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## **Women, STEM, and Gender Differences in Higher Education Attainment**

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# Women, STEM, and Gender Differences in Higher Education Attainment

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Amber Gauthier

(Phillip Oberg, faculty advisor)



# Introduction



# Background

- ❖ Resurgence of discussion of gender differences in earnings and human capital specifically with women in Science, Technology, Math, and Engineering (STEM).
- ❖ Evidence of gender differences in earnings across all fields, including STEM


Sources: Blau & Kahn, 2000; Blau & Kahn, 2017; Gauthier, 2019; American Economic Association, 2019; Kahn & Ginther, 2017)

# Human Capital Theory

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- ❖ Each person has a set of skills they can develop and improve through additional training such as certifications or further educational attainment. This in turn leads to an increased return in the labor market such as wages.
- ❖ While doing this, however, there is a possibility to give up or earn lower wages in hopes of potentially higher wages in the future, leading to both my previous and current work.


Source: Becker, 1962



## Previous Work

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What factors lead to significant differences in wages?



# Research Question

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What factors lead to significant differences in higher education attainment?



# Hypotheses

- ❖ Being female will be associated with **lower** higher educational attainment compared to being male
- ❖ Being in a STEM occupation will be associated with **increased** higher educational attainment compared to being in a non-STEM occupation





# Hypotheses

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- ❖ Being both female and in STEM will be associated with **increased** higher educational attainment compared to females not in STEM
- ❖ Being both female and in STEM will be associated with **lower** higher educational attainment compared to both males in/not in STEM



# Data



# Database


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- ❖ IPUMS Current Population Survey (CPS) March 2019
- ❖ Only using those with completed higher education with age  $\leq 67$  and wage  $> 0$



# Dependent Variables

- ❖ Main variable
  - Graduate School completion
- ❖ Additional variables
  - Professional Certification
  - STEM



# Variable Creation

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❖ Education → separated into 4 categories

- Masters
- Professional School
- Doctoral Program
- Bachelors degree

# Variable Creation

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- ❖ Graduate School
  - Dummy variable
  - =0 if bachelors only,
  - =1 if masters, doctoral, professional school



# Independent Variables

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- ❖ STEM
- ❖ Demographic
- ❖ Employment
- ❖ Graduate School completion

# Variable Creation

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## ❖ STEM, Dummy variable

- In STEM occupation = 1
- Not in STEM occupation = 0

## ❖ STEM occupations

- Ex. Mechanical engineering, Chemist, Computer Scientist

## ❖ Non-STEM occupations


- Ex. Teaching, Community Services, Psychologist





# Summary Statistics

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# Education and Employment

## ❖ Education

- Undergraduate - **78.2%**
- Graduate School - **21.8%**

## ❖ STEM

- STEM -**31.9%**
- Social Sciences - **3.8%**
- Other - **64.3%**

# Demographic


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## ❖ Gender

- Male - **38.3%**
- Female - **61.7%**

## ❖ Race

- White - **81.2%**
- Black - **7%**
- Asian - **9.6%**
- Other - **0.06%**
- 2+ more - **1.4%**



# Results

OLS

(SE)

Controls	Female	STEM	<i>Female · STEM</i>
No	0.028 (0.026)	-	-
No	-	0.074** (0.029)	-
No	0.005 (0.026)	0.097*** (0.029)	-
Yes	0.060* (0.032)	0.203*** (0.044)	-0.172*** (0.056)
*≡ $p < 0.10$ ,      **≡ $p < 0.05$ ,      ***≡ $p < 0.01$			

# Interpretation

Women, compared to men, are **6% more likely** to complete graduate school.

Those in STEM occupations, compared to those who are not, are **20.3% more likely** to complete graduate school.

# Interpretation

But, those who are female and in STEM—compared to those who are not female and/or not in STEM—are **17.2% less likely** to complete graduate school.

# Interpretation

Women in STEM, compared to men in STEM, are  
**11.2% less likely** to complete graduate school  
( $p < 0.05$ )




# Logit and Probit

(SE)

Variable	Logit	Probit
Female	0.067* (0.032)	0.069* (0.031)
STEM	0.216*** (0.048)	0.218*** (0.046)
<i>Female · STEM</i>	−0.142*** (0.038)	−0.146*** (0.038)
*≡ $p < 0.10$ ,    **≡ $p < 0.05$ ,    ***≡ $p < 0.01$		

# Interpretation

Women in STEM, compared to men in STEM, are **7.5%-7.7% less likely** to complete graduate school  
( $p < 0.01$ )



# Other Outcomes




# STEM

- ❖ No gender difference in probability of being in a STEM occupation
- ❖ This means, the above results of women in STEM vs. men in STEM is driven by something else
  - Lesser paying jobs compared to males → cannot afford to continue ed.
  - Childcare and other household responsibilities interfere with schooling

# Professional Certification

- ❖ Used as an alternative to graduate school for continuing education and professional development
  - Results: women in STEM were significantly **30.6% less likely** to obtain a professional certification compared to men in STEM
- ❖ Those in STEM are not getting professional certifications
  - Results: those in STEM were significantly **29.3% less likely** to obtain a professional certification compared to those not in STEM
  - Lead to investigation in higher education completion → current project



# Conclusion



# Summary

- ❖ Individually, being female and in a STEM occupation has a positive effect on the likelihood to attend graduate school
- ❖ However, being both female and in a STEM occupation has a negative effect on the likelihood to attend graduate school
  - And, women in STEM are less likely than men in STEM to attend graduate school



# Policy Implications

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- ❖ Collegiate level programs at both the undergraduate and graduate level that promote women in STEM and higher education
  - Q&A Panels
  - Workshops for graduate school applications for or lead by women in STEM
  - Campus speakers that highlight success of women in STEM and their experience in higher education





## Further Research

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- ❖ Gender and STEM differences in Ph.D. students only
- ❖ Bivariate Probit Model Estimation
  - Gender-STEM differences in wages and higher education
- ❖ Further analysis of what factors affect the likelihood of being in a STEM career



# Thank You

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❖ Dr. Phillip Oberg

❖ IWU Economics Department