The Confidence Gap Predicts the Gender Pay Gap Among STEM Graduates

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Supplementary Materials.

S1. following are the questions and answers that provided the primary data in our analysis.

Dependent Variable

Please think back to your FIRST job after earning your first engineering bachelor's degree.

If you have not earned a bachelor's degree in an engineering field, please refer to your first job after earning your first bachelor's degree in any field.

Note: For many respondents to this survey, their FIRST job after earning their first bachelor's degree might be their CURRENT job!

In this section, by "job", we mean jobs in industry, education, government, or non-profit sectors (as opposed to teaching or research assistantships that one might have in graduate school as a student).

What was the primary source of the job offer you accepted?

Internship or co-op experience (0)
Family, friends, alumni, or another personal connection (1)
Job posting on company website or third party site (Monster.com, Indeed.com, etc.) (2)
College/university Career Center interview (3)
College/university Career Fair (4)
Other (5)

What was the baseline compensation for the job you accepted?

_____

Independent Variable

[Gender] What is your sex?

(0) Female
(1) Male
(2) Other (please specify):
(-9) I prefer not to answer

Mediating Variables

[Engineering Self Efficacy] How confident are you in your ability to do each of the following at this time?

Design a new product or project to meet specified requirements
Conduct experiments, build prototypes, or construct mathematical models to develop or evaluate a design
Develop and integrate component sub-systems to build a complete system or product
Analyze the operation or functional performance of a complete system

Troubleshoot a failure of a technical component or system

(0) Not confident
(1) Slightly confident
(2) Moderately confident
(3) Very confident
(4) Extremely confident
(-9) I prefer not to answer

[Importance] In your search for your first job, how important was each of the following to you?

Geographic location of the job
Workplace culture
Reputation of the organization for being inclusive
Diversity in the organization's workforce
Compensation and benefits
Attractiveness of industry/field
Day-to-day work activities
Potential to have societal impact
Potential to innovate and create new things
Input from family and friends
I had few choices/alternatives

(0) Not important
(1) Slightly important
(2) Moderately important
(3) Very important
(4) Extremely important

[Intentions] How likely is it that your work will involve engineering (e.g., engineering practice, research, management, or sales) in the first year after you graduate?

(0) Definitely will not
(1) Probably will not
(2) Might or might not
(3) Probably will
(4) Definitely will

Control Variables

[Institution] What institution are you currently attending?
(1) Arizona State University
(2) Baylor University
(3) Boise State University
(4) Bucknell University
(5) California State University – Fresno

(6) Embry Riddle Aeronautical University – Daytona Beach
(7) Franklin W. Olin College of Engineering
(8) Indiana University – Purdue University – Indianapolis
(9) Messiah College
(10) Michigan Technological University
(11) North Carolina State University at Raleigh
(12) Rochester Institute of Technology
(13) Seattle Pacific University
(14) Smith College
(15) Stanford University
(16) Temple University
(17) Tennessee Technological University
(18) The University of Texas at San Antonio
(19) Tufts University
(20) University of Illinois at Urbana-Champaign
(21) University of the District of Columbia
(22) University of Utah
(23) University of Wisconsin-Madison
(24) University of Wisconsin-Platteville
(25) Washington University in St. Louis
(26) Wayne State University
(27) Western Michigan University
(28) Other
(-9) I prefer not to answer

[Field] Degree Field
(0) Aerospace/Aeronautical/Astronautical Engineering
(1) Agricultural Engineering
(2) Architectural Engineering
(3) Bioengineering/Biomedical Engineering
(4) Biological Engineering
(5) Chemical Engineering
(6) Civil Engineering
(7) Computer Engineering
(8) Computer Engineering Technology
(9) Computer Science
(10) Construction Engineering/Construction Management
(11) Construction Engineering Technology
(12) Electrical/Electronics/Communications Engineering
(13) Electrical Engineering Technology
(14) Electromechanical Engineering Technology
(15) Engineering, general
(16) Engineering Design
(17) Engineering Management
(18) Engineering Physics
(19) Engineering Technology

