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The Gender Gap in STEM Majors: The (Un)-Importance of Life Goals

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Abstract

There is a large gender gap in who chooses STEM majors, yet decades of research have failed to explain this gap in its entirety. We use extensive data on incoming college freshmen to estimate the importance of ability (both test-based and self-assessed), life goals, other self-assessed traits, high school courses, and family background in explaining the gender gap in STEM majors. Even with this detailed data, we can explain only 39% of the gender gap. A Gelbach decomposition shows that self-assessed ability (26%) and high school courses (12%) account for the bulk of the explained gap, while goals explain little and in fact controlling for goals slightly widens the gender gap. Goals are similarly uninformative of the gender gap in STEM persistence from freshman to senior year. On the other hand, goals contribute substantially to gender differences in biology and some non-STEM majors, particularly business, education, and health, but remain uninformative of the gap for the majority of STEM subjects. We conclude that while life goals are strongly related to major choice, gender-based differences in these goals are not the missing piece to the STEM gender gap puzzle.

JEL classification

J01, J16, I20

Keywords

gender gaps, STEM, college major, life goals

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1 Introduction

Gender sorting across fields of study is one of the most persistent features of higher education. Despite dramatic increases in women's college attendance and convergence in many other educational and labor-market outcomes, men and women continue to sort into very different college majors (Mann and DiPrete, 2013; Jiang, 2021). Fields that were heavily male-dominated decades ago, including engineering, mathematics, and physical sciences, remain disproportionately male, while women continue to be concentrated in fields such as education and health. Gender sorting across college majors has important labor-market consequences: field of study is strongly related to subsequent occupation and earnings, and contributes to gender disparities in both (Brown and Corcoran, 1997; Jiang, 2021).

The gender gap in science, technology, engineering, and mathematics (STEM) has attracted particular attention. Women are substantially less likely than men to enter STEM majors and are also less likely to persist in STEM once they enter (Astorne-Figari and Speer, 2018; Kaganovich et al., 2023; Speer, 2023). These gender differences persist beyond undergraduate major choice, including in postgraduate study and into the labour market (Delaney and Devereux, 2022, 2025). Yet the gap is difficult to explain. Men and women enter college with different academic preparation, achievement, and beliefs about their abilities, but accounting for these differences leaves a substantial gender gap in STEM choice. Why are women less likely to choose STEM even when they have similar academic preparation and ability?

One prominent explanation is that men and women place different weights on the outcomes they hope to achieve through their education and careers. Reviews of the STEM gender gap have identified occupational interests, work-family preferences, and broader life goals as potentially important sources of gender sorting across fields (Ceci and Williams, 2010; Wang and Degol, 2017; Kahn and Ginther, 2018). If different fields are perceived as offering different opportunities to achieve goals such as financial success, family life, or social impact, then gender differences in these broader life priorities could generate gender differences in major choice even among students with similar skills and academic preparation.

This paper examines the extent to which gender differences in life goals can explain the gender gap in STEM major choice. We use unusually rich data on incoming college students across the United States, combining measures of academic preparation and achievement, self-assessed abilities, family background, and a detailed battery of life goals and aspirations. Students report their intended major on entering college, and for a subset we also observe their major in the final year. We first estimate raw and covariate-adjusted gender gaps in STEM choice and then use Gelbach (2016)'s decomposition method to quantify the contribution of different sets of characteristics to the explained portion of the gap. We apply the same framework to gender differences across individual fields of study and to persistence in STEM from freshman to senior year.

Our main finding is that gender differences in general life goals do not explain the gender gap in STEM major choice. Even with our rich set of covariates, we account for only about 39% of the total gap. Self-assessed ability and high school coursework are the largest contributors, explaining 26% and 12% of the gap respectively. By contrast, gender differences in life goals work slightly in the opposite direction, so that controlling for goals modestly widens the estimated gender gap. Vocational goals and intended occupations, however – which are already more closely tied to particular fields – account for a substantial share of the gap.

