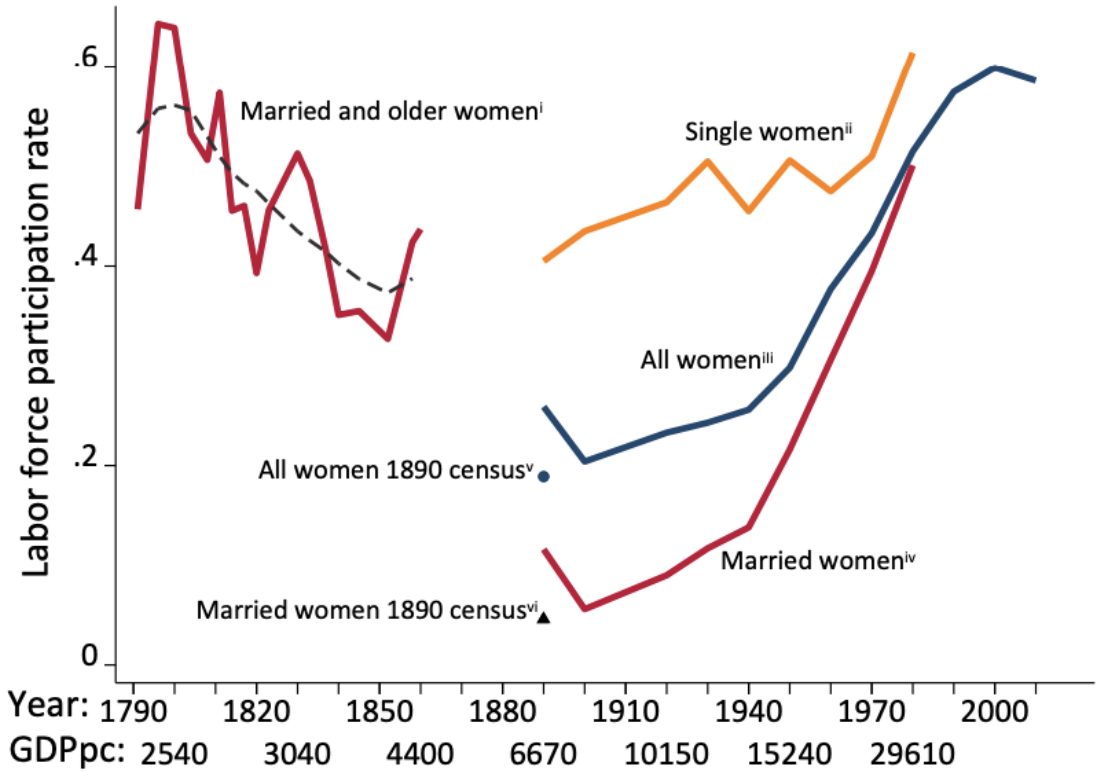
# Female Labor Supply (Extensive Margin)

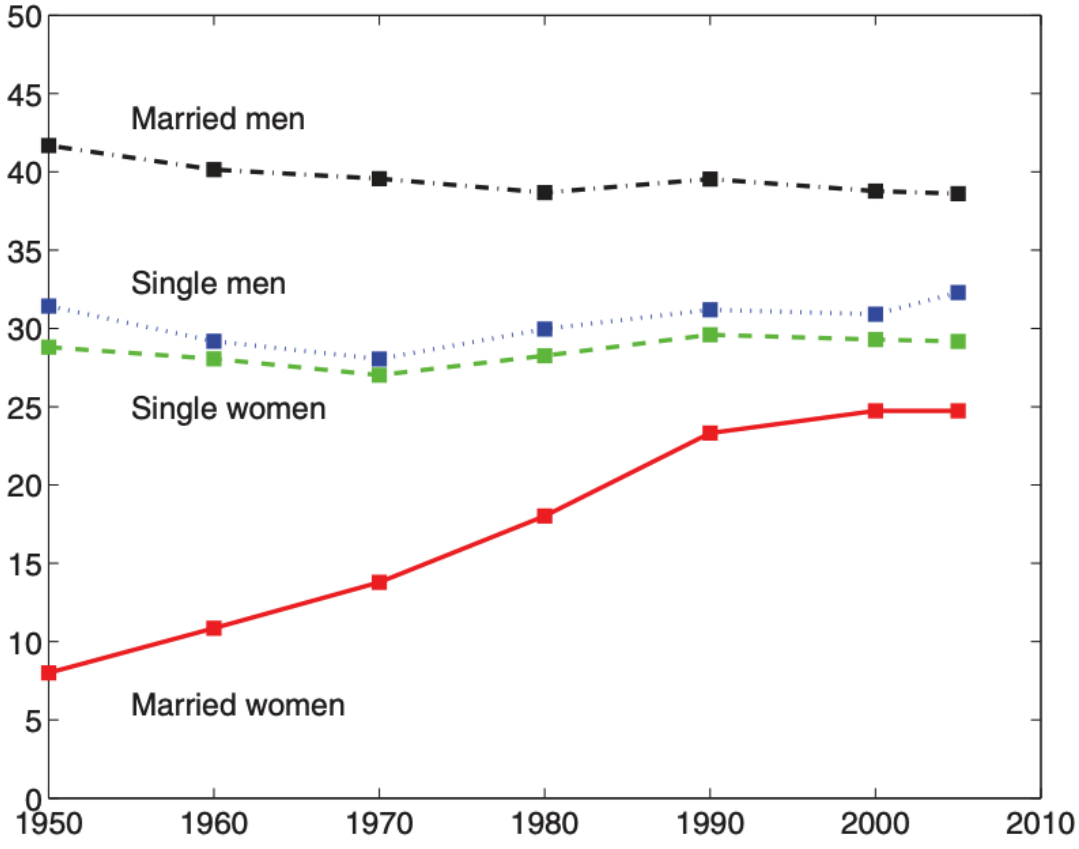
**Figure 1**: U-shaped female labor market participation over time and development




**Notes:** Figure 1 plots labor force participation rates for women by marital status. "Married and older women" is labor market participation rates for female heads of households in Philadelphia. "All women", "Married women", and "Single women" include women in the respective category (all, married, or single) who are 15 years and older up to 1960 and 16 years and older from 1970 and forward. Dashed line shows a smoothed scatterplot.

**Sources:** (i) Goldin (1986); (ii) Goldin (1990); (iii) Goldin (1990), Olivetti (2014), ILO (2023); (iv) Goldin (1990); (v) 1890 US census (from Goldin, 1990) (vi) 1890 US census (from Goldin, 1990).

