# The Ms. Allocation of Talent

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# Despite important advances in participation, women continue to be underrepresented in innovation and STEM

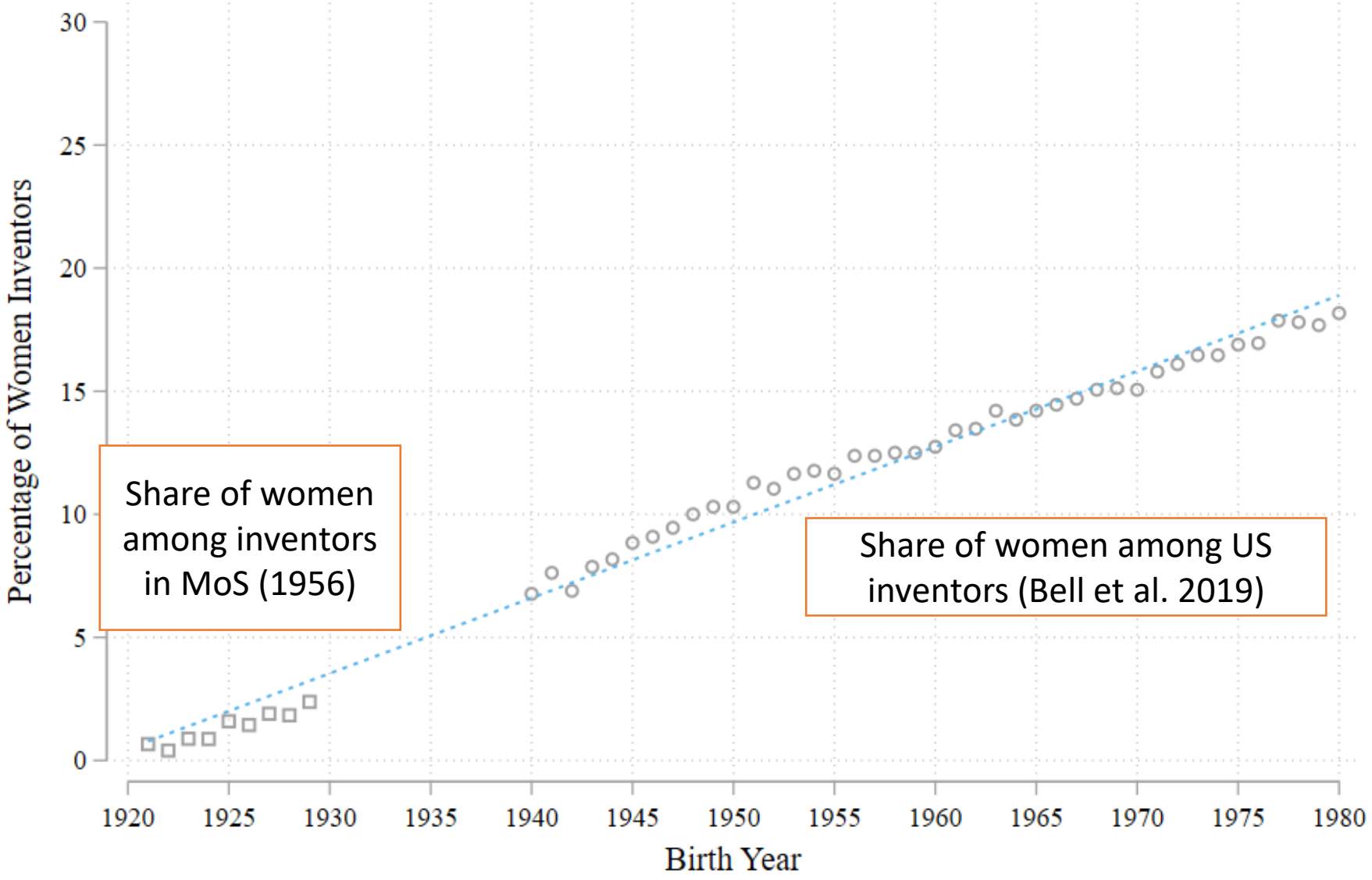
- 40% of productivity growth 1960-2010 due to improvements in allocation of talent as talented women and Black men enter high skilled professions (Hsieh et al. 2019)
- In 2018, just 32% of US PhDs in physical sciences were women (She Figures 2021)
- For every US patent filed with at least one female inventor between 1985 and 2019, nine patents were filed by all-male teams (OECD 2023)
- Fewer than 20% of inventors born in 1980 are female (Bell et al. 2019)