This null result does not reflect a general failure of life goals to predict gender sorting across fields. When we disaggregate major choice, gender differences in goals account for substantial shares of the gender gaps in biology (30%), business (26%), education (17%), and health (12–14%), while contributing very little to gender gaps in engineering, computer science, and mathematics and physical sciences. We find a similarly limited role for goals in STEM persistence. Among students who begin college intending to major in STEM and whom we observe through senior year, women are less likely than men to remain in STEM. Our covariates account for 45% of this persistence gap, but differences in life goals again explain almost none of it.

Existing work has established that differences in academic preparation and measured ability account for only part of the gender gap in STEM major choice. Test scores, prior achievement, and high school course-taking all contribute to gender differences in field of study, but substantial gaps remain after accounting for these factors (Turner and Bowen, 1999; Riegle-Crumb et al., 2012; Speer, 2017; Shi, 2018; Delaney and Devereux, 2019; Card and Payne, 2021). More recent work has emphasized students' beliefs about their own abilities, comparative advantage, and relative performance, which can explain an additional share of gender differences in STEM choice (Delaney and Devereux, 2021; Saltiel, 2023; Owen, 2023; Goulas et al., 2024; Agurto et al., 2025). Taken together, this literature has identified several important components of the STEM gender gap, while leaving a sizeable share unexplained.

A related literature has asked whether gender differences in preferences and aspirations account for some of this remaining gap. Evidence here is more mixed, in part because "preferences" encompass quite different concepts. Some studies consider broad preferences over future outcomes, such as family life, earnings, or helping others (Mann and DiPrete, 2013; Zafar, 2013; Wiswall and Zafar, 2018, 2021), while others incorporate occupational plans or professional goals that are already closely connected to particular fields (Morgan et al., 2013; Shi, 2018). This distinction may be important: Mann and DiPrete (2013) find little role for general life goals in explaining gender differences in STEM, while Morgan et al. (2013) find a much stronger role for occupational plans. These findings raise an important question about what kinds of preferences are actually relevant for explaining gender sorting into STEM.

Our paper makes three contributions. First, we show that gender differences in general life goals do not explain the gender gap in STEM major choice. This is a striking result: male and female students differ substantially in the importance they place on goals such as financial success, helping others, and social impact, and these goals are systematically related to students' choice of major. This finding speaks to a longstanding literature that has considered preferences and aspirations as potential explanations for gender sorting across fields (Mann and DiPrete, 2013; Shi, 2018; Morgan et al., 2013; Jiang, 2021). Our results suggest that broad differences in what men and women want from their future lives are not the missing piece of the STEM gender gap.

Second, we distinguish these general life goals from aspirations that are already closely tied to particular occupations or fields. Previous studies have often considered broad preferences alongside measures such as occupational plans or professional goals (Shi, 2018; Morgan et al., 2013). In our data, this distinction is empirically important: vocational goals and intended occupations account for a substantial share of the STEM gender gap, whereas general life goals do not. This contrast helps clarify what it means to say that "preferences" matter for STEM major choice. Preferences that are already expressed in field-specific aspirations can account for a substantial share of the gender difference in STEM choice, but more fundamental priorities over outcomes such as income, family, and helping others explain little.

Finally, we show that the limited role of general life goals is not an artifact of how we measure major choice, nor does it reflect a general failure of these variables to capture meaningful preferences. The result is robust to excluding undecided students, using a narrower definition of STEM, and examining earlier and later cohorts separately. The same goals account for substantial gender differences in several other fields, including business and education, but contribute very little to gender gaps across the male-dominated STEM fields. They are also largely uninformative about the gender gap in STEM persistence from freshman to senior year. Together, these results show that general life goals matter for educational sorting, but not in the way required to explain women's underrepresentation in most STEM fields.