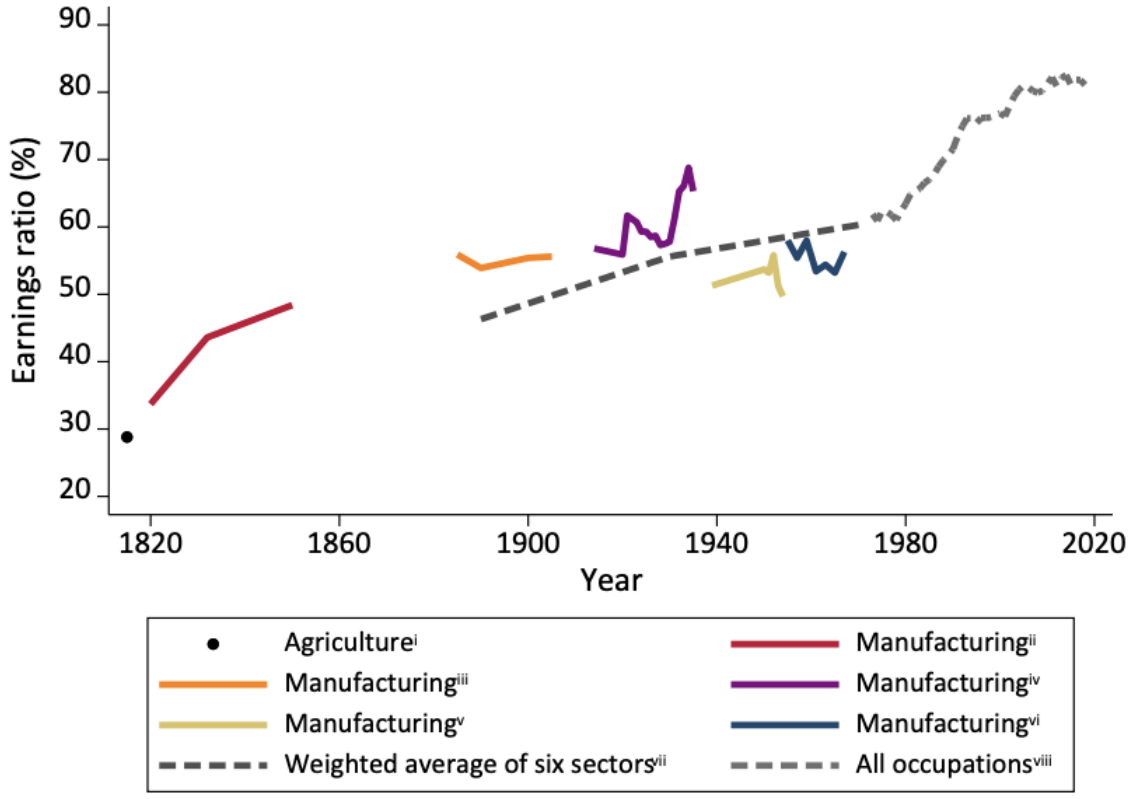
# Female Labor Supply (Intensive Margin) (Jones et al., 2015)




A. Market Hours of Work Per Week

# Gender Wage Gap

**Figure 3:** US gender earnings ratio (women relative to men) from 1820




**Note**: Reproduced from Goldin (1990) and extended up to 2020. Ratio of female-to-male earnings.

**Sources**: (i-vii) Goldin (1990); (viii) OECD (2023).

*(Can we reconcile these different trends using our neoclassical labor supply framework?)*

# Model Single Household

- Single females face the problem:

$$\max_{\{c_{♀s}, \ell_{♀s}, h_{♀s}\}} \ln\left(c_{♀s}\right) + \nu \ln\left(\ell_{♀s}\right)$$

  s.t. $c_{♀s} = w_{♀} h_{♀s}$, $h_{♀s} + \ell_{♀s} = 1$
  - Exactly the same problem as last week
  - $\nu \geq 1$ captures any culture or norm that suppress females working outside home
  - $w_{♀} = \tau w_{♂}$, where $\tau \leq 1$ is a gender wage gap which captures human capital differences, occupation choices, discrimination, ...

- Solution: $h^*_{♀s} = \frac{1}{1+\nu}$, $\ell^*_{♀s} = \frac{\nu}{1+\nu}$, $c^*_{♀s} = \frac{1}{1+\nu} w_{♀}$

- $\Rightarrow h^*_{♀s}$ (and $h^*_{♂s}$) is independent of $w_{♀}$ and $\tau$
  - No wage effect given our utility function

- $\Rightarrow$ Decreases in $\nu$ can generate increase in $h^*_{♀s}$

# Model Married Couples

- Married couples face a joint maximization problem:

$$\max_{\{c_{♀c}, \ell_{♀c}, h_{♀c}, c_{♂c}, \ell_{♂c}, h_{♂c}\}} \ln\left(c_{♀c}\right) + \nu \ln\left(\ell_{♀c}\right) + \ln\left(c_{♂c}\right) + \ln\left(\ell_{♂c}\right)$$

  s.t. $c_{♀c} + c_{♂c} = w_{♀} h_{♀c} + w_{♂} h_{♂c}$, $h_{♀c} + \ell_{♀c} = 1$, $h_{♂c} + \ell_{♂c} = 1$
  - The budget for consumption is pooled between the couple

- Lagrangian: $\mathcal{L} = \ln\left(c_{♀c}\right) + \nu \ln\left(\ell_{♀c}\right) + \ln\left(c_{♂c}\right) + \ln\left(\ell_{♂c}\right)$
  $-\lambda\left(c_{♀c} + c_{♂c} - w_{♀}\left(1 - \ell_{♀c}\right) + w_{♂}\left(1 - \ell_{♂c}\right)\right)$

- FOCs: $c_{♀c} = c_{♂c} = \frac{1}{\lambda}$, $\frac{\nu}{\ell_{♀c}} = \lambda w_{♀}$, $\frac{1}{\ell_{♂c}} = \lambda w_{♂}$

- Solutions:

$$c^*_{♀c} = c^*_{♂c} = \frac{w_{♀} + w_{♂}}{\nu + 3}$$

$$\ell^*_{♀c} = \frac{\nu\left(w_{♀} + w_{♂}\right)}{(\nu + 3) w_{♀}}, \quad \ell^*_{♂c} = \frac{w_{♀} + w_{♂}}{(\nu + 3) w_{♂}}$$

# Model Married Couples

- Denote $w_c \equiv w_{\female} + w_{\male} = w_{\male} + \tau w_{\male} = (1+\tau) w_{\male}$
- Solutions: $h^*_{\female c} = 1 - \frac{\nu(1+\tau)}{(\nu+3)\tau}, \quad h^*_{\male c} = 1 - \frac{(1+\tau)}{(\nu+3)}$
- $\Rightarrow$ Married women work less than their husband (and when they are single) if $\tau < 1$
- $\Rightarrow$ Similar to single household case, changes in $w_{\male}$ (and proportionally in $w_{\female}$) do not change labor supply decisions
- $\Rightarrow$ However, now reduces in gender wage gap, $\tau$, increase married women's working hours (and decrease that for married men)
- Intuition: the substitution effect now dominates because the income effect is shared by husband
- Useful in thinking about policy implications: e.g. reducing 1.03 million yen wall or raising high-income tax

# Explanations for Increased FLFP in the Literature

- More productive opportunities for women (Galor and Weil, 1996) and reduced gender wage gap (Goldin, 1990; Jones et al., 2015)
- Home production through durable appliances (Greenwood et al., 2005) or marketization (Ngai et al., 2022)
- Introduction of the contraceptive pill and fertility changes (Goldin and Katz, 2002; Bailey, 2006)
- Medical advances of childbirth (Albanesi and Olivetti, 2016)
- Reductions in the cost of childcare (Attanasio et al., 2008)
- A change in women's bargaining power (Knowles, 2013)
- Cultural change, preference change, and learning (Fernández et al., 2004; Fogli and Veldkamp, 2011; Fernández, 2013)

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# ”M-shaped” Pattern of FLFP in Japan

(Shambaugh et al., 2017)

FIGURE 2A.

