Gender Differences in Economics Course-Taking and Majoring: Findings from an RCT

Elizabeth T. Powers, The University of Illinois at Urbana-Champaign, Daniel Halim (World Bank) and Rebecca Thornton (UIUC)

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Women in Economics

• The level of women’s involvement in economics is low, beginning with the undergraduate level.
  • Historically, around 1/3 of economics majors are women. There’s been little change in women’s representation over time.

• Importance
  • Women miss out on valuable knowledge.
  • There is a weak pipeline for women into the economics profession.
Why don’t women take more economics? Findings from the Prior Literature

• College major literature
  • Women have many reasons for choosing their major, while financial concerns dominate men’s (Altonji, Blum, & Meghir, 2012).

• Economics major literature
  • When economics is framed as a “business” subject, women are less interested in the major (Bansak & Starr, 2010).
  • Concern with ability and grades: A ‘low’ introductory economics grade is especially discouraging to women (Goldin, 2015; Main & Ost, 2014; Owen, 2010; Rask & Tiefenthaler, 2008).
  • Female role models are important to women, but they are few in economics (Blau, Currie, Croson & Ginther, 2010; Porter & Serra, 2020; Robb & Robb, 1999).
• How can we nudge women undergraduate students to take more economics courses or major in economics?
• We study large cohorts of students in introductory classes.
• Students are randomized to information and encouragement treatments with different framings of the gains from studying economics
  • Prosocial – more “female”
  • Earnings – more “male”
• Measure impact of treatment on post-introductory course-taking and economics majoring using matched student-level administrative data
A Study within a Study

• Avilova and Goldin’s “Undergraduate Women in Economics” project.
  • A project to “evaluate whether better course information, mentoring, encouragement, career counseling, and more relevant instructional content can increase women’s majoring.”

• 20 institutions were randomized to treatment. Treatment schools received some funding to conduct an evaluation of any initiative hypothesized to increase women’s majoring in economics at their institution.
The Intervention

• Treated students received a letter and email with encouragement, general information, and specific information that framed economics as “prosocial” or “earnings”-focused.
November 3, 2017

Jane Doe
2002 Westdale Rd.
Schaumburg, IL 60159
USA

Dear Jane:

Please accept my congratulations on your performance in your economics course in Spring 2017. Your performance indicates that you have the potential for success in Economics. I encourage you to consider adding an Economics major, either as a primary major or a second major, to your accomplishments at the University of Illinois.

Our alumni have gone on to careers in banking and finance, marketing, insurance, and consulting, to name just a few. Economics is one of the best-rewarded majors in the job market. According to a recent study, economics majors receive pre-graduation job offers at the second-highest rate of all majors. Earnings growth for economics majors over the course of their careers is also among the best. Of all bachelor’s degree recipients, Economics majors have among the highest mid-career earnings. See attachments for specifics.

The department offers you many activities and experiences to build on your academic training, including special events, networking opportunities, workshops, student organizations, and other activities that promote your personal, academic, and professional growth, in addition to ongoing mentoring and tutoring support. Our undergraduate office staff is ready to help you with any concerns about the requirements for the major and your course scheduling. Please call (217) 333-2620 or e-mail econmajors@illinois.edu to arrange a consultation.

My congratulations and best wishes for another successful semester.

Sincerely,

Elizabeth T. Powers
Associate Professor of Economics and Faculty Member, Institute of Government and Public Affairs
• Please accept my congratulations on your performance in your economics course in Spring 2017. Your performance indicates that you have the potential for success in Economics. I encourage you to consider adding an Economics major, either as a primary major or a second major, to your accomplishments at the University of Illinois.
• The department offers you **many activities and experiences to build on your academic training**, including special events, networking opportunities, workshops, student organizations and other activities that promote your personal, academic, and professional growth, in addition to **ongoing mentoring and tutoring supports**. Our undergraduate office staff is ready to help you with any concerns about the requirements of the major and your course scheduling. Please call (217) 333-2628 or e-mail econug@illinois.edu to arrange a consultation.
Some people think that an Economics major can only be used in business and finance, focusing on things like stocks, bonds, interest rates, inflation, and unemployment. Not true. The skills you learn in Economics are important for understanding decision making more generally. This can be applied to everything from helping to combat climate change, teaching children in the classroom, motivating people to adopt healthy behaviors, working to promote self-sufficiency in developing countries, even raising your own kids. You can see a list of the wide variety of paths our Economics alumni have followed in the attachment.
### Well-Known People with Economics Degrees in “prosocial” careers