# Extrapolating from inventors born 1940-80 birth cohorts, it will take 118 years to close the innovation gender gap

# Can improving the allocation of scientific talent close the innovation gender gap?

- Match 70,039 scientists from *American Men of Science* (MoS 1956) with patents
  - 3.6% of female scientists patent, compared with 23.2% of male scientists
  - OLS shows that research fields are best predictor of gender gap in patenting
- Roy model of field choice with gender distortions
- Use male enlistment as instrument for female entry
  - For each additional 10% of men enlisted in a field, female entry increases by 41%
  - For every 5 additional women entering STEM 1 additional woman becomes an inventor
- Counterfactuals
  - Use IV estimates to predict the effects of shifting women into STEM fields
  - If women entered STEM at the same rate as men, US birth cohorts 1940-1980 would have had 61% more female inventors
  - Parity in 47 (rather than 118) years

# Changes in the share of women are on a similar trend for inventor-scientists in the MoS and inventors today



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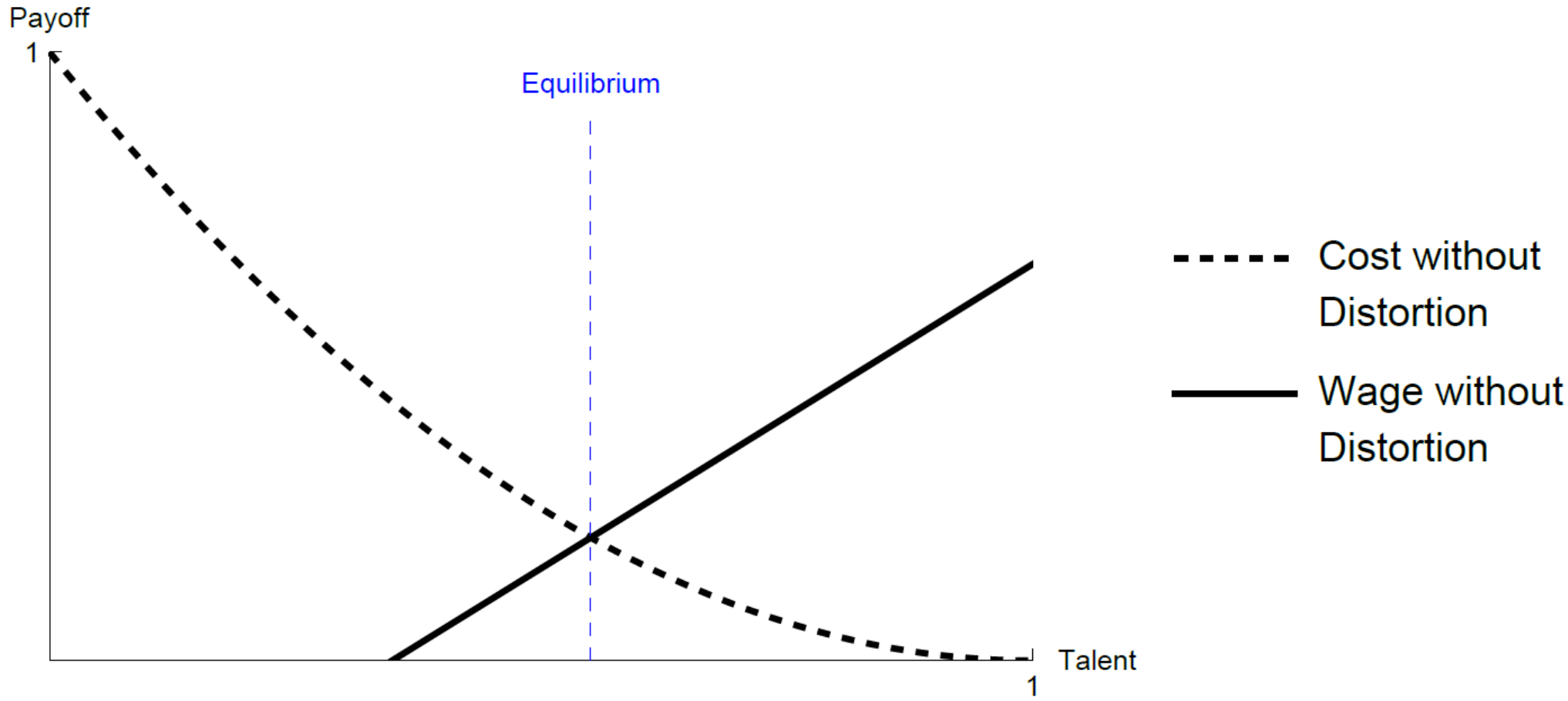
If women face higher cost to enter patenting fields (P) than fields without patenting (S), they will be underrepresented but positively selected