Japanese Women’s Labor Force Participation, by Birth Cohort and Age Group

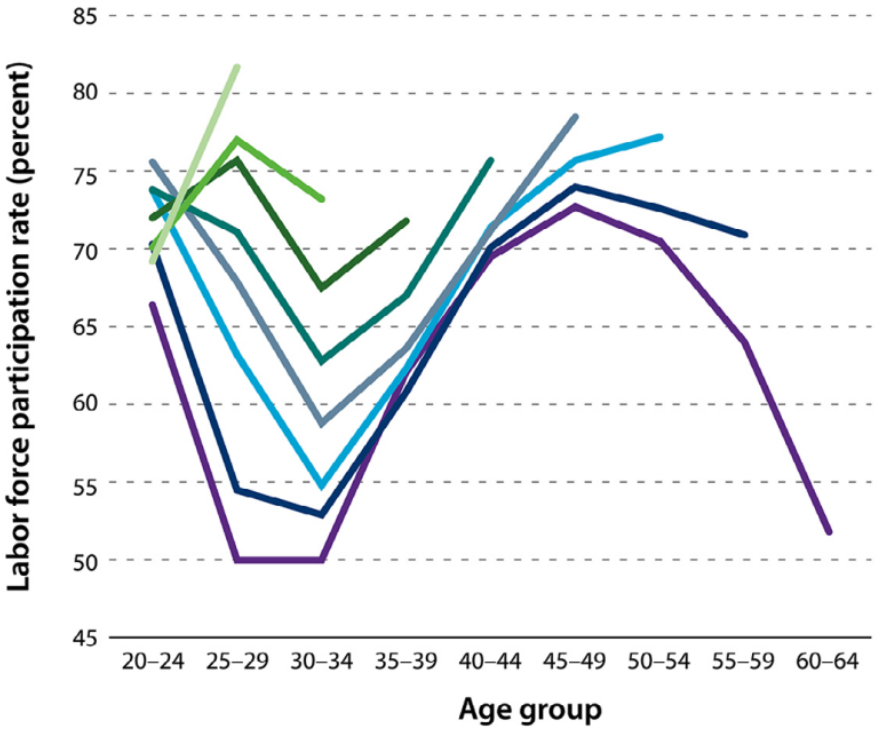
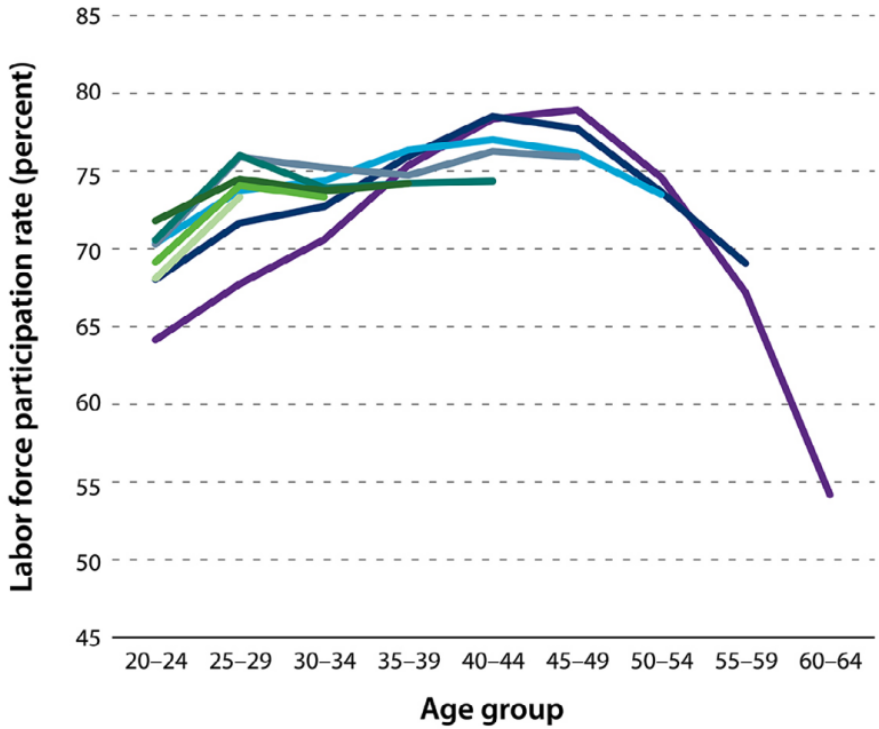



FIGURE 2B.

American Women’s Labor Force Participation, by Birth Cohort and Age Group




Source: Authors’ calculations; Japanese Labour Force Survey 1971–2016; Current Population Survey Annual Social and Economic Supplement, Bureau of Labor Statistics.