- **Politics and Policymakers**
  - George W. Bush - Former US President
  - Condoleezza Rice - Former US Secretary of State
  - Paul Wolfowitz - Former US Deputy Secretary of Defense
  - Gordon Brown - Former Prime Minister of the United Kingdom
  - Vito De Filippo - Former Prime Minister of Italy
  - Ahmed Hooda - Former Prime Minister of Sudan
  - Benazir Bhutto - Former Prime Minister of Pakistan
  - cashier - Former Prime Minister of Kenya

- **Business Leaders**
  - Jack Ma - Co-Founder and Executive Chairman of Alibaba
  - Larry Page - Co-Founder and CEO of Alphabet
  - Jeff Bezos - Founder and CEO of Amazon
  - Sheryl Sandberg - COO of Facebook
  - Mark Zuckerberg - CEO of Facebook

- **Economics Professors**
  - Robert Barro - Professor at Harvard University
  - Robert Shiller - Professor at Yale University
  - Daniel Yergin - Former CEO of the Energy Information Administration

- **Academics**
  - Christopher Blattman - Professor of Economics at The Ohio State University
  - Economist - Professor of Economics at the University of California, Berkeley

### UIUC Econ alumni with “prosocial” careers

- **UIUC Econ Alumni**
  - Warren Buffett - Alumnus from the UIUC Econ program
  - Jack Bogle - Alumnus from the UIUC Econ program
  - Robert Shiller - Alumnus from the UIUC Econ program
  - Robert Shiller - Alumnus from the UIUC Econ program

- **UIUC Econ Alumni in Non-Profit Organizations**
  - Susan Shlafer - Alumnus from the UIUC Econ program
  - Robert Shiller - Alumnus from the UIUC Econ program

- **UIUC Econ Alumni in Government**
  - Robert Shiller - Alumnus from the UIUC Econ program

### NGO job postings

- **NGO Job Postings**
  - California Health Institute - Policy Analyst
  - Peace Corps - Community Development Advisor
  - Center for Community Adaptation - CEO
  - Chicago Public Schools - VP, Finance
  - Illinois State Board of Education
  - Teach for America
  - America’s Safes Families, American Red Cross
  - Centers for Disease Control and Prevention - Data Analyst
  - United Nations - Food Security and Agricultural Development Officer
• Our alumni have gone to careers in banking and finance, marketing, insurance, and consulting, to name just a few. **Economics is one of the best-rewarded majors in the job market.** According to a recent study, economics majors receive **pre-graduation job offers** at the second-highest rate of all majors. **Earnings growth** for economics majors over the course of their careers is also among the best. Of all bachelor’s degree recipients, Economics majors have among the **highest mid-career earnings**. See attachments for specifics.
Salary potential associated with the economics major

UIUC Econ alumni with “lucrative/business-y” careers

Job opportunities by major

Earnings and job opportunities can vary greatly. It’s important to do your research to find the best fit for your career goals. Ultimately, the decision to pursue a certain career path should be based on your passion, interests, and personal values. Good luck in your career journey!
RCT Implementation

- Institutional Research Board (IRB) approval
- Students in intro micro, macro, and stats in Fall 2015, Spring 2016, and Fall 2016 were offered a small amount of extra credit for completing a survey about their major interests during class.
- Upon completion of the survey, students were solicited to enroll in the study (nearly all enrolled).
- Random assignments made to control (1/3), T1 (1/3), and T2 (1/3)
  - students attaining lower than a B- and with a cumulative GPA below 2.67 were not randomized
  - women & men, Freshmen & Sophomores
- Treated students received an email and letter shortly after the close of the semester
- Administrative records were matched to students through 2019 in order to track course-taking and majoring through the end of Junior year (95% observed through end of Junior year)

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The final sample consists of 1,134 men and 842 women who declared a major by the end of their Junior year.

78% enrolled in the study in their introductory micro course, 13% in macro, and 9% in stats.
Specification with two treatments

\[ y_i = \alpha + \beta_1 T_{1i} + \beta_2 T_{2i} + \gamma F_i + \delta_1 T_{1i} F_i + \delta_2 T_{2i} F_i + \psi X_i + \epsilon_i \]

Estimated for pooled sample

\( y = \) any additional course or economics major

\( T_1 = \) random assignment to Prosocial Treatment

\( T_2 = \) random assignment to Earnings Treatment

\( F = \) female

\( X = \) additional baseline controls (age, U.S. citizenship, first-generation college student, race, pre-college academic and math score indices, declared major, class standing at baseline; term solicited)
We also explored factors potentially mediating the treatments

• Does a student receiving a good or bad grade surprise respond differently to treatment than a student whose grade expectations are met?

