

College Education, Employment Divergences, and the Gender Wage Gap

Mei-Yu Kuo

Advisor: Vincent J. Roscigno

Stalled Gender Wage Gap

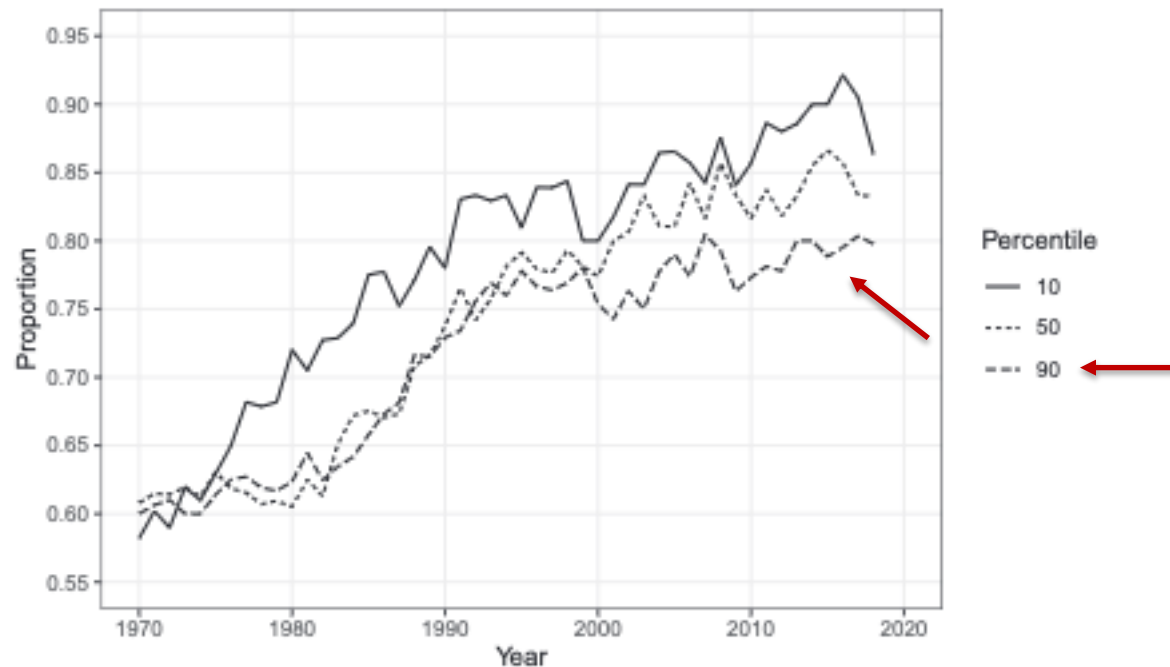


Fig. 12. Ratio of women's to men's hourly wage at the 10th, 50th, and 90th percentile of their distributions, for full-time workers employed in the last week, age 25 to 54, 1970 to 2018. Source: Authors' computations from IPUMS CPS ASEC samples for 1970 to 2018.

Individual Level

- Gender Segregation in Field of Study in College
- Transition to Family Roles and Unqual Family Responsibilities



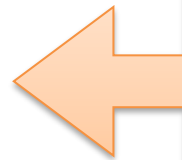
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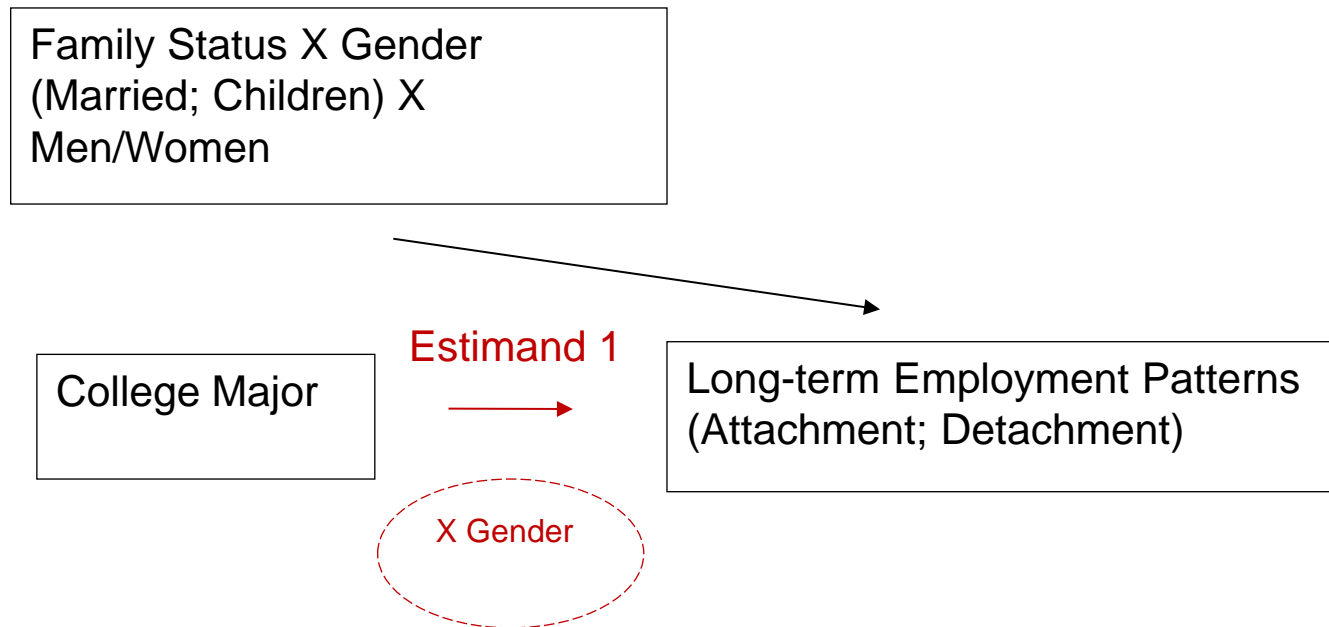


- **Cumulative (Dis)advantage**
- How do early educational decision shape long-term employment outcomes, and therefore wages?
- How do family (and gender) dynamics play a role?