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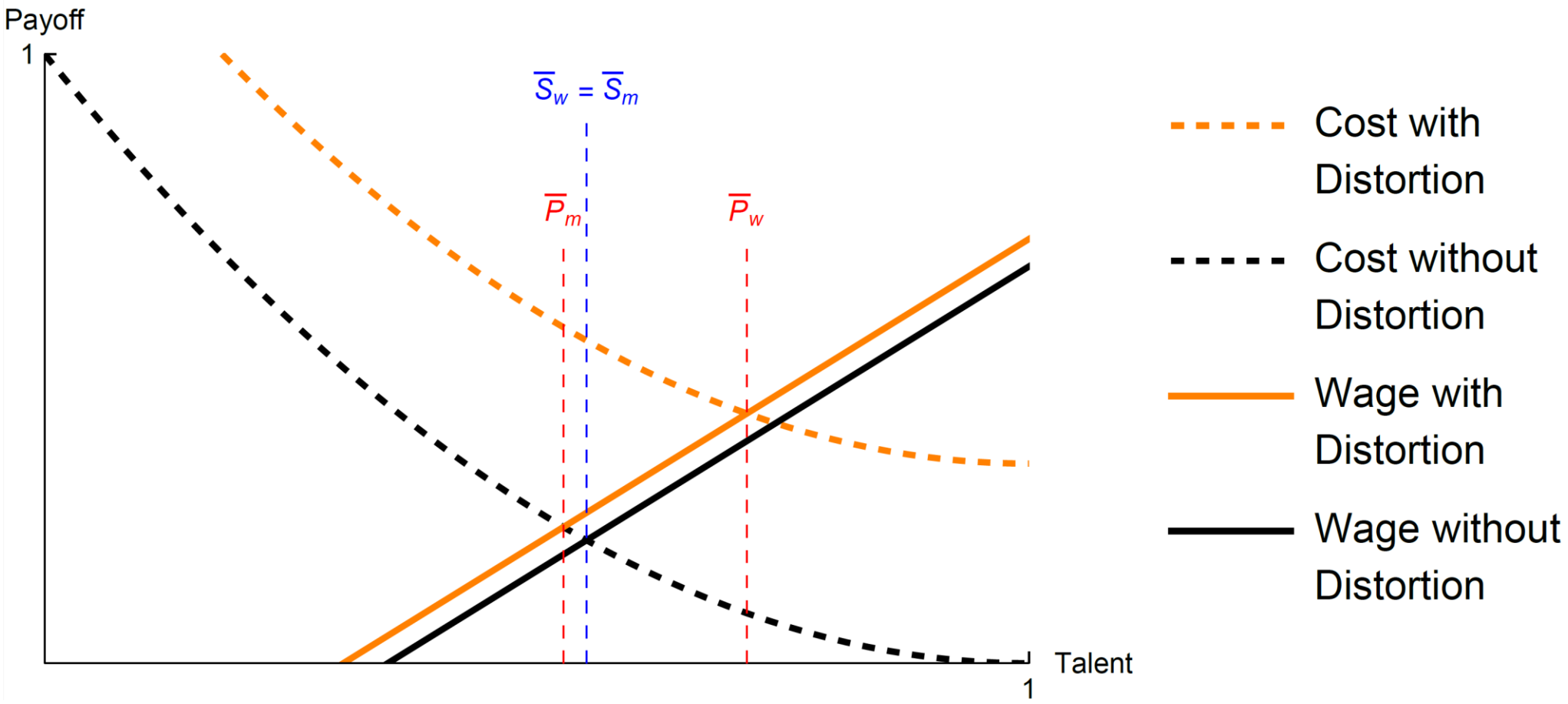