• Does a student with a female TA respond differently to treatment than a student with a male TA?
Specification with treatment mediators

\[ y_i = \alpha + \beta_1 T_{1i} + \beta_2 T_{2i} + \gamma M_i + \delta_1 T_{1i} M_i + \delta_2 T_{2i} M_i + \psi_i X_i + \epsilon_i \]

Specifications estimated separately for women and men

\( y \) = any additional courses or economics major

\( M \) = Grade surprise or female TA

\( T_1 \) = random assignment to Prosocial Treatment

\( T_2 \) = random assignment to Earnings Treatment

\( X \) = additional controls (age, U.S. citizenship, first-generation college student, race, pre-college academic and math score indices, declared major, class standing at baseline; term solicited)
### Table 1: Main Treatment Effects

<table>
<thead>
<tr>
<th></th>
<th>Any Subsequent Course (1)</th>
<th>Major in Economics (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Pro-social)</td>
<td>0.053</td>
<td>0.041</td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.032)</td>
</tr>
<tr>
<td>T2 (Earnings)</td>
<td>0.032**</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.029)</td>
</tr>
<tr>
<td>T1 * Female</td>
<td>-0.048</td>
<td>-0.047</td>
</tr>
<tr>
<td></td>
<td>(0.040)</td>
<td>(0.035)</td>
</tr>
<tr>
<td>T2 * Female</td>
<td>-0.046</td>
<td>-0.040*</td>
</tr>
<tr>
<td></td>
<td>(.056)</td>
<td>(0.022)</td>
</tr>
<tr>
<td>Female</td>
<td>-0.017</td>
<td>-0.072**</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Observations</td>
<td>1976</td>
<td>1885</td>
</tr>
<tr>
<td>R²</td>
<td>0.147</td>
<td>0.161</td>
</tr>
<tr>
<td>Dep variable mean</td>
<td>0.630</td>
<td>0.632</td>
</tr>
<tr>
<td>T1 = T2 (p-value)</td>
<td>0.460</td>
<td>0.191</td>
</tr>
<tr>
<td>T1<em>F = T2</em>F (p-value)</td>
<td>0.964</td>
<td>0.820</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are shown in parentheses. All specifications include the following controls: age, age-squared, US citizenship, first-generation college, race dummies, academic score index, math score index, interacted dummies of Freshman * term solicited, [and depending on the sample restriction] dummies for being an econ major or undeclared when solicited.
### Table 2: Interaction Main Treatment Effects: Grade Surprise x Any Subsequent Course

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>T1 (Pro-social)</td>
<td>0.060</td>
<td>0.046</td>
</tr>
<tr>
<td>(0.071)</td>
<td>(0.045)</td>
<td></td>
</tr>
<tr>
<td>T2 (Earnings)</td>
<td>0.049</td>
<td>0.007</td>
</tr>
<tr>
<td>(0.052)</td>
<td>(0.044)</td>
<td></td>
</tr>
<tr>
<td>T1 * Lower than expected grade</td>
<td>-0.162**</td>
<td>-0.007</td>
</tr>
<tr>
<td>(0.055)</td>
<td>(0.062)</td>
<td></td>
</tr>
<tr>
<td>T1 * Higher than expected grade</td>
<td>0.056</td>
<td>0.072</td>
</tr>
<tr>
<td>(0.107)</td>
<td>(0.107)</td>
<td></td>
</tr>
<tr>
<td>T2 * Lower than expected grade</td>
<td>-0.152**</td>
<td>0.053</td>
</tr>
<tr>
<td>(0.052)</td>
<td>(0.065)</td>
<td></td>
</tr>
<tr>
<td>T2 * Higher than expected grade</td>
<td>0.042</td>
<td>0.057</td>
</tr>
<tr>
<td>(0.112)</td>
<td>(0.139)</td>
<td></td>
</tr>
<tr>
<td>Lower than expected grade</td>
<td>0.055</td>
<td>-0.029</td>
</tr>
<tr>
<td>(0.057)</td>
<td>(0.045)</td>
<td></td>
</tr>
<tr>
<td>Higher than expected grade</td>
<td>0.014</td>
<td>0.046</td>
</tr>
<tr>
<td>(0.043)</td>
<td>(0.089)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>842</td>
<td>1134</td>
</tr>
<tr>
<td>R²</td>
<td>0.177</td>
<td>0.161</td>
</tr>
<tr>
<td>Dep variable mean</td>
<td>0.630</td>
<td>0.632</td>
</tr>
<tr>
<td>% lower than expected</td>
<td>0.415</td>
<td>0.426</td>
</tr>
<tr>
<td>% higher than expected</td>
<td>0.112</td>
<td>0.072</td>
</tr>
<tr>
<td>T1 + T1*Lower than expected = 0</td>
<td>0.030</td>
<td>0.494</td>
</tr>
<tr>
<td>T1 + T1*Higher than expected = 0</td>
<td>0.262</td>
<td>0.149</td>
</tr>
<tr>
<td>T2 + T2*Lower than expected = 0</td>
<td>0.065</td>
<td>0.057</td>
</tr>
<tr>
<td>T2 + T2*Higher than expected = 0</td>
<td>0.527</td>
<td>0.552</td>
</tr>
</tbody>
</table>