The paper proceeds as follows. Section 2 describes the data and shows some descriptive analysis. Section 3 describes our empirical approach. Section 4 shows the results. Section 5 concludes.

2 Data

2.1 Data and sample

We use two data sources in our analysis, both administered by the University of California Los Angeles's Higher Education Research Institute (HERI) (Higher Education Research Institute, 1966–2010). Our primary data source is The Freshman Survey (TFS), an annual survey of incoming college freshmen across the United States. The survey is typically administered before classes begin and collects detailed information on students' intended majors, academic preparation and achievement, self-assessed abilities, goals and aspirations, family background, and demographic characteristics.

Colleges opt in to the survey, and the set of participating institutions varies across years. Coverage is nevertheless extensive: almost 2,000 institutions have participated at some point over the life of the survey, ranging from highly selective to non-selective colleges. HERI provides survey weights designed to make each year's norms sample representative of the national population of first-time, full-time entering college students, adjusting for differential response within institutions and participation across institutional strata.

Our analysis uses the survey years in which all variables required for our primary specification are available: 1994, 1996, 1998, 2001, 2006, 2008, and 2010.[1] These seven waves comprise 1,735,623 respondents in the HERI norms sample. After restricting to respondents with non-missing STEM status and complete records on the covariates used in the primary specification, the primary analysis sample contains 731,428 students.

For our analysis of STEM persistence, we additionally use HERI's College Senior Survey (CSS). The CSS records students' senior-year majors, and HERI has linked a subset of CSS respondents to their earlier Freshman Survey responses. The full matched dataset contains 216,525 students who completed the senior survey between 1994 and 2008. Because the variables required for our analysis were not collected in every TFS wave, our persistence analysis is effectively restricted to students who entered college in 1994, 1996, 1998, or 2001. After further restricting the sample to students who initially intended to major in STEM, report a senior-year major outcome, and have complete records on the covariates used in this analysis, the persistence sample contains 8,512 students. Because matching requires respondents to appear in the senior-year survey, we do not observe students who leave college before completing the CSS; our persistence analysis is therefore conditional on being observed as a senior.

2.2 Outcome variables

Our primary outcome is intended major choice in a STEM field. Incoming freshmen report their intended major using 86 categories, including "undecided." We define STEM to include four traditional STEM categories—engineering and architecture, computer science, biological and interdisciplinary sciences, and mathematics and physical sciences—as well as pre-medicine and pre-pharmacy.[2] Students who report being undecided are included in the non-STEM category, while respondents with no intended-major response are excluded. In our primary analysis sample, 38.9% of men and 26.5% of women intend to major in STEM.

We also examine gender gaps across individual fields of study. This analysis both disaggregates the broad STEM category and considers non-STEM fields with substantial gender differences in enrollment, such as education and business. Appendix Table A1 reports intended-major shares by gender across these major categories.

Finally, we examine persistence in STEM using the matched TFS–CSS sample. We

[1] 2010 is the most recent year available in the research-use dataset.

[2] Pre-medicine and pre-pharmacy are not typically degree majors; however, students intending to pursue medicine or pharmacy generally follow coursework similar to that of students in chemistry or biology.

define a student as persisting in STEM if they report an intended STEM major on entering college and a STEM major in the senior-year survey. Students with missing senior-year major reports are excluded, while students who report being undecided in the senior-year survey are classified as not persisting. Among the 8,512 students in our persistence sample, 61% remain in STEM: 68% of men and 55% of women.

2.3 Life goals and aspirations

A central feature of the TFS is a detailed set of questions about students' goals. Students are asked, "*Please indicate the importance to you personally of each of the following*," with responses on a four-point scale from 'essential' to 'not important.' Our primary analysis focuses on 11 general goals: being very well-off financially, helping others in need, raising a family, becoming an authority in one's field, obtaining recognition from colleagues, developing a meaningful philosophy of life, influencing social values, becoming a community leader, keeping up with politics, participating in a community action program, and promoting racial understanding. Although some of these goals relate to students' future careers, none is tied to a particular occupation or field of study. Appendix Figure A1 shows that several of these general goals vary systematically across major categories.