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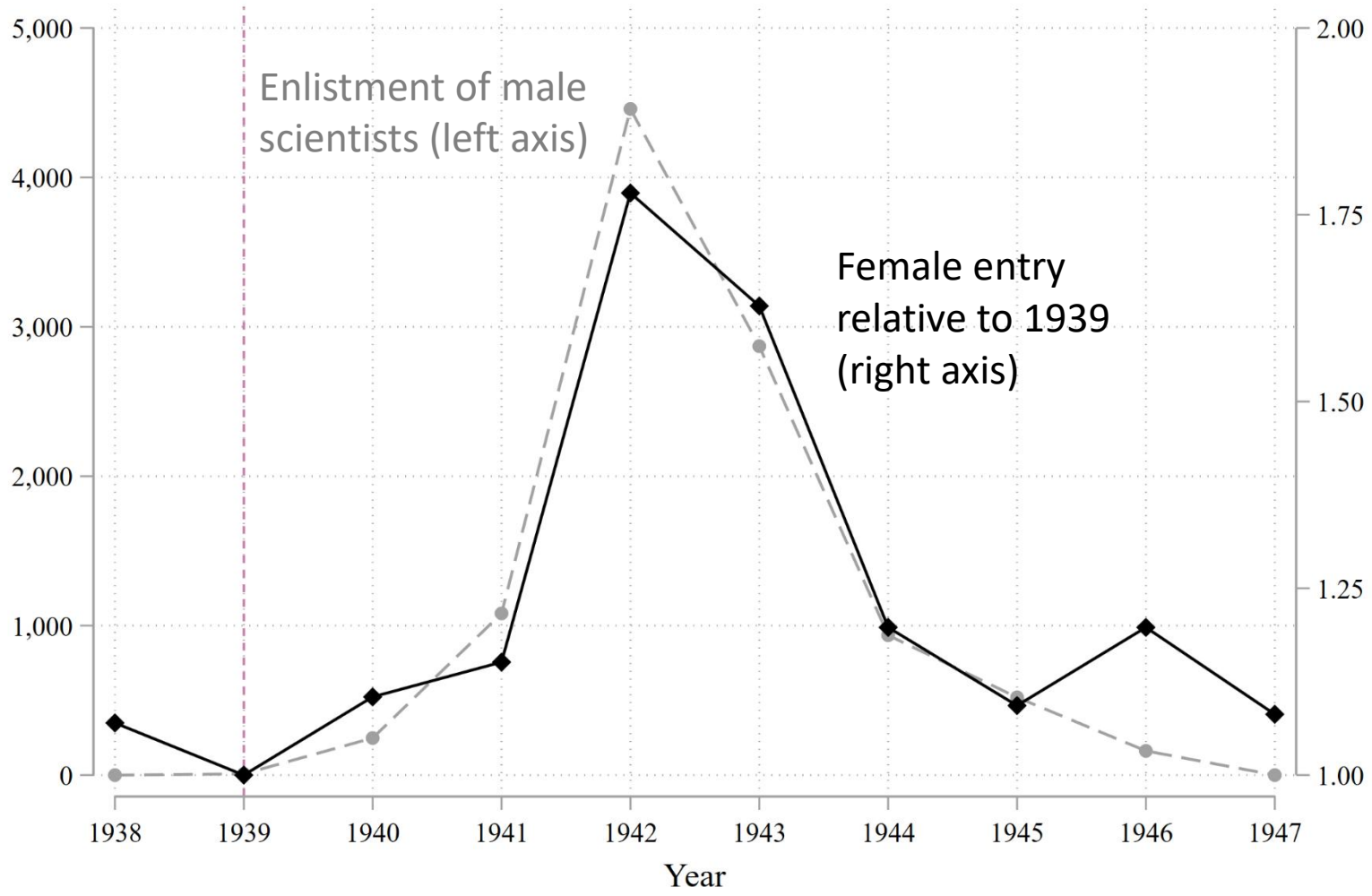
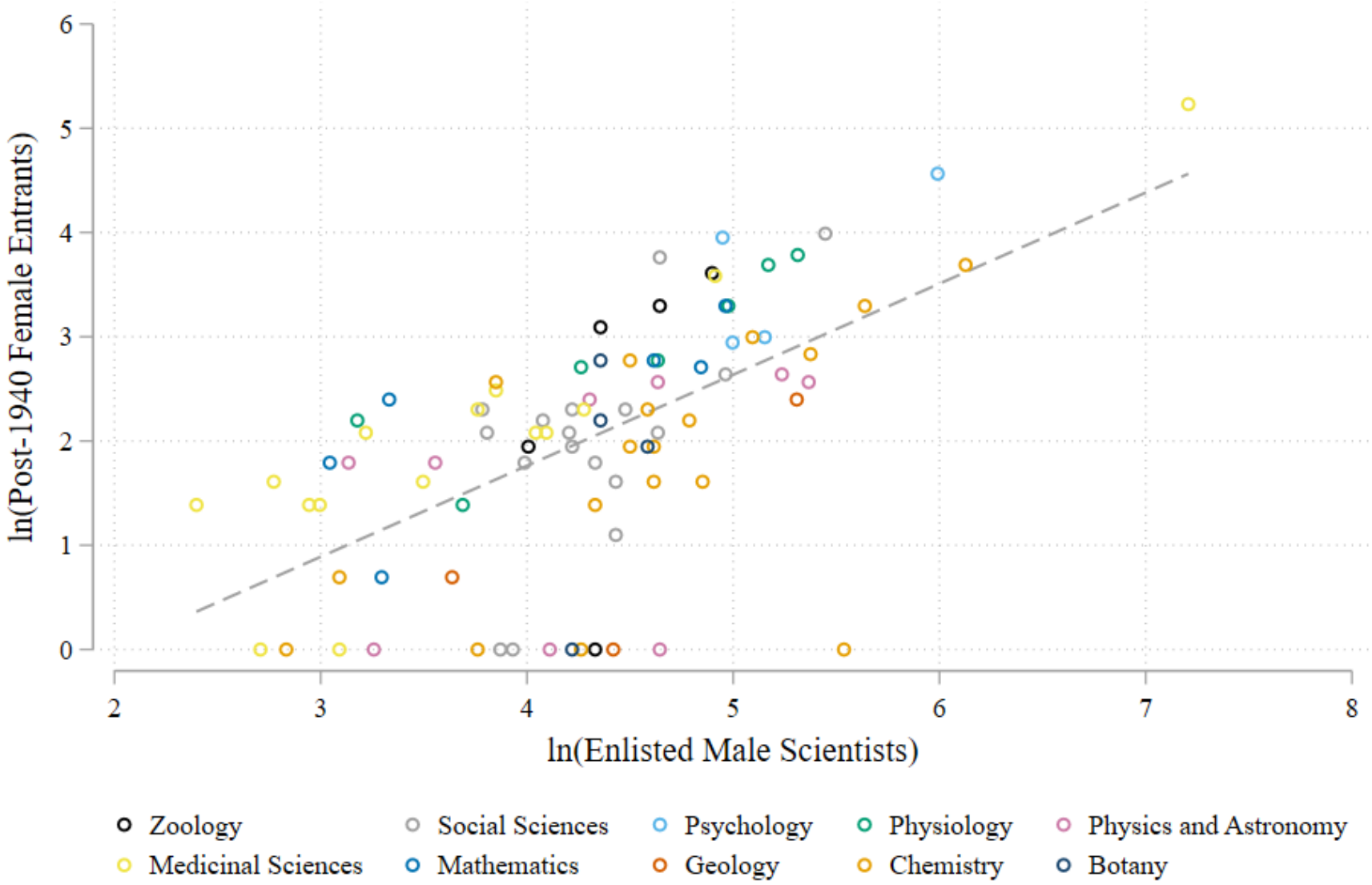
# 10,285 male scientists enlisted in WWII