Stalled Gender Wage Gap

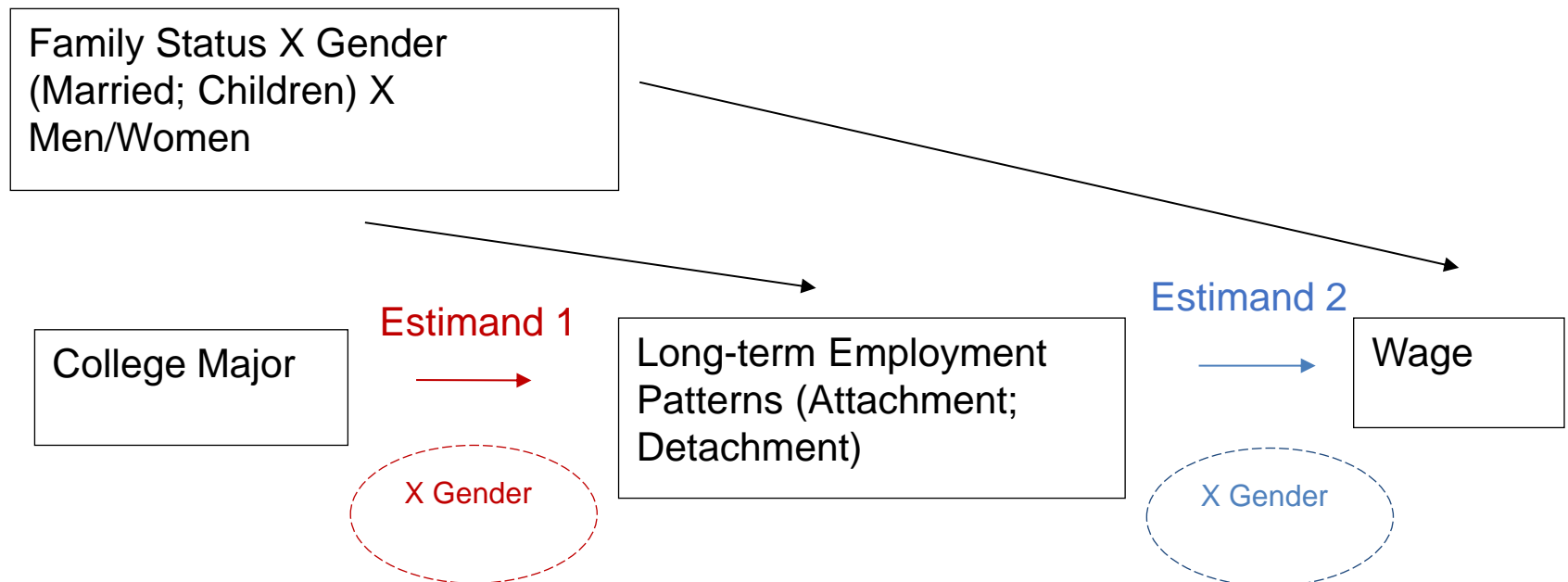
Objective 1: college major → labor market attachment/detachment



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Objective 2: labor market attachment/detachment → wage

Objective 3: college major → labor market attachment/detachment → wage



Data and Method

- Data
 - NLSY97, round 1~ round 22 (age 12~43).
 - Bachelor's degree holder.
 - Final sample size 2,333 people + 32,316 person-years.

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Estimand	Approach	Estimator
College major → Labor Market Attachment/Detachment	Event History Analysis	Linear Probability Model
Labor Market Attachment/Detachment → Wage	Growth Curve Modeling	Multilevel Linear Regression