Notes: Robust standard errors are shown in parentheses. Bottom two rows contain p-values. All specifications include the following controls: age, age-squared, US citizenship, first-generation college, race dummies, academic score index, math score index, interacted dummies of Freshman * term solicited, [and depending on the sample restriction] dummies for being an econ major or undeclared when solicited.
### Table 3: Interaction Main Treatment Effects: Female TA x Any Subsequent Course

<table>
<thead>
<tr>
<th></th>
<th>Any Subsequent Course</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Women (1)</td>
<td>Men (2)</td>
<td></td>
</tr>
<tr>
<td>T1 (Pro-social)</td>
<td>0.058</td>
<td>-0.011</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td>(0.035)</td>
<td></td>
</tr>
<tr>
<td>T2 (Earnings)</td>
<td>0.063</td>
<td>-0.044</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.047)</td>
<td></td>
</tr>
<tr>
<td>T1 * Female TA</td>
<td>-0.101</td>
<td>0.107**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.090)</td>
<td>(0.040)</td>
<td></td>
</tr>
<tr>
<td>T2 * Female TA</td>
<td>-0.134</td>
<td>0.141</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.081)</td>
<td>(0.094)</td>
<td></td>
</tr>
<tr>
<td>Female TA</td>
<td>0.066</td>
<td>-0.116</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.060)</td>
<td>(0.073)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Observations</th>
<th>R²</th>
<th>Dep variable mean</th>
<th>% Female TA</th>
<th>T1+T1*Female TA = 0</th>
<th>T2+T2*Female TA = 0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>842</td>
<td>0.172</td>
<td>0.630</td>
<td>0.578</td>
<td>0.566</td>
<td>0.393</td>
</tr>
<tr>
<td></td>
<td>1134</td>
<td>0.166</td>
<td>0.632</td>
<td>0.543</td>
<td>0.024</td>
<td>0.086</td>
</tr>
</tbody>
</table>

Notes: Standard errors are shown in parentheses. Notes: Robust standard errors are shown in parentheses. Bottom two rows contain p-values. All specifications include the following controls: age, age-squared, US citizenship, first-generation college, race dummies, academic score index, math score index, interacted dummies of Freshman * term solicited, [and depending on the sample restriction] dummies for being an econ major or undeclared when solicited.
Key Findings of the Study

- We could nudge students to take additional courses with treatment, but we could not nudge students to the point of majoring.
- The type of treatment (prosocial or earnings) did not matter.
- Men were more often nudged than women.
• Nudging women with grade ‘disappointment’ had the unintended consequence of discouraging them from taking more classes.

• Having a female TA did not make women any more nudge-able to take more classes, but men who had a female TA were nudged to take more classes.
An undergraduate student responds...

- Nudging women with bad grade surprises had the *unintended consequence* of discouraging them from taking more classes.
  
  “If I hadn’t done my best in a course, I would be turned off by a letter encouraging me to major, because it means that department has low standards”.

- Having a female TA did not make women any more nudge-able to take more classes.
  
  “My coworkers got me interested (in majoring). The women who are TAs—I think they’re students—I have no interest in being like them.”
Men are more nudge-able (similar to Pugatch & Schroeder, 2021).
Women aren’t particularly prosocial (Croson & Gneezy, 2009).
Grades have an important influence on women’s behavior but not men’s (Goldin, 2015).
Not every woman associated with economics is an effective role model.
A Caution: Consider that “encouragement” may not always be a good thing

We don’t influence majoring with our “cheap and simple” treatments.

But we do encourage additional course-taking.

Additional course-taking is good from a knowledge perspective.

Additional course-taking is potentially costly to the student if we are drawing out an inevitable exit from economics.
Men view economics as a good major. They’re often marginal to choosing economics, so they can be nudged to explore it further.

Women’s behavior is not straightforward, and good intentions may backfire.