(20) Environmental Engineering
(21) Geological Engineering
(22) Geophysical Engineering
(23) Industrial Engineering
(24) Industrial Engineering Technology
(25) Management Science and Engineering
(26) Manufacturing Engineering
(27) Materials Engineering/Materials Science and Engineering
(28) Mechanical Engineering
(29) Mechanical Engineering Technology
(30) Metallurgical Engineering
(31) Mining Engineering
(32) Nuclear Engineering
(33) Ocean Engineering
(34) Optical Science and Engineering
(35) Petroleum Engineering
(36) Robotics Engineering
(37) Software Engineering
(38) Systems Engineering
(39) Other

[Year] Year Earned Degree:
(0) 2017
(1) 2016
(2) 2015
(3) 2014
(4) 2013
(5) 2012
(6) 2011
(7) 2010
(8) 2009
(9) 2008
(10) 2007
(11) 2006
(12) Before 2006

[Degree] Degree Type:
(0) BS
(1) BA

[Second Degree] Have you earned a second bachelor's degree?
(0) No
(1) Yes

[GPA] What is your overall college grade point average?
(0) A or A+ (i.e., 3.9 or above on a 4.0 scale)

(1) A– (3.5 – 3.8)
(2) B+ (3.2 – 3.4)
(3) B (2.9. – 3.1)
(4) B– (2.5 – 2.8)
(5) C+ (2.2 – 2.4)
(6) C (1.9 – 2.1)
(7) C– or lower (1.8 or less)
(-9) I prefer not to answer

[Sector] What is your industry sector?
(0) Agriculture, Forestry, Fishing, and Hunting
(1) Mining, Quarrying, and Oil and Gas Extraction
(2) Utilities
(3) Construction
(4) Manufacturing
(5) Wholesale Trade
(6) Retail Trade
(7) Transportation and Warehousing
(8) Information
(9) Finance and Insurance
(10) Real Estate and Rental and Leasing
(11) Professional, Scientific, and Technical Services
(12) Management of Companies and Enterprises
(13) Administrative and Support and Waste Management and Remediation Services
(14) Educational Services
(15) Health Care and Social Assistance
(16) Arts, Entertainment, and Recreation
(17) Accommodation and Food Services
(18) Other Services (except public administration)
(19) Public Administration (except armed forces)
(20) Armed Forces
(21) Other (not listed above)

[Source] What was the primary source of the job offer you accepted?
(0) Internship or co-op experience
(1) Family, friends, alumni, or another personal connection
(2) Job posting on company website or third party site (Monster.com, Indeed.com, etc.)
(3) College/university Career Center interview
(4) College/university Career Fair
(5) Other

Table S1: Correlation Matrix for Main Variables

		1	2	3	4
1	Female				
2	Annual Salary	-0.11*			
3	Engineering Self Efficacy	-0.25**	0.23**		
4	Importance of Compensation	-0.05	0.23**	0.11*	
5	Importance of Workplace Culture	0.22**	0.14**	0.03	0.13**

Note: *p<0.05; **p<0.01. Correlation matrix is for main variables shown in Table 1 (N=559).

Table S2: Description of Covariates

Name of Variable	Type
Industry	Categorical
School	Categorical
Field	Categorical
GPA	Ordinal
Degree (B.S. or B.A.)	Binary
Year of Degree	Ordinal
Second Degree Dummy	Binary
Internship Employer Dummy	Binary

Table S3: OLS Regressions Predicting Engineering Task Self-Efficacy by Sex

	Dependent variable:	
	Professional Role Confidence	
	(1)	(2)
Female	-0.433**	-0.369**
	(0.070)	(0.075)
Observations	559	559
Fixed Effects Included	No	Yes
Controls Included	No	Yes
Adjusted R^2	0.063	0.171
Residual Std. Error	0.785 (df = 557)	0.738 (df = 495)

Note: *p<0.05; **p<0.01; two tailed hypothesis tests.