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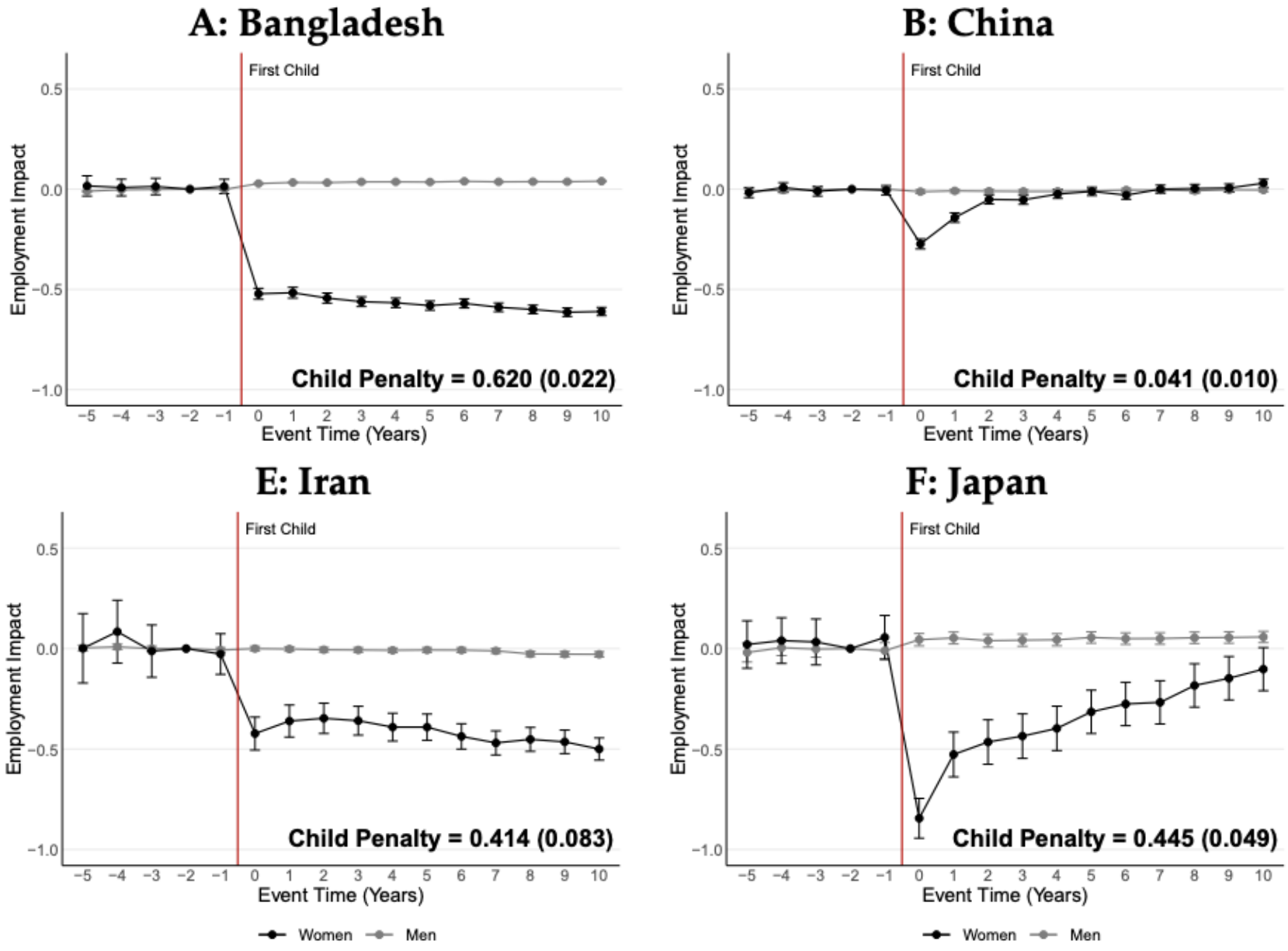
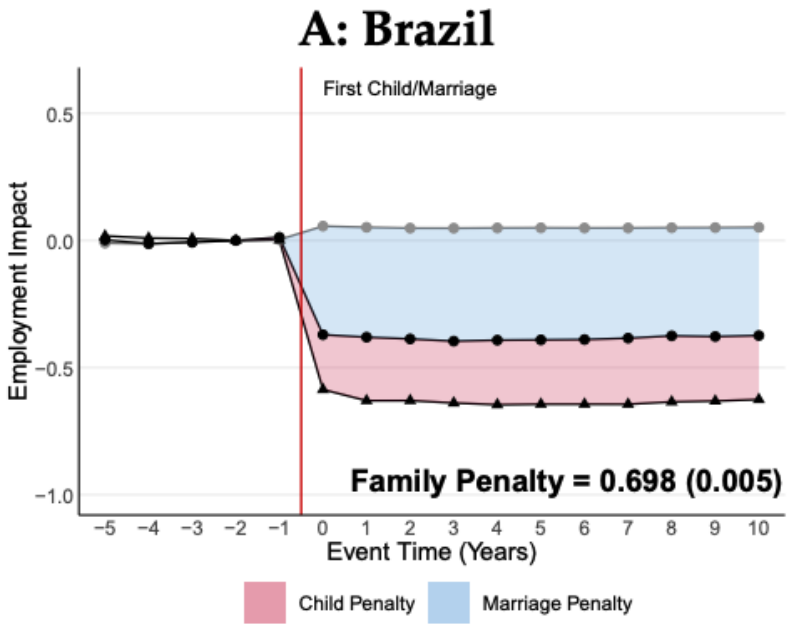
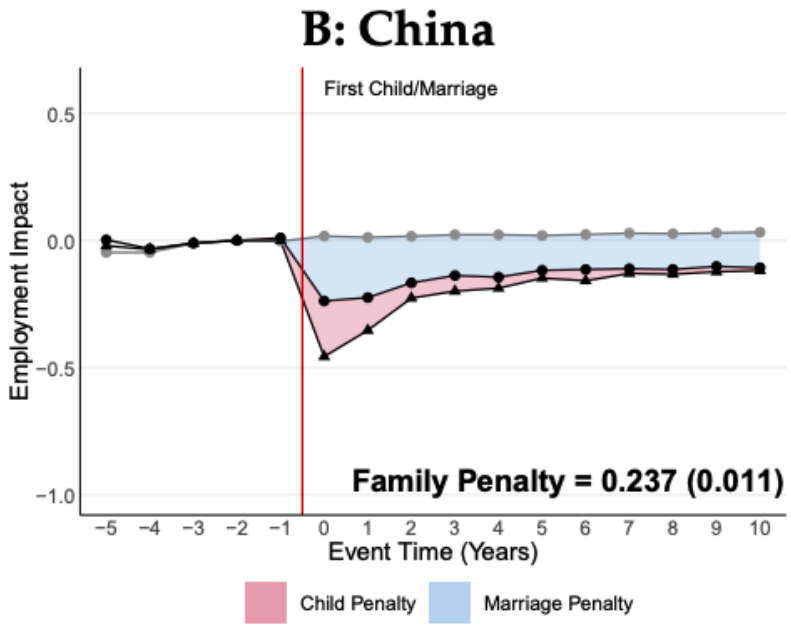
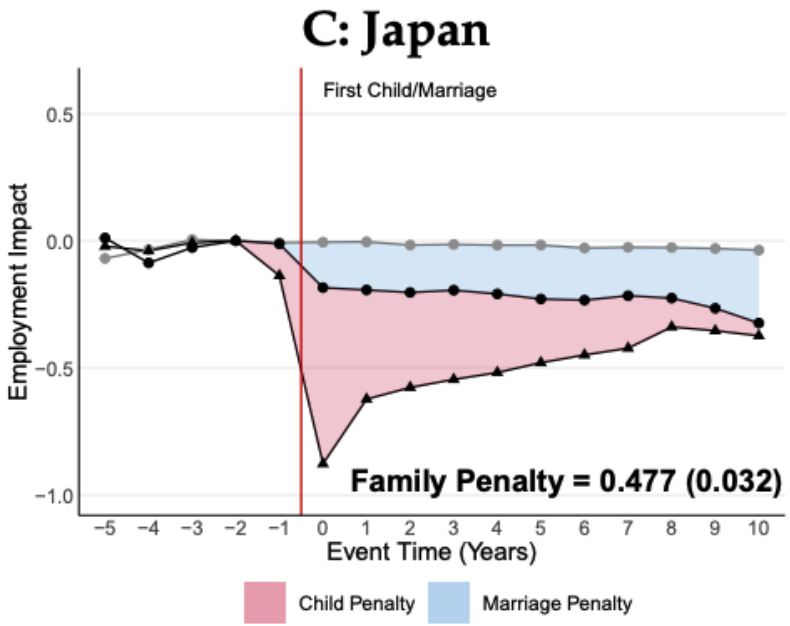
# Child Penalty (Kleven et al. (2024); see more countries)