We distinguish these general goals from aspirations that are more directly connected to particular occupations or fields. The survey also asks about vocational goals such as creating artistic works, becoming successful in one's own business, and making a theoretical contribution to science,[3] as well as students' intended occupations. These measures are potentially highly informative about major choice, but have a different interpretation. A student who intends to become an engineer or places high importance on contributing to science has already expressed an orientation toward a particular type of career.

All of these measures are reported at the same time as students' intended majors, so we cannot establish their temporal ordering or interpret their associations with major choice causally. Our distinction is instead conceptual. We treat the general goals as more fundamental preferences over future outcomes because they can in principle be pursued through many different educational and occupational paths. Vocational goals and intended occupations, in contrast, may already embody preferences for particular fields. We therefore focus

[3] The full set of vocational goals is: writing original works, becoming successful in a business of one's own, influencing the political structure, becoming accomplished in one of the performing arts, creating artistic works, and making a theoretical contribution to science.

on general goals in our primary specification and examine vocational goals and intended occupations separately. Comparing the two allows us to assess whether the explanatory power of "preferences" depends on whether they are measured as broad priorities over future outcomes or as aspirations already closely connected to particular careers.

2.4 Other covariates

In addition to general life goals, our primary specification includes five other sets of covariates, summarized in Table 1. The first captures measured academic achievement and ability, using high school grade point average and SAT math and verbal scores. The second captures self-assessed abilities. Students are asked to "*Rate yourself on each of the following traits as compared with the average person your age. We want the most accurate estimate of how you see yourself.*" Responses are on a five-point scale ranging from the highest 10% to the bottom 10%. We include self-assessments of mathematics ability, writing ability, overall academic ability, artistic ability, creativity, and public speaking ability.

Our third set of covariates consists of other self-assessed traits reported in the same survey block: drive to achieve, leadership ability, social confidence, cooperativeness, emotional health, physical health, understanding of others, and intellectual confidence.

The fourth set captures prior academic preparation, measured by the number of years students studied different subjects in high school. The fifth captures family background. Students report both parents' occupations and education. We classify each parent's occupation as STEM, non-STEM, or other, and define first-generation status as neither parent having a bachelor's degree.[4]

For the STEM persistence analysis, we retain the same covariates with the exception of parental occupation, which cannot be coded consistently in the matched TFS–CSS data.[5]

2.5 Gender differences in key variables

Table 1 shows substantial gender differences across several of the characteristics in our analysis. In measured academic outcomes, women have higher high school grade point averages, while men score higher on SAT mathematics; SAT verbal scores are similar across

[4]We do not include parental income because of the large share of missing responses. In the subsample for which parental income is observed, its inclusion has little effect on either the gender gap or the contribution of the other covariate sets.

[5]Differences in the coding of parental occupation across the matched data prevent us from reliably constructing comparable indicators of parental STEM occupation.