KEY FINDINGS



1. Applied non-STEM and applied STEM degrees → stronger labor market attachment.

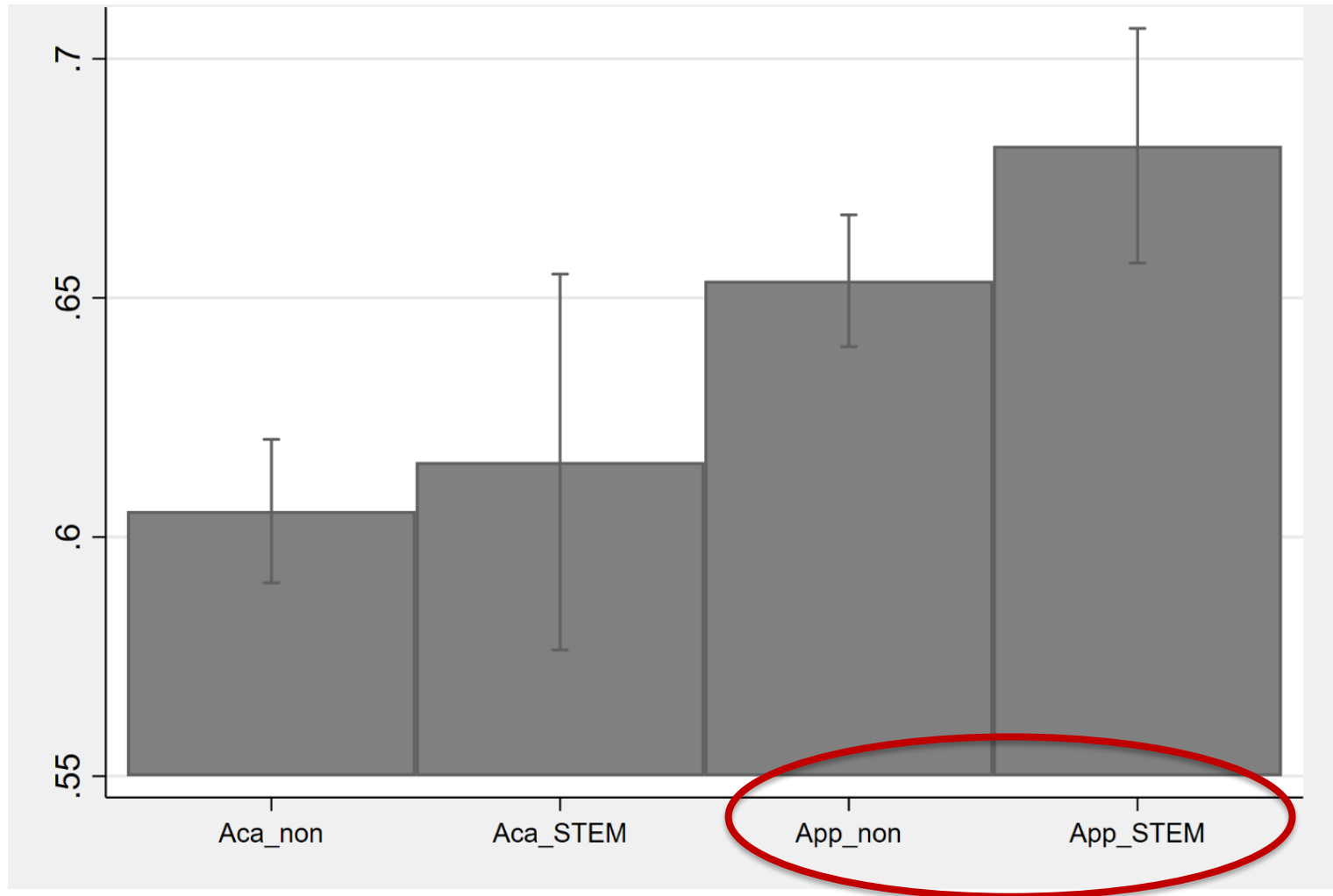


Figure 2. Predicted Probability of Labor Market Attachment across College Major.



2. However, women benefit less from **applied non-STEM degrees** than their men counterpart —concentration of women in care-centered majors?

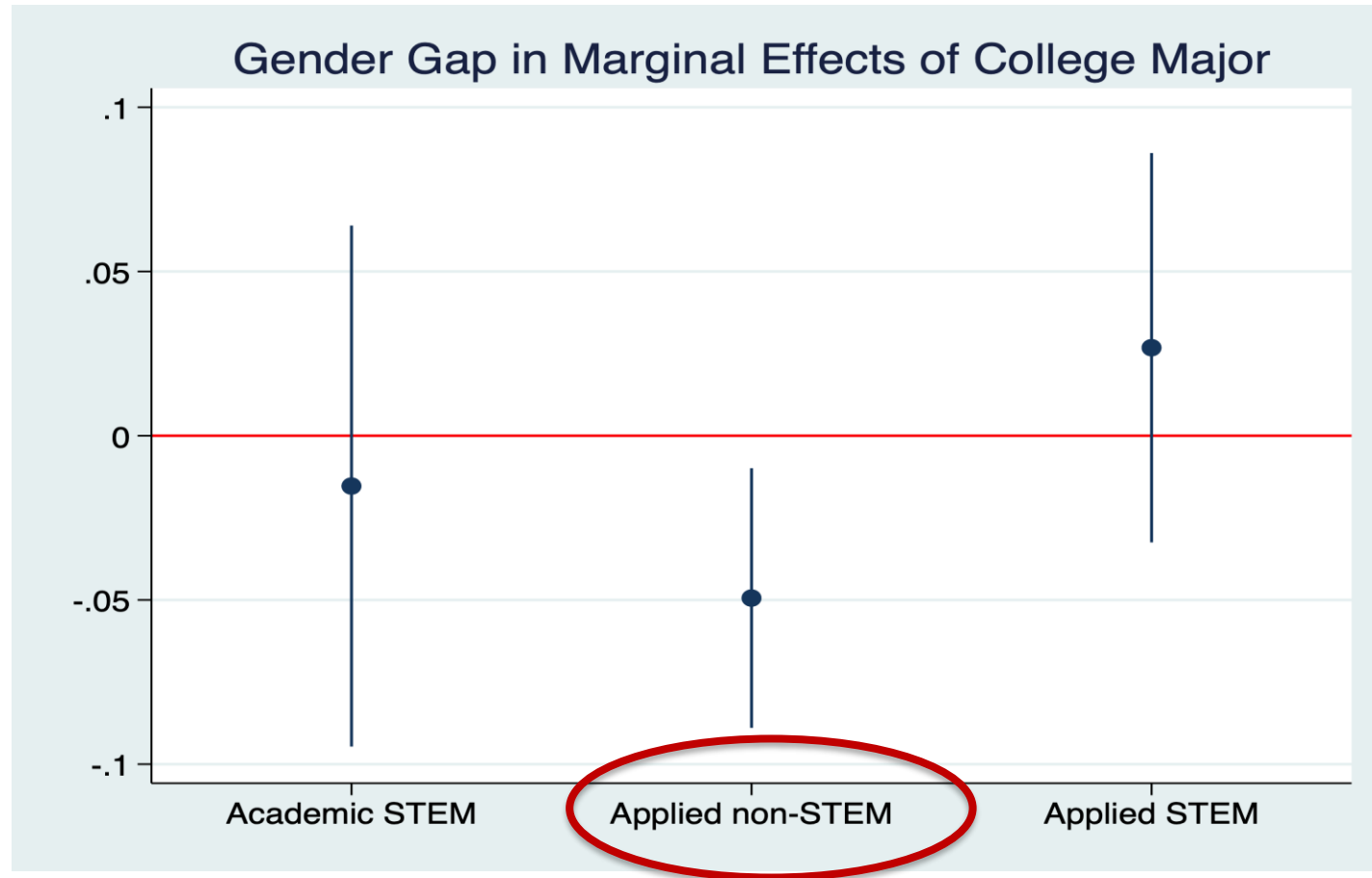


Figure 3. Gender Gap (women – men) in Effects of College Major on Labor Market Attachment



3. Although **applied STEM** degrees offer equal advantages to men and women, **women's significant underrepresentation** in such fields means that these advantages are disproportionately realized by men.