# As men enlist in WWII, women enter science



# More women entered fields with more enlisted men

(100 fields defined by *k*-means)



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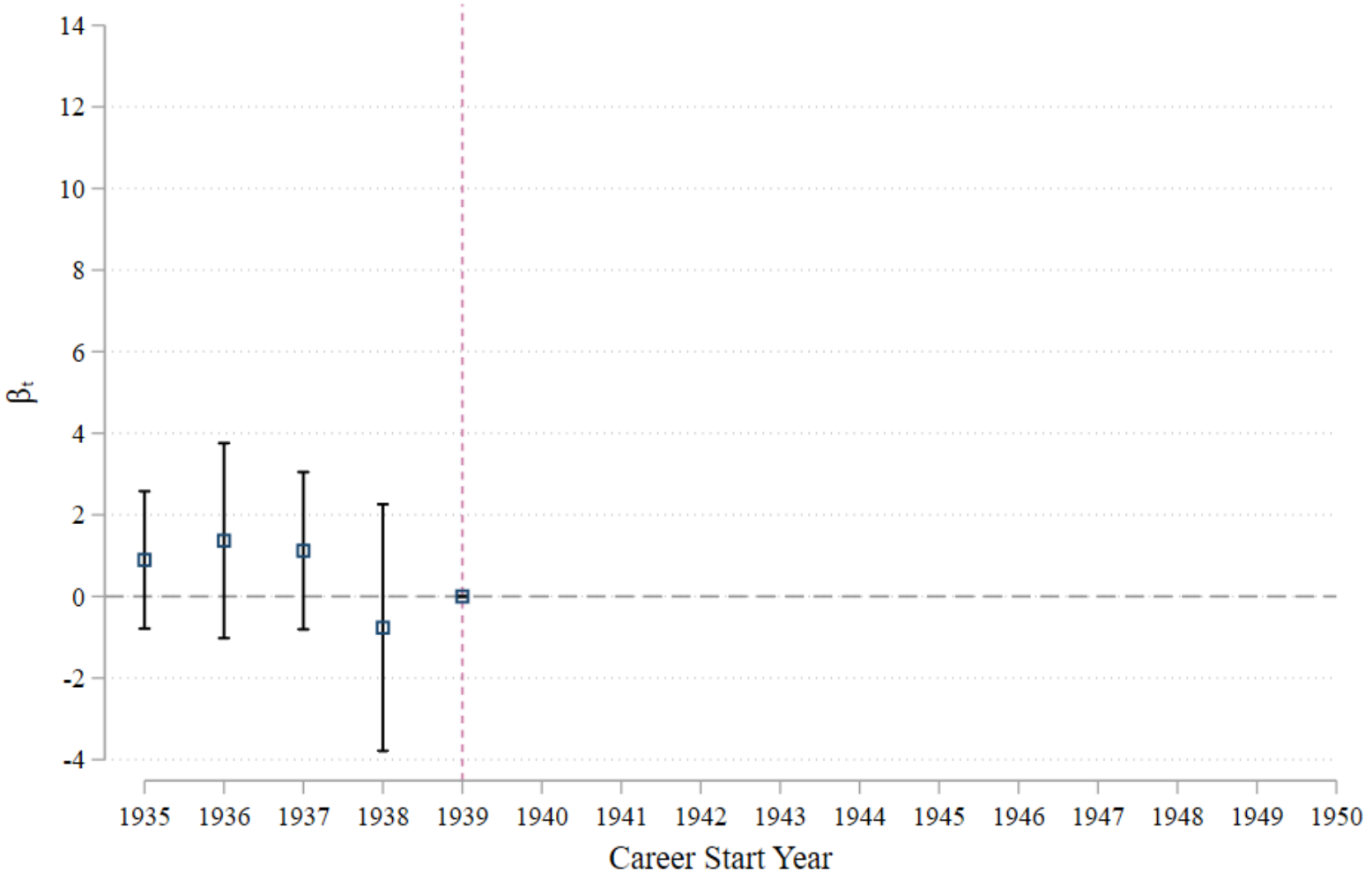
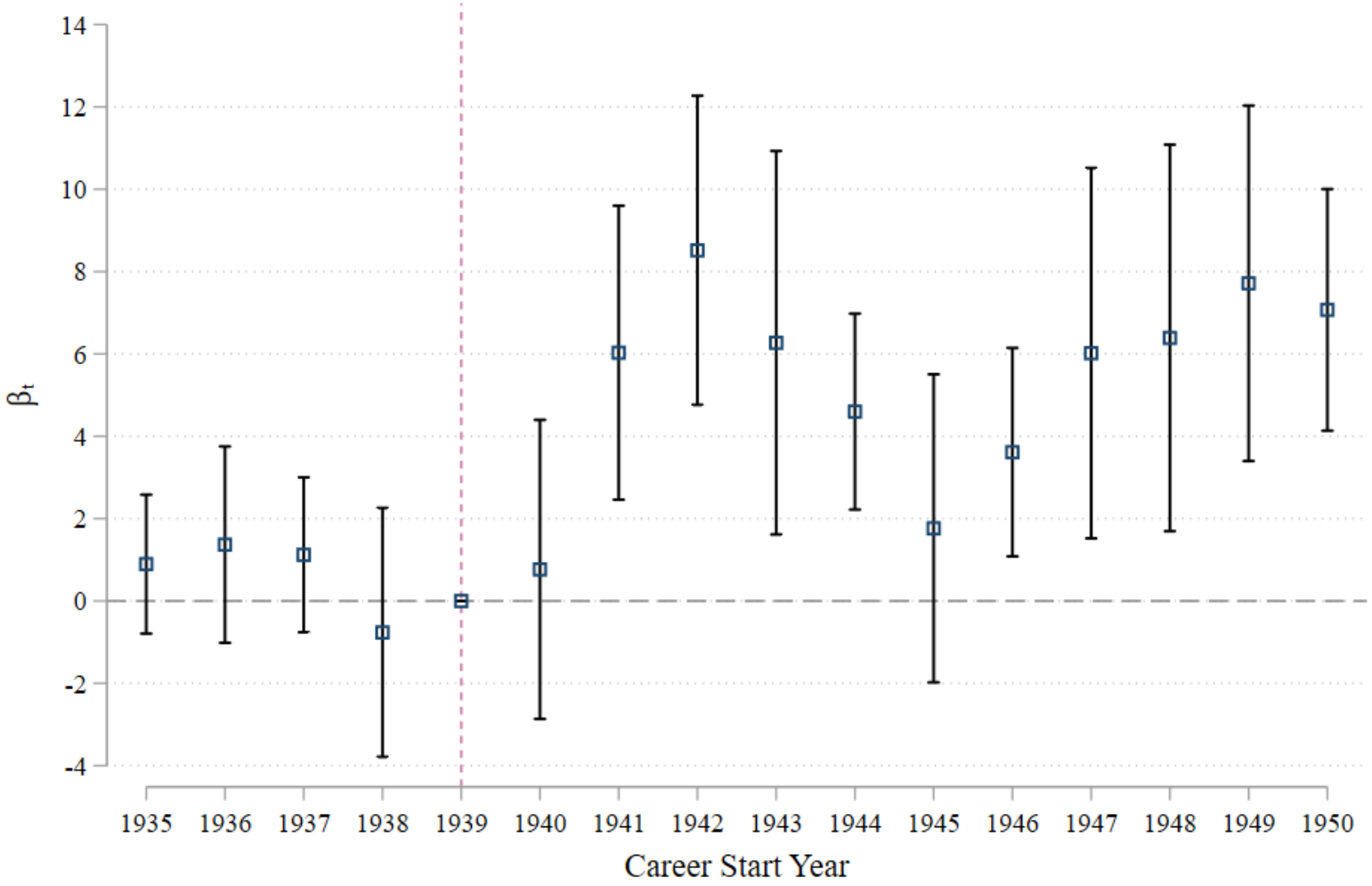
# Before 1940, female scientists are not more likely to enter fields in which more men enlist after 1940