Table S4: OLS Regressions Predicting Annual Salary by Engineering Task Self-Efficacy and Sex

	Dependent variable:		
	Log Annual Salary		
	(1)	(2)	(3)
Female	-0.091**	-0.052	-0.044
	(0.031)	(0.031)	(0.031)
Professional Role Confidence		0.091**	0.067**
		(0.018)	(0.019)
Observations	559	559	559
Fixed Effects Included	No	No	Yes
Controls Included	No	No	Yes
Adjusted R^2	0.014	0.054	0.238
Residual Std. Error	0.346 (df = 557)	0.339 (df = 556)	0.304 (df = 494)

Note: *p<0.05; **p<0.01; two tailed hypothesis tests.

Table S5: Average Mediation Effect of Engineering Self-Efficacy on Annual Salary

	Estimate	95% CI Lower	95% CI Upper
AME	-1756.07	-2949.47	-823.36
Direct Effect	-2141.84	-5680.10	1324.00
Total Effect	-3897.91	-7509.64	-486.45
Prop. Mediated	0.44	0.22	1.96

Note: We follow the Baron and Kenny approach (34) to mediation using the *medeff* package in Stata. To determine the significance of the indirect effect and to correct for standard errors, we use 1000 bootstrapped samples. The results indicate support for mediation, where the proportion mediated is 0.44 ($p < 0.001$). AME=Average mediation effect.

As a robustness check, we also ran the simple mediation analysis using the Hayes approach (35). To estimate the direct, indirect, and total effects, we obtain coefficients from two linear models defined by equations (2) and (3). To determine the significance of these effects and to correct for standard errors, we use 1000 bootstrapped samples. The results below indicate support for full mediation, where the average proportion mediated is 0.48 ($p < 0.001$). These results are comparable to results in Table S5. Since the results in Table S5 are more conservative they are reported in the main paper.

	Estimate	95% CI Lower	95% CI Upper
Indirect Effect	-0.0256	0.0100	-0.0113
Direct Effect	-0.0453	-0.1033	0.0098
Total Effect	-0.0709	-0.1256	-0.0118
Prop. Mediated	0.4771	0.1273	1.3014

Table S6. OLS Regressions of Importance of Compensation by Sex

	Dependent variable:	
	Importance of Compensation	
	(1)	(2)
Female	-0.105	-0.057
	(0.081)	(0.090)
Observations	559	559
Fixed Effects Included	No	Yes
Adjusted R^2	0.001	0.048
Residual Std. Error	0.916 (df = 557)	0.894 (df = 495)