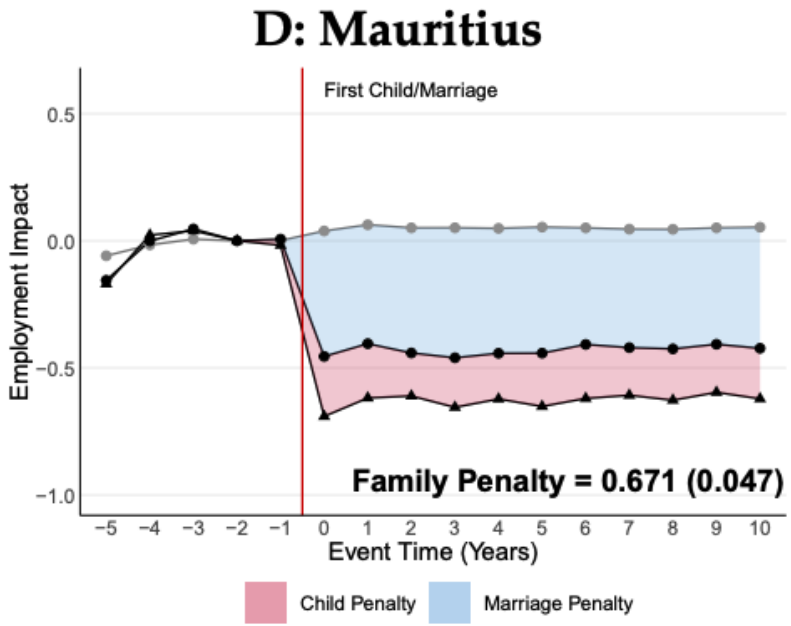


# Family (Marriage + Child) Penalty (Kleven et al. (2024); link)



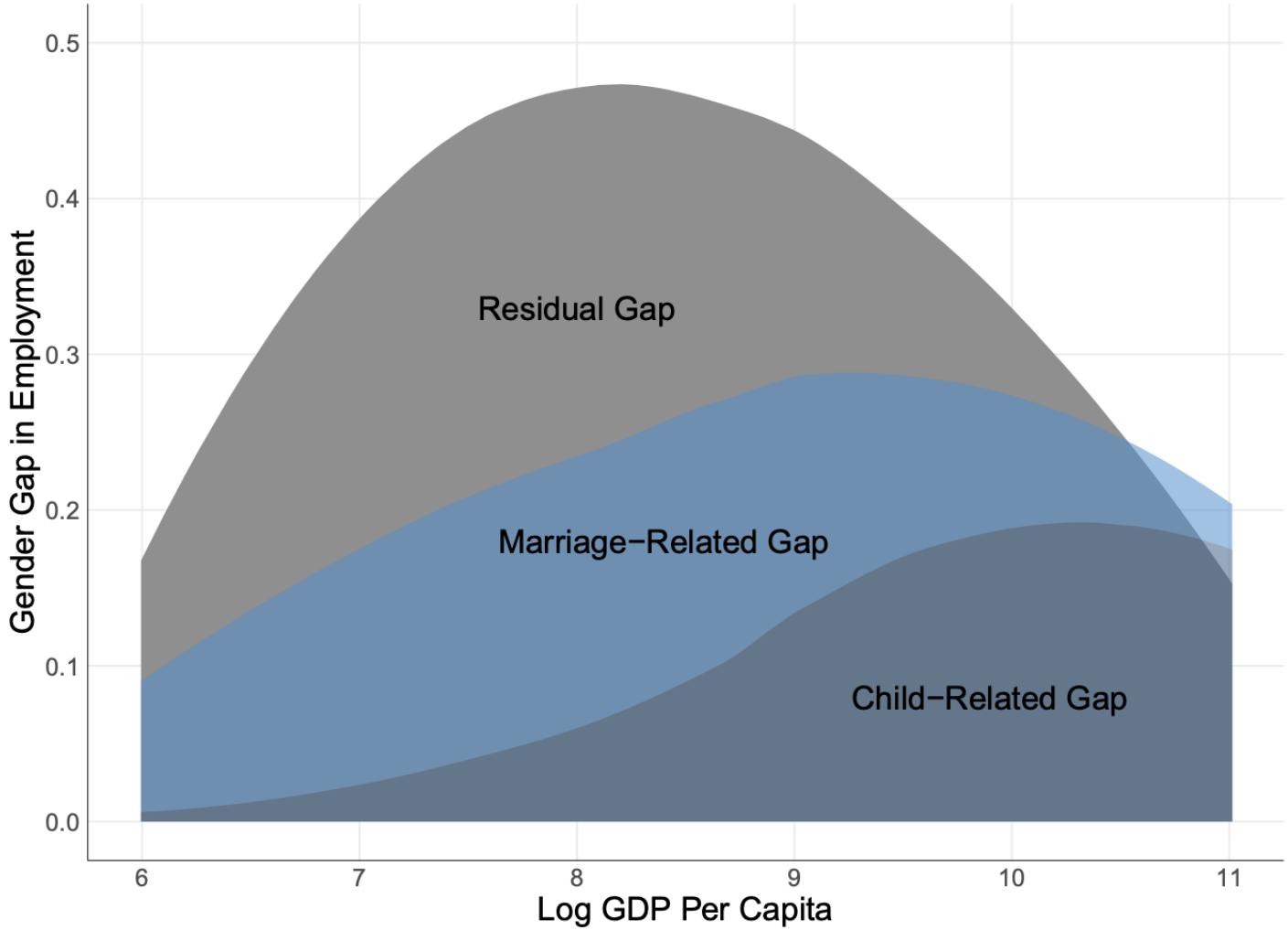



# Family Penalty Explain A LOT! (Kleven et al., 2024) (see map)

FIGURE 15: DECOMPOSITION OF GENDER GAP BY LEVELS OF DEVELOPMENT




Notes: This figure decomposes the gender gap in employment at each level of GDP per capita into a child-related gender gap (dark blue), a marriage-related gender gap (light blue), and a residual gender gap (gray). The gaps are shown in absolute terms, i.e. the percentage point difference in the employment rates of men and women. The estimates of child and marriage penalties used for the decomposition are obtained from specification (6). The decomposition is implemented using local linear regressions (LOESS) to smooth the GDP profile of each gender gap — the total gap, the child-related gap, and the marriage-related gap — and calculating the residual gap as the difference between the smoothed total gap and the sum of the smoothed child- and marriage-related gaps. The GDP data come from the World Bank's World Development Indicators for the year 2019.

# Put Child Into Our Model

- A couple with $n$ children face the problem:

$$\max_{h_{♂}, h_{♀}} \left[ w_{♂} h_{♂} + w_{♀} h_{♀} + F\left(1 - h_{♂}, 1 - h_{♀}\right) n \right]$$

, where $F\left(1 - h_{♂}, 1 - h_{♀}\right) = \ln\left[\alpha_{♂}\left(1 - h_{♂}\right) + \alpha_{♀}\left(1 - h_{♀}\right)\right]$

  - $F$ is a child-care production function with non-work time as inputs
    (We can further add market goods as inputs of $F$, which are bought using income)
  - $\alpha_{♂}, \alpha_{♀}$ indicate the efficiency of doing child-care
  - Here, two inputs of $F$ are "perfect substitutes" (more next week)
  - Note that we abstract from leisure choices to simplify the problem

- Many corner solutions depend on the parameters
  - This is trivial if there is no children ($n = 0$)
  - This is also easy to see for $n > 0$ if one writes down the FOCs

- Tradeoff when $n \geq 1$: more earning vs. more child care
  - For brevity, let's assume $n = 1$ hereafter

# Put Child Into Our Model: Wage

- First consider the case $\alpha_{♂} = \alpha_{♀} = \alpha$ (same efficiency)
- Marginal utility gain from child-care: $\frac{1}{2-h_{♂}-h_{♀}}$
- Marginal utility gain from work: $w_{♂}$ and $w_{♀}$
- If $w_{♂} > 1 > w_{♀}$: $h_{♂} = 1, h_{♀} = 0$
- If $w_{♂} > w_{♀} > 1$: $h_{♂} = 1, h_{♀} = 1 - 1/w_{♀}$
- If $1 > w_{♂} > w_{♀} > 0.5$: $h_{♂} = 2 - 1/w_{♂}, h_{♀} = 0$
- ...
- Symmetric results when we have all $w_{♀} > w_{♂}$ cases

# Put Child Into Our Model: Efficiency

- Now consider the case $\alpha_{♀} = 2 > \alpha_{♂} = 1$ (mather more efficient)
- If $w_{♀} = w_{♂} = 1$: $h_{♂} = 1, h_{♀} = 0$
- If $w_{♀} = 1.5 > w_{♂} = 1$: $h_{♂} = 1, h_{♀} = 1/3$
- ...
- You can try different parameters and see the results by running this code
- Female's "comparative advantage" in home production and child-rearing can thus undermine their labor market performance
- Alternatively, assuming that female has more responsibility on home production and child-rearing will play a similar role

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# Gender and Education and Major