Table 1: **Summary statistics**

	Gender		
	Men	Women	Test
N	348,578 (47.7%)	382,850 (52.3%)	
STEM	0.389 (0.487)	0.265 (0.441)	<0.001
Math ability (SA)	0.467 (0.956)	0.072 (0.951)	<0.001
Writing ability (SA)	0.113 (1.043)	0.204 (0.961)	<0.001
Academic ability (SA)	0.440 (0.978)	0.259 (0.946)	<0.001
Artistic ability (SA)	-0.019 (1.041)	0.096 (0.965)	<0.001
Creativity (SA)	0.083 (1.005)	-0.004 (0.970)	<0.001
Public speaking ability (SA)	0.156 (1.007)	0.043 (0.985)	<0.001
SAT Math score	0.423 (0.943)	0.064 (0.941)	<0.001
SAT Verbal score	0.256 (0.971)	0.219 (0.974)	<0.001
High school GPA	0.209 (0.951)	0.424 (0.836)	<0.001
Social confidence (SA)	0.049 (1.026)	-0.127 (0.968)	<0.001
Intellectual confidence (SA)	0.318 (0.958)	-0.051 (0.969)	<0.001
Drive to achieve (SA)	0.051 (1.041)	0.145 (0.946)	<0.001
Leadership ability (SA)	0.130 (0.991)	-0.026 (0.985)	<0.001
Understanding of others (SA)	-0.034 (1.036)	0.097 (0.952)	<0.001
Cooperativeness (SA)	0.002 (1.031)	0.049 (0.961)	<0.001
Emotional health (SA)	0.198 (1.017)	-0.063 (0.977)	<0.001
Physical health (SA)	0.266 (0.995)	-0.140 (0.952)	<0.001
Years study: English	0.053 (0.846)	0.079 (0.809)	<0.001
Years study: Mathematics	0.260 (0.864)	0.144 (0.881)	<0.001
Years study: Foreign Language	0.268 (0.900)	0.466 (0.877)	<0.001
Years study: Physical Science	0.235 (1.006)	0.041 (0.969)	<0.001
Years study: Biological Science	-0.050 (0.936)	0.069 (0.973)	<0.001
Years study: History/Govt	0.085 (0.984)	0.111 (0.953)	<0.001
Years study: Computer Science	0.027 (1.014)	-0.212 (0.850)	<0.001
Years study: Art or Music	-0.152 (0.979)	0.171 (0.999)	<0.001
Mother STEM career	0.049 (0.216)	0.046 (0.210)	<0.001
Mother non-STEM career	0.812 (0.391)	0.813 (0.390)	0.499
Father STEM career	0.152 (0.359)	0.145 (0.352)	<0.001
Father non-STEM career	0.739 (0.439)	0.723 (0.447)	<0.001
First generation	0.229 (0.420)	0.259 (0.438)	<0.001
Financial goal	-0.017 (1.016)	-0.208 (1.021)	<0.001
Helping goal	-0.186 (1.006)	0.144 (0.952)	<0.001
Family goal	0.024 (0.975)	-0.012 (1.008)	<0.001
Authority goal	0.072 (0.983)	0.014 (0.974)	<0.001
Recognition goal	0.014 (1.001)	-0.001 (0.969)	<0.001
Meaning goal	0.102 (1.023)	0.110 (1.001)	<0.001
Social values goal	-0.116 (1.020)	0.057 (0.969)	<0.001
Community leader goal	0.037 (1.006)	0.049 (0.982)	<0.001
Keep up with politics goal	0.187 (1.015)	0.105 (0.990)	<0.001
Community action goal	-0.134 (0.965)	0.195 (1.002)	<0.001
Racial understanding goal	-0.082 (0.990)	0.125 (0.973)	<0.001

Notes: Means with standard deviations in parentheses. Sample restricted to the primary analysis sample and statistics are unweighted. Standardized variables are standardized using the full dataset. SA denotes self-assessed.

genders. Self-assessments show a somewhat different pattern: men rate their mathematics and overall academic abilities more highly, while women rate their writing ability more highly.

Men and women also enter college with different academic preparation. Men report more years of study in mathematics, physical science, and computer science, while women report more study in biological science, foreign languages, art or music, and slightly more English and history or government.

Gender differences are also apparent in the general goals that are central to our analysis. Men place substantially greater importance on being financially well-off, while women place greater importance on helping others in need, influencing social values, participating in community action, and promoting racial understanding. Men also place somewhat greater importance on becoming an authority in their field and keeping up with politics. Gender differences are small for raising a family, gaining recognition from colleagues, developing a meaningful philosophy of life, and becoming a community leader.