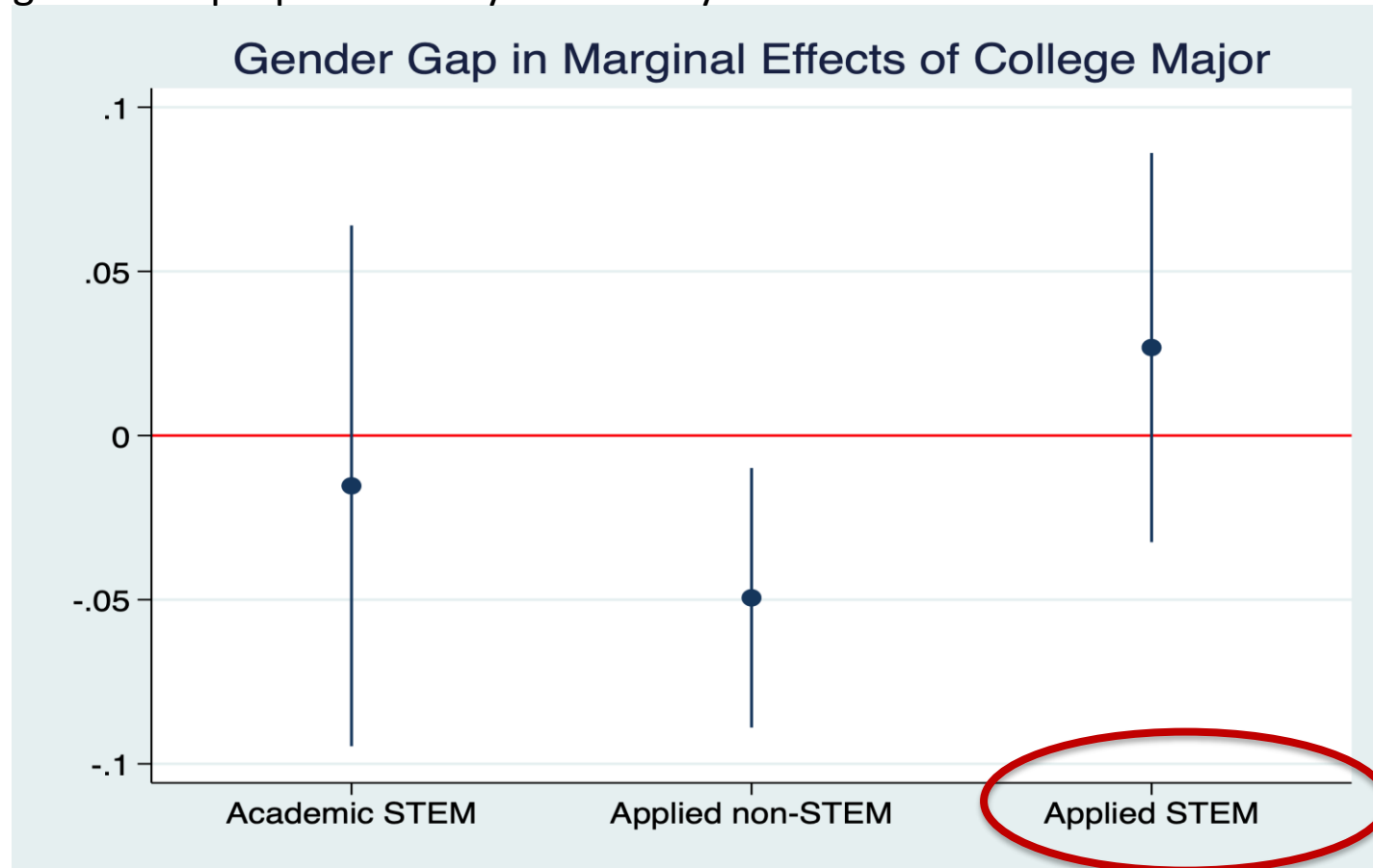
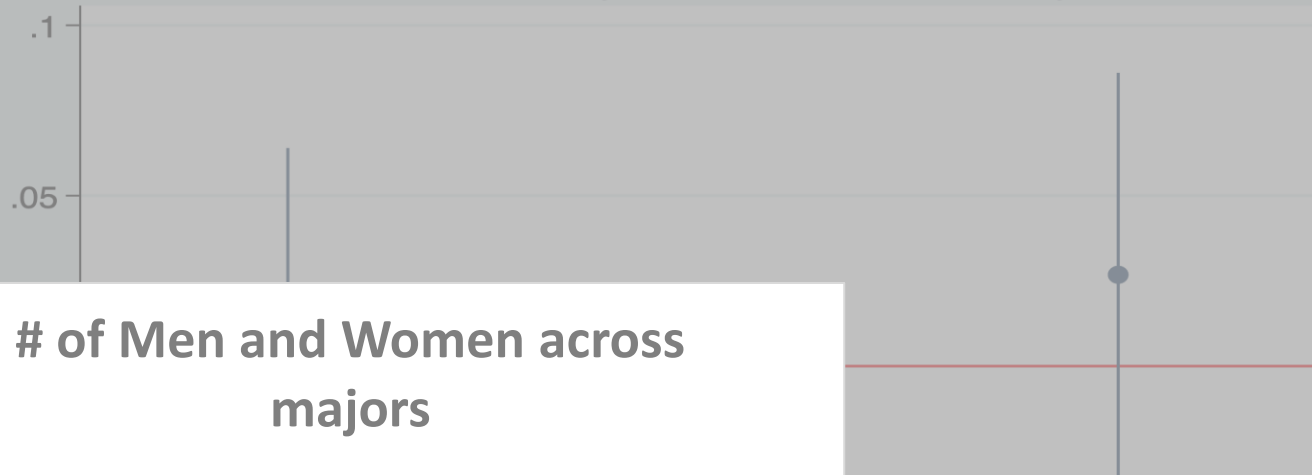