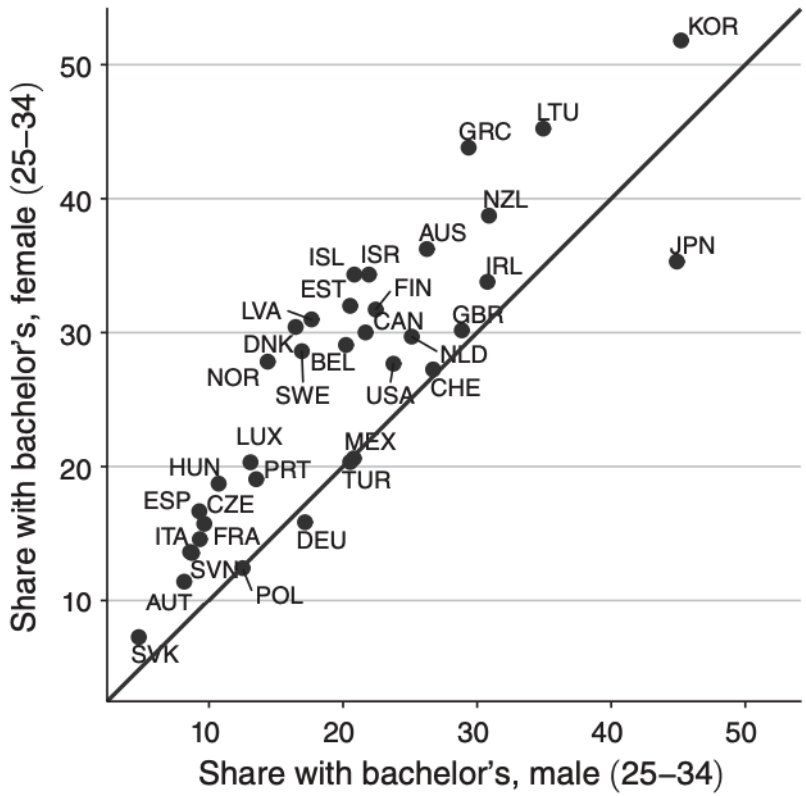



FIGURE 2. SHARES OF MEN AND WOMEN WITH AT LEAST A BACHELOR'S DEGREE

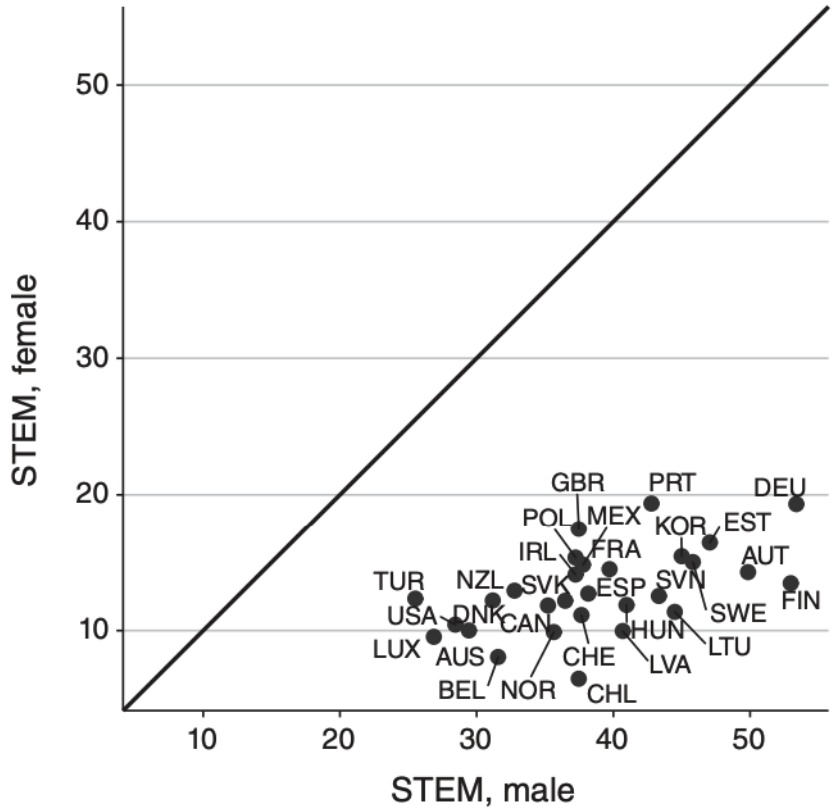
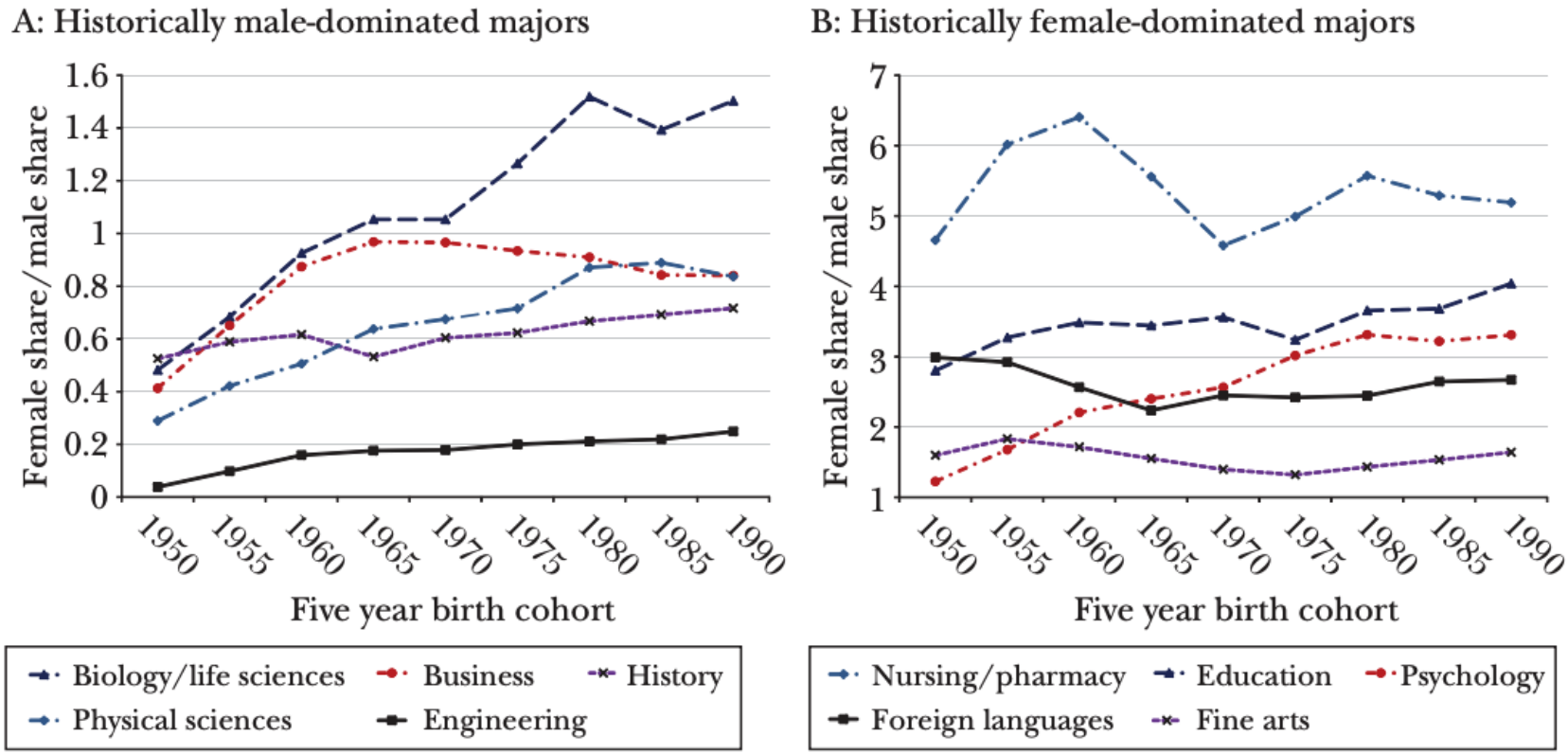



FIGURE 3. GENDER DIFFERENCES IN STEM EDUCATION (TERTIARY DEGREES)