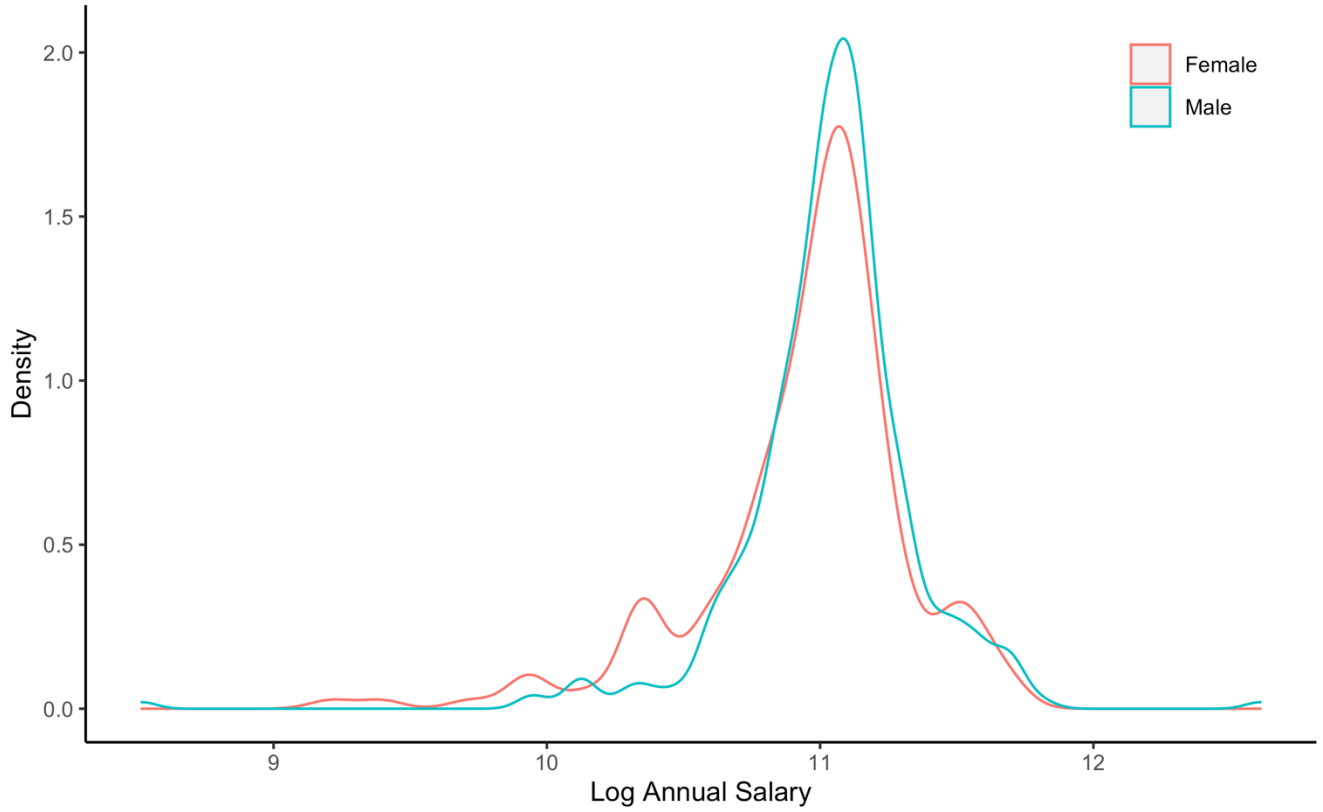
Note: *p<0.05; **p<0.01; two-tailed hypothesis tests.

Table S7. OLS Regressions of Importance of Workplace Culture by Sex

	Dependent variable:	
	Importance of Workplace Culture	
	(1)	(2)
Female	0.437**	0.455**
	(0.084)	(0.095)
Observations	559	559
Fixed Effects Included	No	Yes
Adjusted R^2	0.045	0.051
Residual Std. Error	0.947 (df = 557)	0.944 (df = 495)