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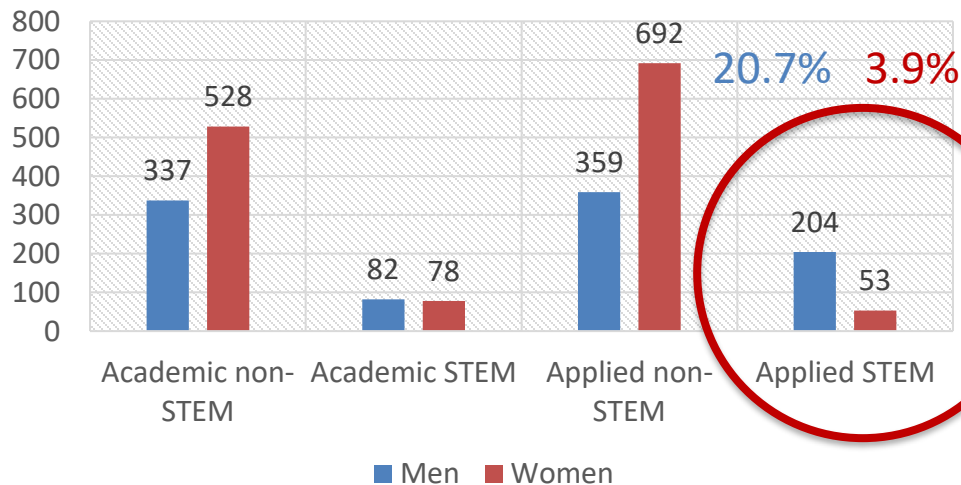


3. Although **applied STEM** degrees offer equal advantages to men and women, **women's significant underrepresentation** in such fields means that these advantages are disproportionately realized by men.

Gender Gap in Marginal Effects of College Major



of Men and Women across majors



Applied STEM

4. Labor market attachment can increase wages, while detachment can reduce wages;

Table 4. College Major, Labor Market Attachment/Detachment, and Gender Wage Gap, Lagged Wage.

	(1)	(2)	(3)	(4)	(5)
Women	-.052** (.02)	-.022 (.02)	-.009 (.02)	-.023 (.02)	-.010 (.02)
Academic STEM		.046 (.04)	.047 (.04)	.049 (.04)	.048 (.04)
X Women		n.s.	n.s.	n.s.	n.s.
Applied non-STEM		.055** (.02)	.051* (.02)	.053* (.02)	.051* (.02)
X Women		n.s.	n.s.	n.s.	n.s.
Applied STEM		.248*** (.03)	.242*** (.03)	.245*** (.03)	.242*** (.03)
X Women		n.s.	n.s.	n.s.	n.s.
Married		.026* (.01)	.024* (.01)	.026* (.01)	.024* (.01)
X Women		n.s.	n.s.	n.s.	n.s.
>=1 child in residence		.005 (.01)	.005 (.01)	.007 (.01)	.005 (.01)
X Women		n.s.	n.s.	n.s.	n.s.
Labor Market Attachme:			.019*** (.00)		.013* (.01)
X Women			-.008** (.00)		-.008** (.00)
Labor Market Detachme				-.027*** (.01)	-.017 (.01)
X Women				n.s.	n.s.
Log-Likelihood	-15483.685	-15450.574	-15434.759	-15438.777	-15431.765
Observations	25092	25092	25092	25092	25092

*Initial wage refers to the first reported wage earned by individuals after obtaining their bachelor's degree. Note: Standard errors are shown in parentheses.

5. The wage benefits individuals gain from labor market attachment is nearly double for men compared to women.

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Conclusion

1. Applied STEM field can foster stronger labor market attachment, and men are four times more likely than women to be in such field.
2. Applied non-STEM fields also enhance labor market attachment, but the effects are three times greater for men than for women.
3. Consistent labor market attachment leads to wage increases; however, men benefit significantly more from these gains than women.



Figure 1. The Pathway of Gender Wage Gap in Education and Employment

Appendices

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- Analytical Strategy
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Literature Review

Individual-Level

- Education: Segregation in Field of Study in College
- Family: Unequal Family Responsibilities

Cumulative (dis)advantage

- How do early educational decision shape long-term employment trajectories, and therefore wages?

Labor-Market Level

- Gender discrimination
- Devaluation of Women's Job
- Gender Segregation in Industry



Theoretical Framework

- Applied/STEM majors → Labor market attachment (+); Labor market detachment (-)
 - Occupational Specificity
 - STEM → Science → Higher valued skill.
- Labor market (de)attachment → Wage
 - Human capital accumulation
 - Singaling effect



Modeling



Estimand 1:

The influence of college majors on long-term employment trajectories and how it varies by gender.

Model	Event history analysis.
Estimator	Discrete-time multilevel linear probability model.
Formula	$\begin{aligned} Attach_{it} &= \alpha + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_3 Gender_i + \beta_4 Major_i \\ &+ \beta_5 (Gender_i \times Major_i) + \beta_6 Family_{it} \\ &+ \beta_7 (Gender_i \times Family_{it}) + \sum \beta_i controls \\ &+ \sum \beta_{it} controls + \varepsilon_{it} \end{aligned}$

Modeling, Wage model.



Estimand 2:

The impact of employment patterns on wage and how it varies by gender.

Model	Growth curve modeling.
Estimator	Multilevel linear regression model.
Formula	$\ln(Wage)_{it} = \alpha + \beta_1 age_{it} + \beta_2 age_{it}^2 + \beta_3 Gender_i + \beta_4 Major_i + \beta_5 (Gender_i \times Major_i) + \beta_6 Attach_{it} + \beta_5 (Gender_i \times Attach_{it}) + \beta_6 Family_{it} + \beta_7 (Gender_i \times Family_{it}) + \sum \beta_i controls + \sum \beta_{it} controls + \varepsilon_{it}$



Measurement

Variable (Time-varying)	Type	Measurement
Family status	Binary	<ul style="list-style-type: none">• Marital Status (Married/not married)• Children in residence (Having children/none)
Labor Market Attachment (t1)	Binary	<ul style="list-style-type: none">• 1, if...• Full-time (t0) → full-time (t1)• Part-time (t0) → full-time (t1)• Not employed (t0) → part-time or full-time (t1)
Labor Market Detachment (t1)	Binary	<ul style="list-style-type: none">• 1, if...• Not employed (t0) → not employed (t1)• Part-time (t0) → not employed (t1)• Full-time (t0) → part-time or not employed (t1)
Years after BA	1,2,3,...	Years after attaining BA.
Industry	Categorical	Core, high-wage service, low-wage service, public sector, extractive and others, not employed.