# Gender and Major - Cohort Trend

*Figure 1*

**Gender Differences in Selected Majors by Birth Cohort**

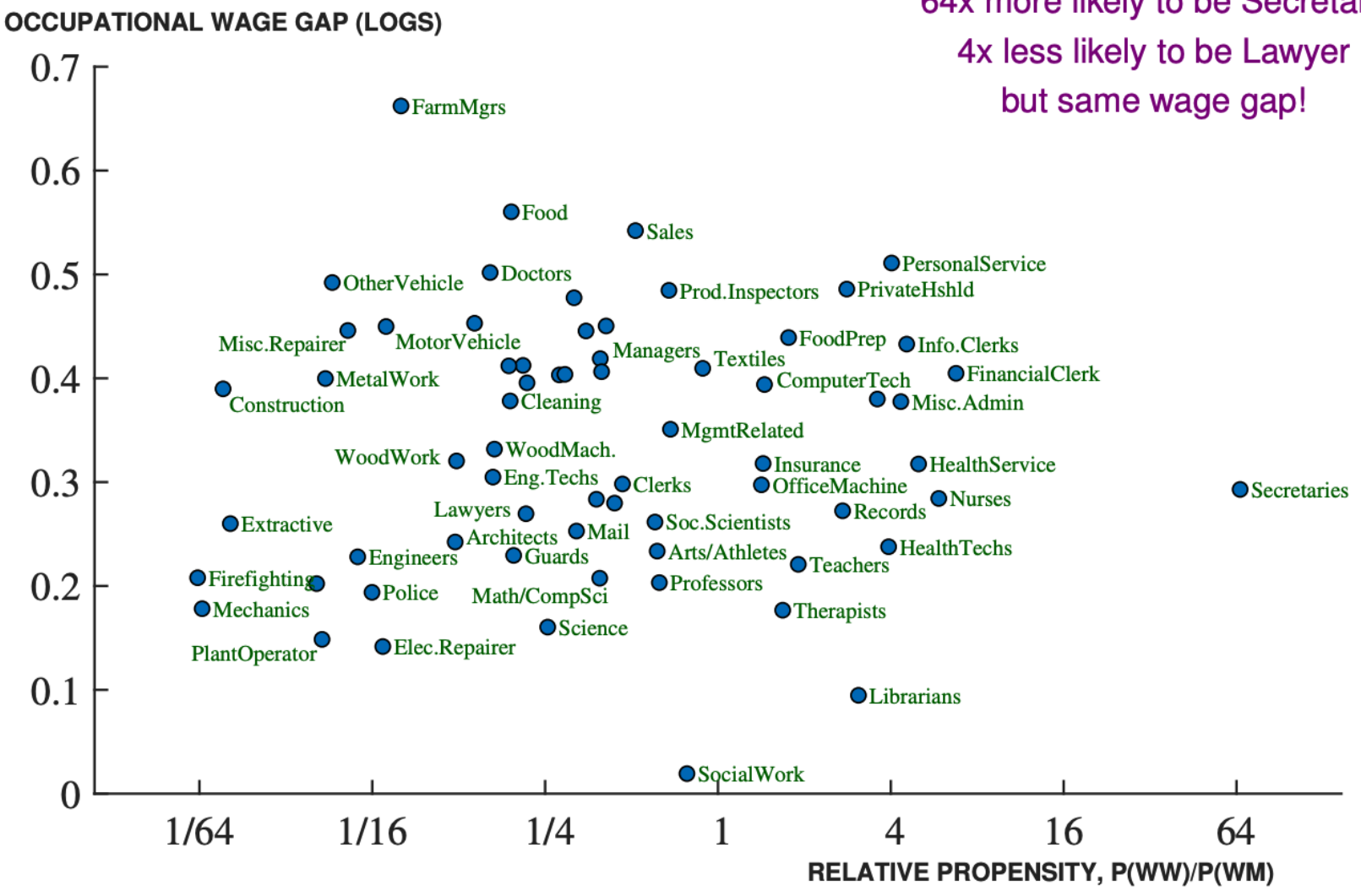



*Source:* Data from the 2014–2017 ACS and are restricted to those with at least a bachelor's degree. See text and the online Appendix for additional details.

*Note:* These figures plot the ratio of females to males within major category. The left panel shows trends for a set of majors where men outnumber women. The right panel shows trends for a set of majors where women outnumber men.

# Gender and Occupation

## Wage Gaps and Relative Propensities (Women in 1980)

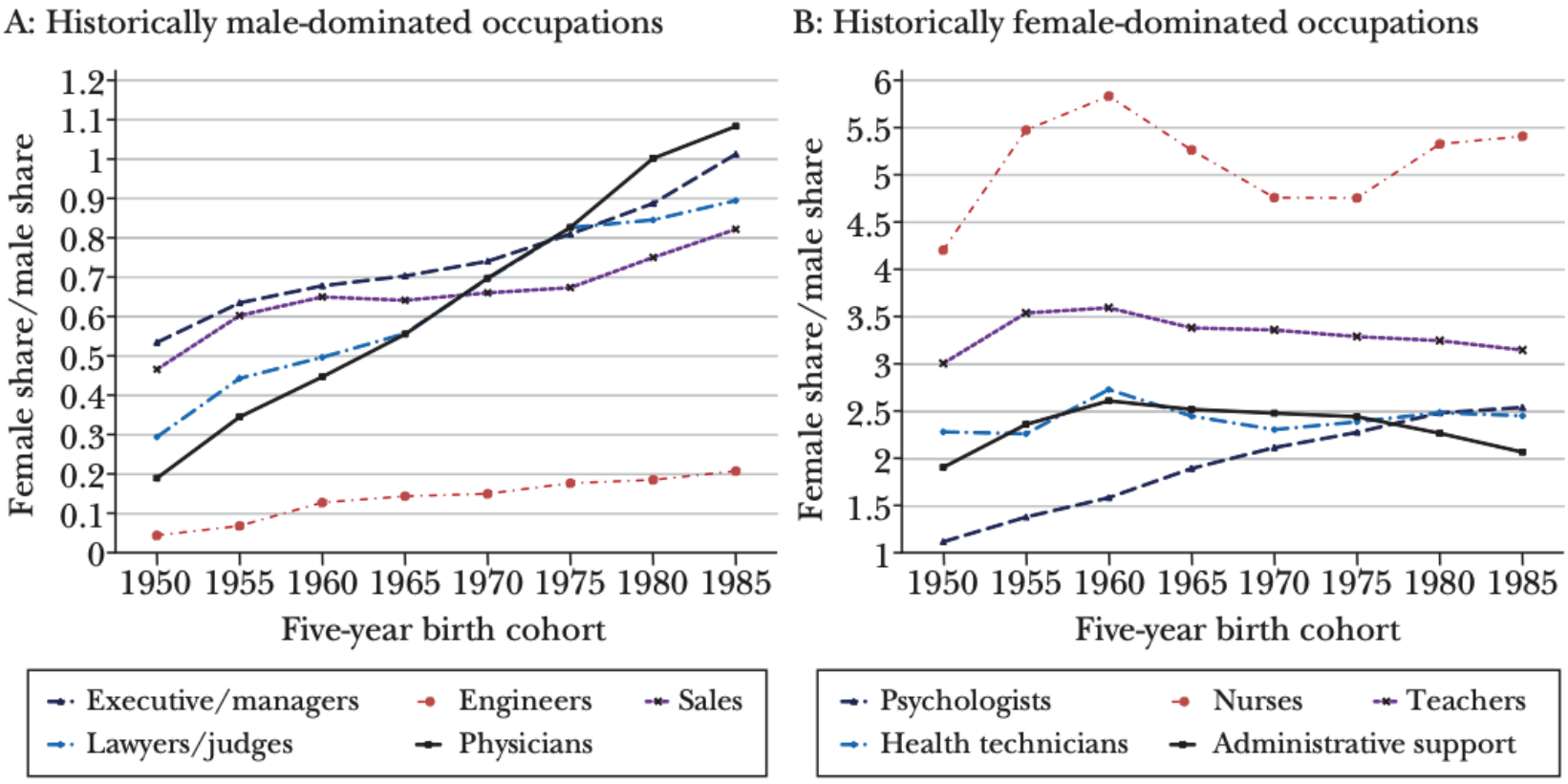



64x more likely to be Secretary
4x less likely to be Lawyer
but same wage gap!

# Gender and Occupation - Cohort Trend

*Figure 3*

**Gender Differences in Selected Occupations by Birth Cohort**




*Source:* Data from the 2014–2017 ACS and are restricted to those with at least a bachelor's degree with non-missing occupation information. See text for additional details.

*Note:* These figures plot the ratio of females to males within broad occupation category. The left panel shows trends for a set of occupations where men outnumber women. The right panel shows trends for a set of occupations where women outnumber men.