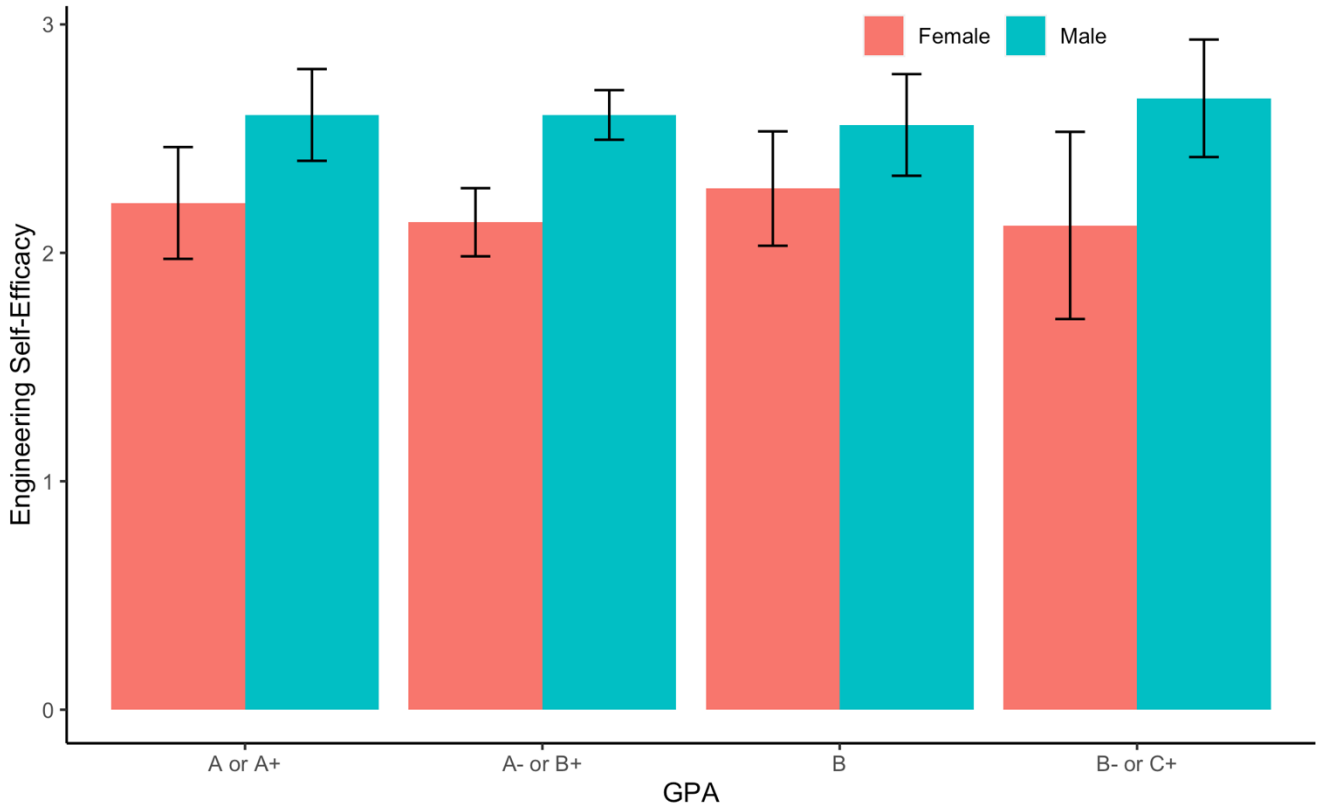
Note: *p<0.05; **p<0.01; two-tailed hypothesis tests.

Figure S1. Salary Distributions for Women and Men Upon Workforce Entry



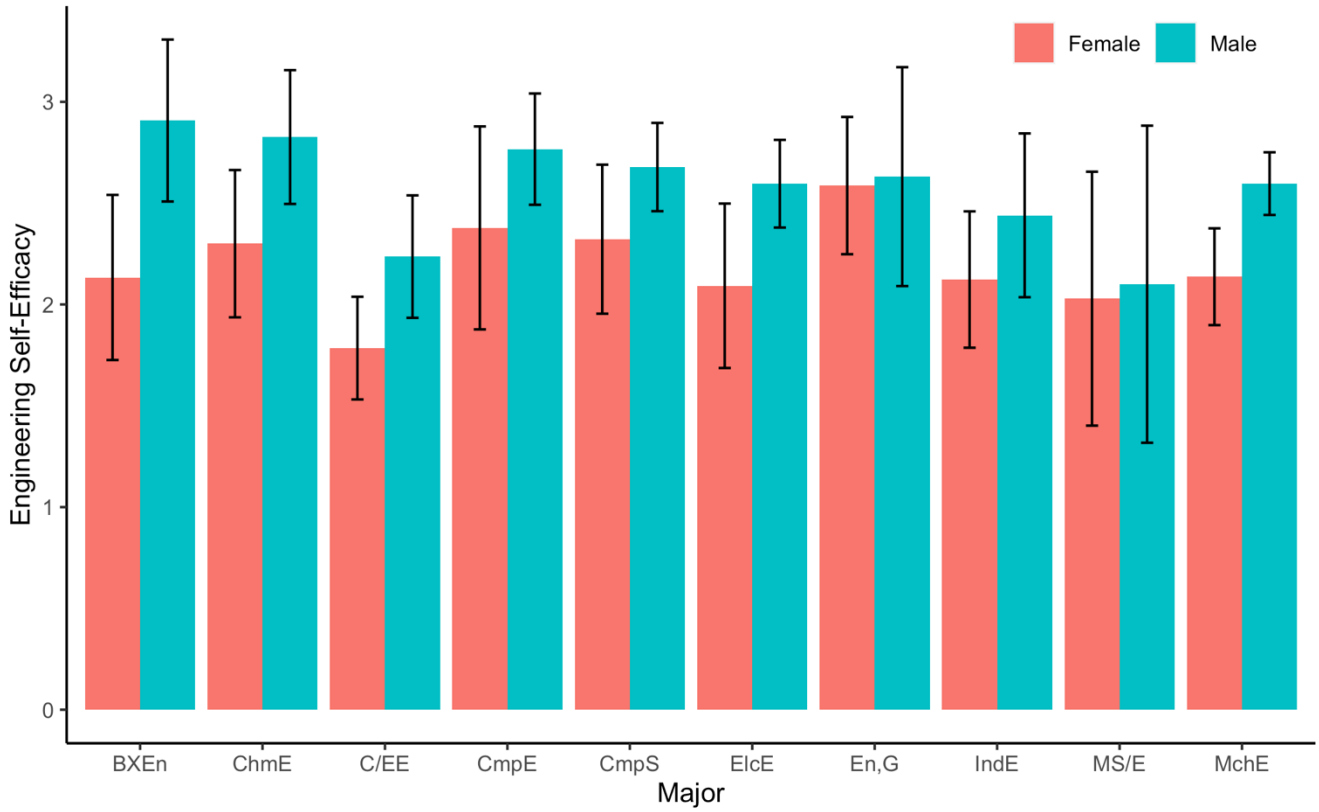
Note: Kernel density plot of the natural logarithm of nominal salaries by sex is shown (N = 559). There is a significant difference between women and men in starting salaries.