Measurement, Wage model.

Variable (Time-varying)	Type	Measurement
First Wage	Continuous	<ul style="list-style-type: none">• First Wage after BA.
Wage	Continuous	<ul style="list-style-type: none">• Wage at each time point.
Labor Market Attachment	1,2,3...	<ul style="list-style-type: none">• Cumulative number of labor market attachment.
Labor Market Detachment	1,2,3...	<ul style="list-style-type: none">• Cumulative number of labor market detachment.



Lagged and Unlagged Wage Model



Lagged wage model

ID	Time	Employment status	# Labor market attachment	# Labor market detachment	Wage
1	t0	Full-time	.	.	W1, controlled
1	t1	Full-time	1	0	w2
1	t2	Part-time	1	1	w3
1	t3	Full-time	2	1	w4

Unlagged wage model

ID	Time	Employment status	# Labor market attachment	# Labor market detachment	Wage
1	t0	Full-time	.	.	W1, controlled
1	t1	Full-time	1	0	w2
1	t2	Part-time	1	1	w3
1	t3	Full-time	2	1	w4

Figure 1. Typology of College Major



Figure 1. Typology of College Major.		
	non-STEM	STEM
Academic	Social/Behavioral Science Arts & Humanities Literatures	Biological Science Physical Science Mathematics & Statistics
Applied	Business Finance Communications Education Administration & Social Services Nursing & Other Health Professions	Engineering Computer Science Architecture Technology



Table 2. Gender, College Major, and Labor Market Attachment, Multilevel Linear Probability Model.

	(1)	(2)	(3)	(4)
Women	-.061*** (.010)	-.055*** (.010)	-.032* (.016)	.007 (.017)
Academic STEM		.010 (.022)	.019 (.030)	.028 (.027)
X Women			-.013 (.043)	-.015 (.040)
Applied non-STEM		.048*** (.011)	.085*** (.017)	.083*** (.016)
X Women			-.057** (.022)	-.049* (.020)
Applied STEM		.076*** (.015)	.079*** (.019)	.086*** (.017)
X Women			.034 (.032)	.027 (.030)
Married				.039*** (.011)
X Women				-.076*** (.015)
>=1 child in residence				.008 (.011)
X Women*				-.069*** (.014)
Controls				
Years after BA	.053*** (.002)	.053*** (.002)	.053*** (.002)	.035*** (.002)
Year-Square	-.004*** (.000)	-.004*** (.000)	-.004*** (.000)	-.002*** (.000)
Race/Ethnicity (Ref.White)				
African American	.003 (.013)	.004 (.013)	.003 (.013)	.014 (.012)
Asian or Pacific Islander	-.005 (.027)	-.009 (.027)	-.009 (.027)	-.019 (.027)
Hispanic	-.038** (.015)	-.038** (.014)	-.039** (.014)	-.027* (.014)
Other	-.018 (.028)	-.023 (.028)	-.023 (.028)	-.023 (.025)
Region (Ref.North Central)				
Northeast	.021 (.015)	.023 (.015)	.022 (.015)	.009 (.014)
South	.011 (.013)	.011 (.013)	.010 (.013)	.012 (.012)
West	-.022 (.014)	-.021 (.014)	-.021 (.014)	-.027* (.013)
MSA (Ref. Non-MSA)	.037 (.030)	.036 (.030)	.036 (.030)	.024 (.029)
Industrial Sector (Ref. Core)				
Extractive and Other	.015 (.021)	.018 (.021)	.019 (.021)	.014 (.019)
High-Wage Service	-.131*** (.013)	-.127*** (.013)	-.125*** (.013)	-.037** (.013)
Low-Wage Service	-.121*** (.017)	-.116*** (.017)	-.116*** (.017)	-.089*** (.016)
Public Sector	.041* (.020)	.048* (.020)	.049* (.020)	.048** (.018)
Never been Employed	-.119*** (.019)	-.148*** (.023)	-.136*** (.024)	-.126*** (.019)
Constant	.693*** (.034)	.655*** (.035)	.641*** (.036)	.623*** (.035)
Log-Likelihood	-16357.870	-16341.699	-16336.642	-14660.650
Person-Year	32316	32316	32316	32316

Note: Standard errors are shown in parentheses. +p < .01; *p < .05; **p < .01; ***p < .001.

Controlling graduate degree attainment (time-varying)



Appendix 1. College major, Employment Transition, and Gender Wage Gap, contro

	(1)		(2)		(3)	
Women	-.008	(.02)	-.024	(.02)	-.009	(.02)
Academic STEM	.040	(.04)	.042	(.04)	.041	(.04)
X Women	n.s.		n.s.		n.s.	
Applied non-STEM	.056**	(.02)	.059**	(.02)	.057**	(.02)
X Women	n.s.		n.s.		n.s.	
Applied STEM	.247***	(.03)	.251***	(.03)	.247***	(.03)
X Women	n.s.		n.s.		n.s.	
Married	.022+	(.01)	.024*	(.01)	.022+	(.01)
X Women	n.s.		n.s.		n.s.	
>=1 child in residence	.006	(.01)	.008	(.01)	.007	(.01)
X Women	n.s.		n.s.		n.s.	
Labor Market Attac	.023***	(.00)			.018**	(.01)
X Women	-.009***	(.00)			-.009***	(.00)
Labor Market Deta			-.029***	(.01)	-.015	(.01)
X Women			n.s.		n.s.	
Grad Degree Atta	.147***	(.02)	.140***	(.02)	.146***	(.02)
Lokg-Likelihood	-15375.178		-15384.115		-15372.780	
Observations	25092		25092		25092	

Note: Standard errors are shown in parentheses. +p < .01; *p < .05; **p < .01; ***p < .00



Figure 2. Predicted Probability of Labor Market Attachment across College Major.