# After 1940, more women enter fields with more enlisted men



# Moving 5 additional women into the physical sciences increases the number of female inventors by 1

| Y = | (1) Women Inventors | (2) Women Inventors | (3) Women Scientists | (4) Women Inventors |
|---|---|---|---|---|
| | OLS | Reduced Form | First Stage | IV (TSLS) |
| Female Scientists | 0.095*** | | | 0.195*** |
| | (0.022) | | | (0.070) |
| Predicted Female Scientists | | 0.034** | 0.175*** | |
| | | (0.013) | (0.032) | |
| Year FE | ✓ | ✓ | ✓ | ✓ |
| Field FE | ✓ | ✓ | ✓ | ✓ |
| Mean Y | 0.069 | 0.069 | 0.656 | 0.069 |
| Observations | 1,000 | 1,000 | 1,000 | 1,000 |
| Cragg-Donald F | | | | 16.763 |
| Kleibergen-Paap F | | | | 29.179 |

# Female patents more likely to be highly cited

| Y = | (1) Top 5% Citations | (2) Top 10% Citations | (3) Top 25% Citations | (4) ln(Citations) |
|---|---|---|---|---|
| Female | 0.030** | 0.044** | 0.051** | 0.080 |
| | (0.012) | (0.017) | (0.024) | (0.051) |
| Publication Year FE | ✓ | ✓ | ✓ | ✓ |
| Patent Class FE | ✓ | ✓ | ✓ | ✓ |
| Research Field FE | ✓ | ✓ | ✓ | ✓ |
| Mean Y | 0.058 | 0.120 | 0.299 | 1.638 |
| Observations | 91,250 | 91,250 | 91,250 | 91,250 |
| R-squared | 0.015 | 0.020 | 0.029 | 0.082 |