Figure S2. Engineering Self-Efficacy Differences by Sex Across GPA



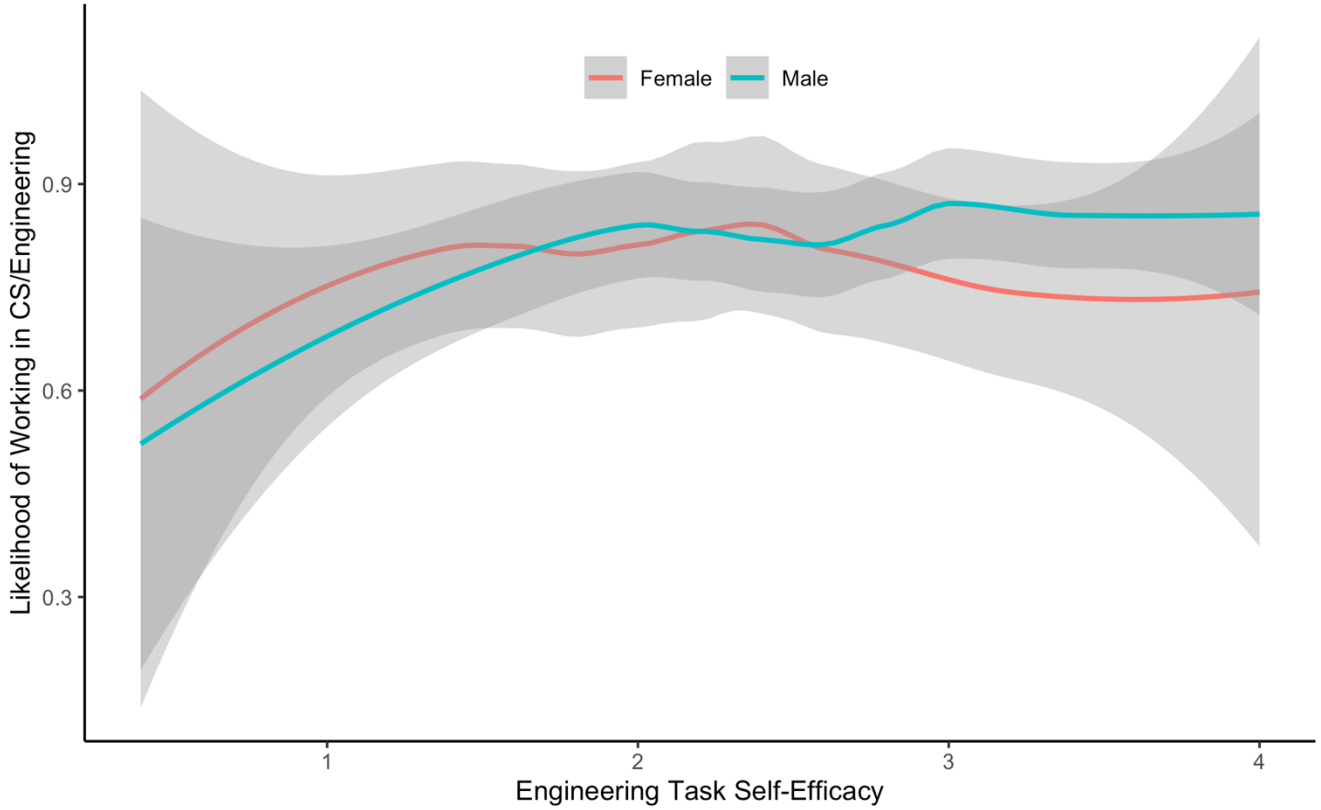
Note: Error bars represent 95 percent confidence intervals (N = 559). There is a statistical difference in engineering self-efficacy by sex ($p < 0.001$). Engineering self-efficacy is not statistically different for women and men in most GPA categories shown above.