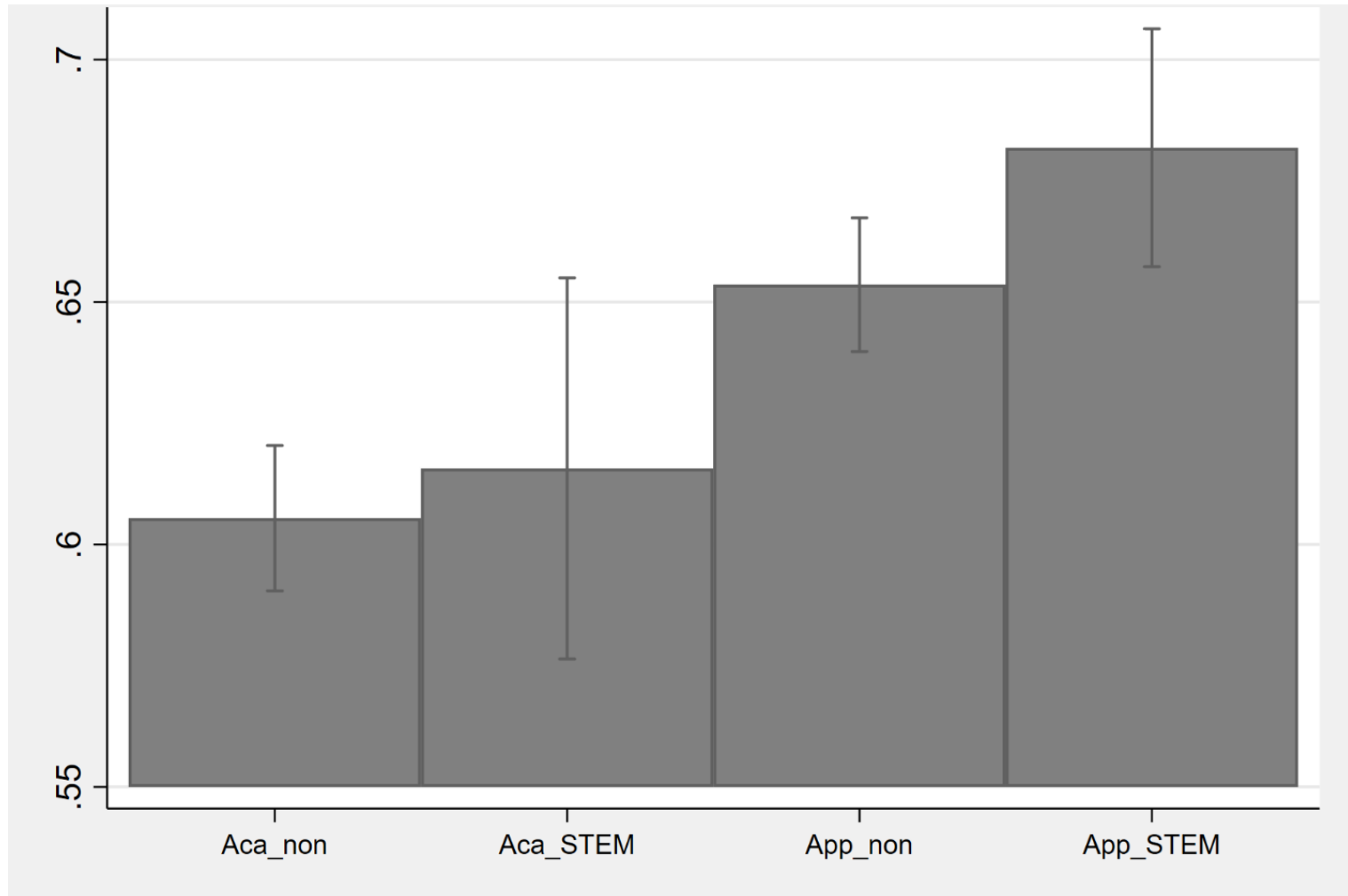




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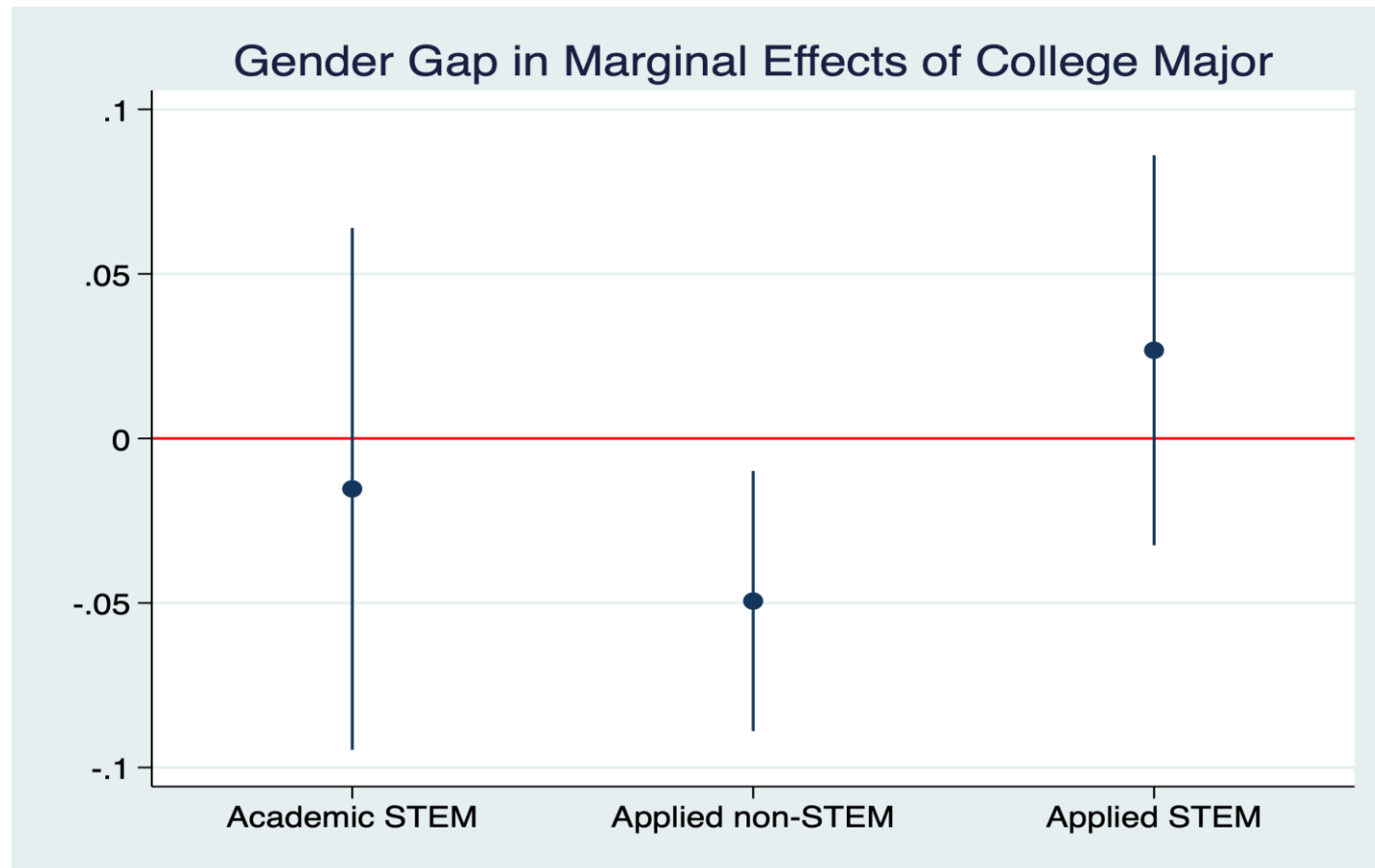