# Gender and Within-Occupation Wage Gap

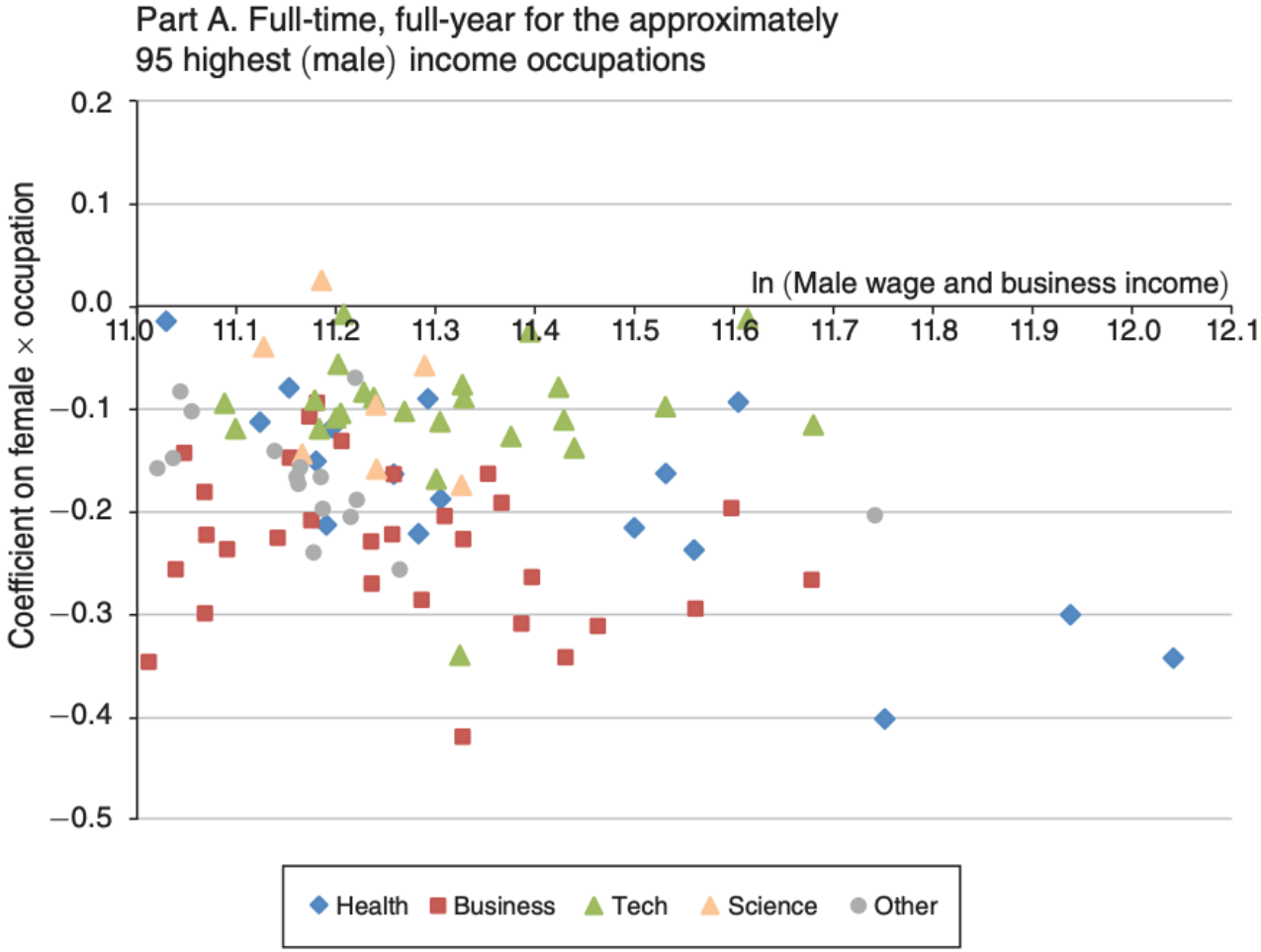
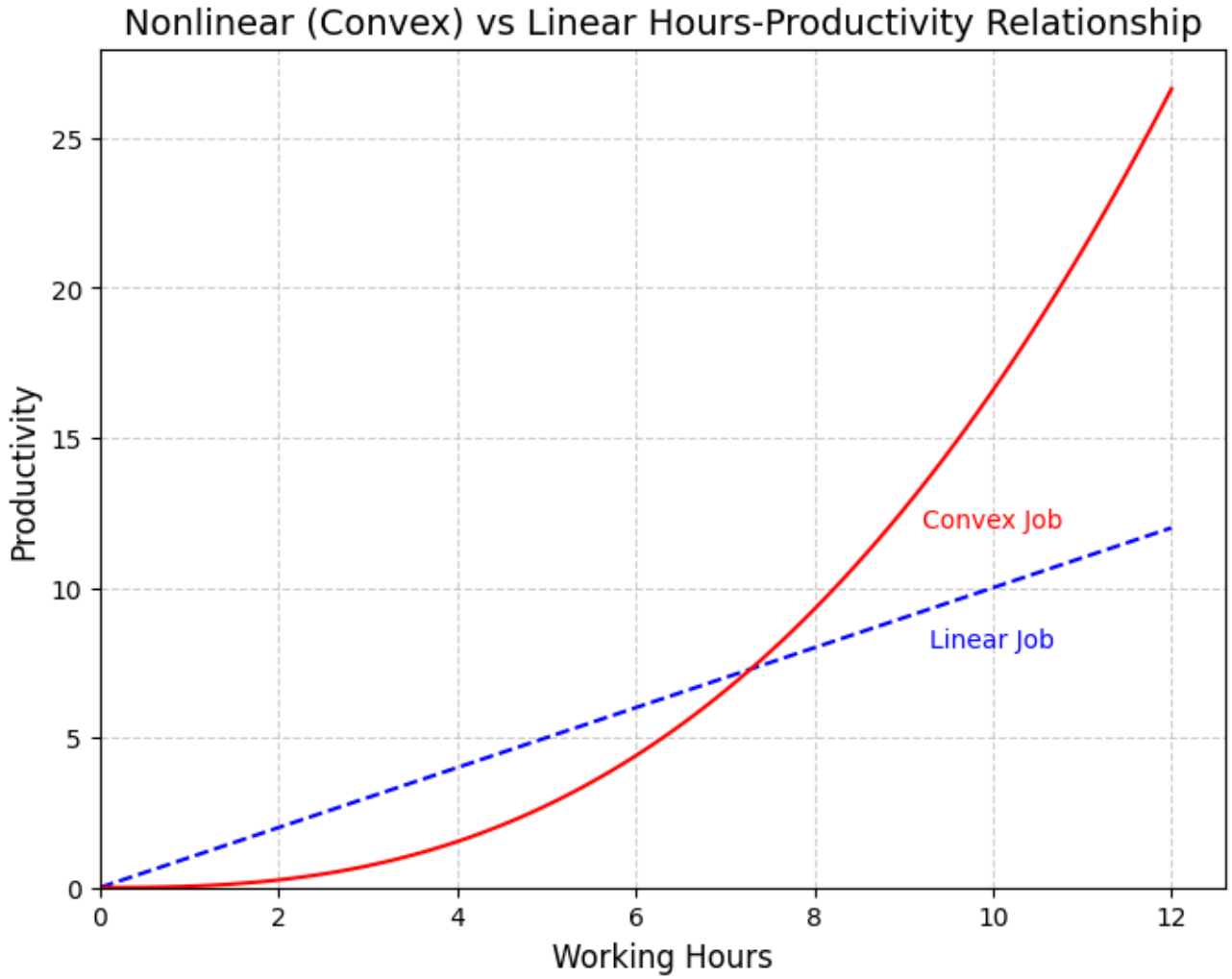



FIGURE 2A. GENDER PAY GAPS BY OCCUPATION: 2009 TO 2011

*Notes:* Sample consists of full-time, full-year individuals 25 to 64 years old excluding those in the military using trimmed annual earnings data (exceeding 1,400 hours × 0.5 × 2009 minimum wage). Regression contains age in a quartic, race, log hours, log weeks, education levels, census year, all occupations (469), and an interaction with female and occupation. Part A contains all full-time, full-year workers (2,603,968 observations); part B has those who graduated (BA) college (964,705 observations); part C has the group < 45 years old among those included in part A (1,333,013 observations). Each of the symbols in part A is an occupation

# Goldin (2014): Nonlinear (Convex) Hours-Wage Relationship

*Some occupations exhibit linearity with respect to time worked (customer service representatives,pharmacists) whereas others exhibit nonlinearity (layers, C-suite, physicians)*




*Women, with higher preference in reduced hours or more flexible employment, thus will choose linear jobs rather than convex jobs, sacrificing highest returns*

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