Figure S3. Engineering Self-Efficacy Differences by Sex Across Major



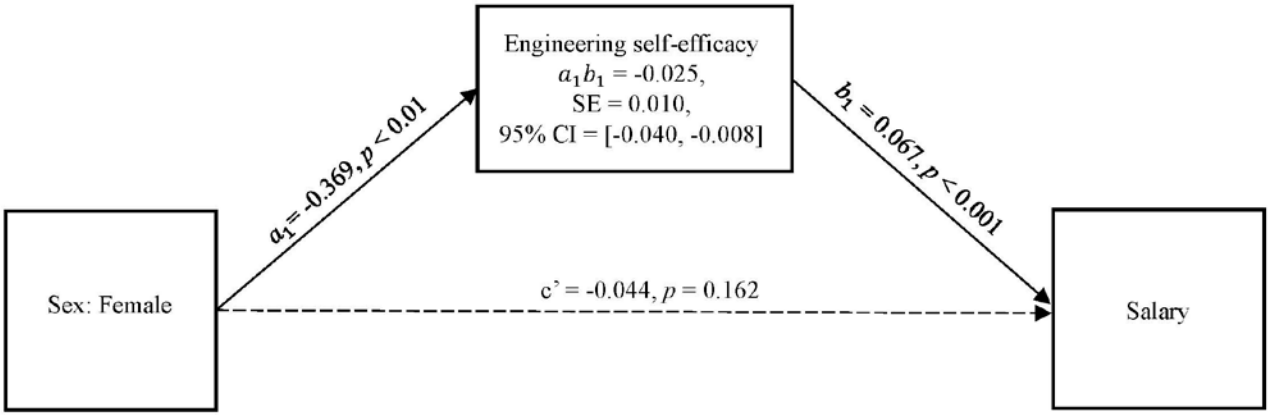
Note: Error bars represent 95% confidence intervals (N = 559). There is a statistical difference of engineering self-efficacy by sex ($p < 0.001$). Engineering self-efficacy is not statistically different in most major categories shown above. A/AE = Astronautics/Aerospace Engineering; BXEn = Biological Engineering; ChmE = Chemical Engineering; C/EE = Civil/Environmental Engineering; CmpE = Computer Engineering; CmpS = Computer Science; ElcE = Electrical Engineering; En,G = General Engineering; IndE = Industrial Engineering; MS/E = Material Science and Engineering; MchE = Mechanical Engineering.

Figure S4. Engineering Self-Efficacy and Likelihood of Working in CS and/or Engineering



Note: The shaded area represents the 95% confidence interval for the fitted locally weighted curve (N = 460).

Figure S5. Simple Mediation Model of the Relation among Sex, Engineering Self-Efficacy, and Salary



Note: 1,000 bootstrapped iterations were performed to compute a bias corrected 95% CI for the indirect effect of engineering self-efficacy (N=559).