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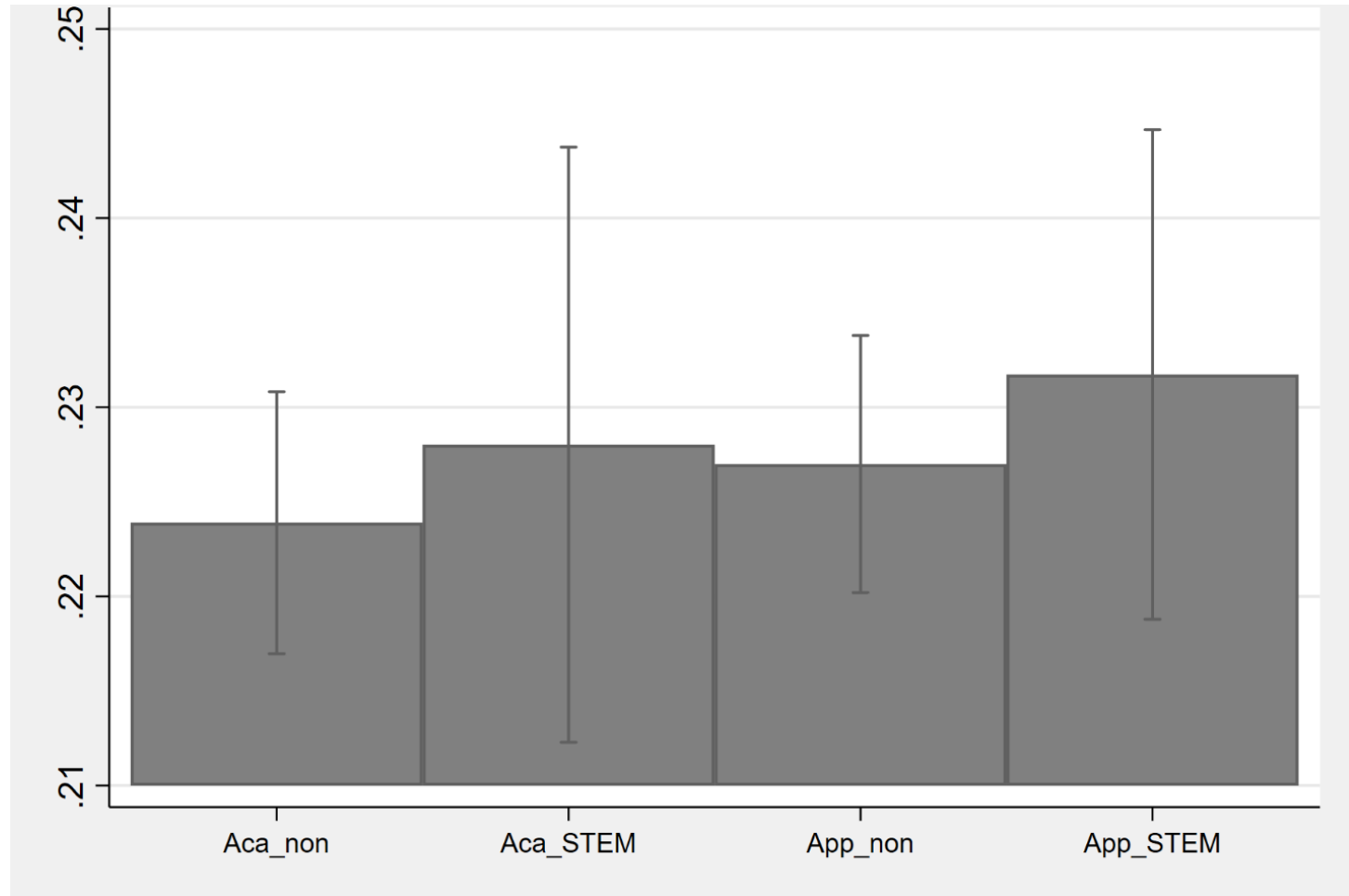




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