*Note:* OLS estimates at the patent level. Robust standard errors in parentheses. Percentiles determined by rank within publication year and discipline.
*** $p < 0.01$ ** $p < 0.05$ * $p < 0.10$

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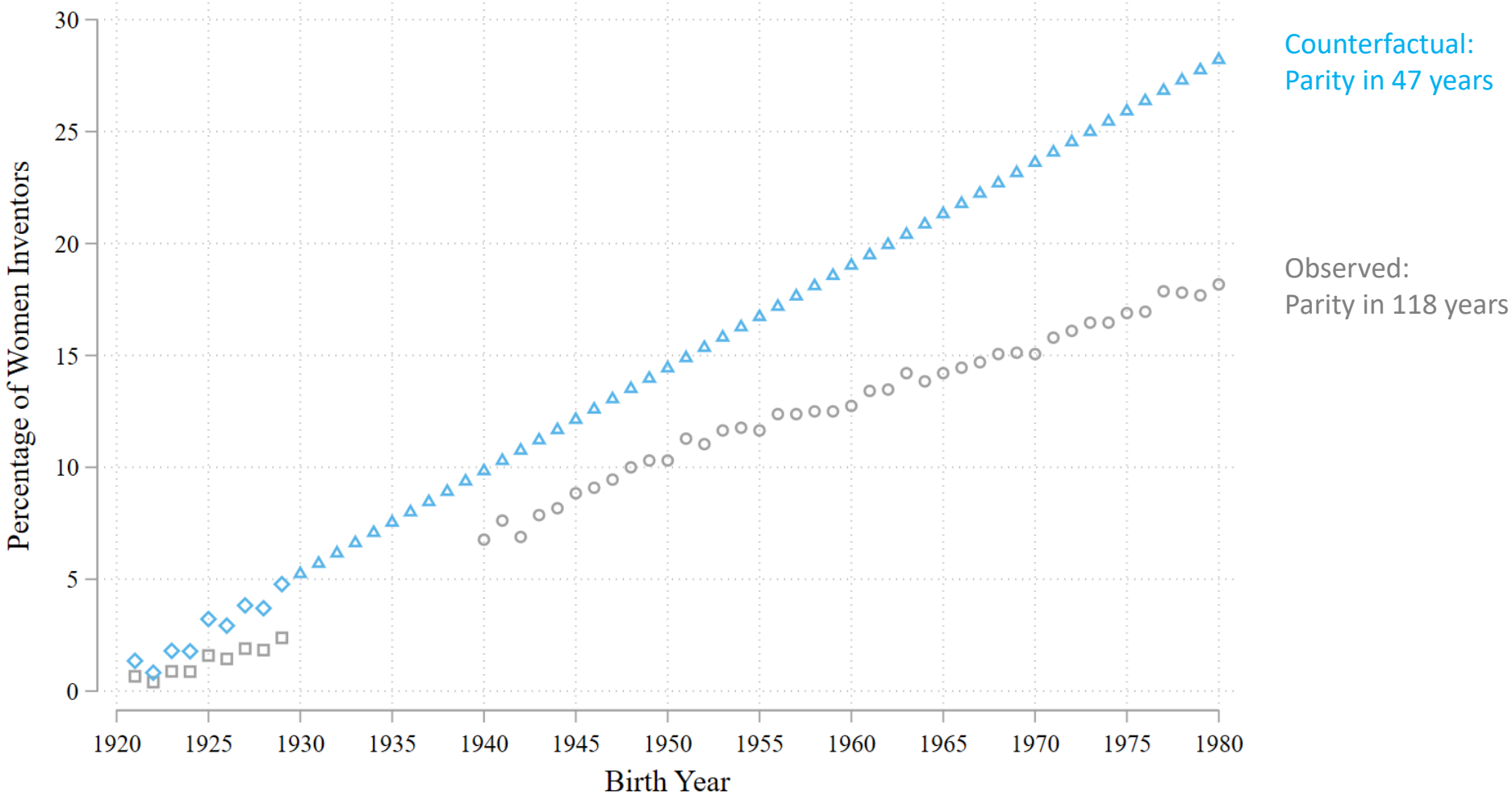
If women entered STEM at male rate, cohorts 1940-80 would have +61% female inventors.
Gender parity in 47 (rather than 118) years.



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