Finally, there are gender differences in several of the other self-assessed traits, including social and intellectual confidence, leadership, cooperativeness, and understanding of others. Differences in parental background are comparatively small.

3 Empirical strategy

Our empirical analysis asks three questions. First, how much of the gender gap in STEM major choice can be accounted for by observed student characteristics, and in particular by differences in general life goals? Second, does the contribution of these characteristics differ across individual fields of study? Finally, do the same factors that account for gender differences in initial STEM choice also account for the gender gap in STEM persistence?

3.1 Estimating the gender gap in major choice

We begin by estimating the gender gap in intended major choice using a linear probability model. Our baseline specification is

$$\mathrm{MAJ}_{it} = \alpha_0 + \alpha_1 \mathrm{Female}_i + \nu_t + \epsilon_i, \tag{1}$$

where MAJ_{it} is an indicator for whether student i in survey year t intends to major in the field under consideration, $Female_i$ is an indicator for female students, and ν_t denotes survey-year fixed effects. In our primary analysis, MAJ_{it} indicates an intended STEM major; we subsequently estimate the same specification separately for individual fields of study. The coefficient $\hat{\alpha}_1$ therefore captures the gender gap in major choice, conditional only on survey year.

We then estimate a fully adjusted specification:

$$\text{MAJ}_{it} = \beta_0 + \beta_1 \text{Female}_i + A_i\Gamma_1 + R_i\Gamma_2 + C_i\Gamma_3 + P_i\Gamma_4 + G_i\Gamma_5 + T_i\Gamma_6 + \nu_t + \epsilon_i, \qquad (2)$$

where A_i contains measured academic achievement and ability, R_i self-assessed abilities, C_i prior academic preparation, P_i parental characteristics, G_i general goals, and T_i other self-assessed traits. The coefficient $\hat{\beta}_1$ is the remaining gender gap after accounting for these observed characteristics. All TFS major-choice specifications use HERI student weights, with standard errors clustered by institution. The persistence analysis is unweighted, with standard errors also clustered by institution.

The change from $\hat{\alpha}_1$ to $\hat{\beta}_1$ measures the portion of the gender gap accounted for by the full set of covariates. We report the explained share of the raw gap as

$$\frac{\hat{\alpha}_1 - \hat{\beta}_1}{\hat{\alpha}_1}. \qquad (3)$$

3.2 Decomposing the gender gap in major choice

We use the decomposition method developed by Gelbach (2016) to quantify the contribution of each set of covariates to the change in the estimated gender gap between the baseline and fully adjusted specifications. The Gelbach decomposition provides an exact additive decomposition of the difference $\hat{\alpha}_1 - \hat{\beta}_1$, assigning a unique contribution to each covariate or group of covariates even when those covariates are correlated. Unlike a sequential decomposition, the resulting contributions do not depend on the order in which covariates are added to the regression.[6]

For our primary specification, we group the covariates into six blocks: measured academic achievement and ability, self-assessed abilities, prior academic preparation, parental characteristics, general goals, and other self-assessed traits. We report both the contribution

[6] We implement the decomposition in Stata using Gelbach (2014).

of each block to the change in the female coefficient and that contribution as a share of the raw gender gap.

The decomposition is descriptive rather than causal. A contribution indicates how much of the change in the estimated gender gap is statistically associated with a particular covariate block, conditional on the other variables included in the full model. It does not establish that differences in that characteristic cause the gender gap, nor can it account for omitted variables that may be correlated with the included covariates. We therefore interpret the decomposition as identifying which observed differences between male and female students account statistically for the gender gap, rather than as estimating causal mechanisms.

4 Results

4.1 The Gender Gap in Initial STEM Choice

We begin with the gender gap in intended STEM major choice. Panel A of Table 2 reports estimates from the baseline and fully adjusted specifications. Women are 11.8 percentage points less likely than men to intend to major in STEM. Adding the full set of covariates reduces this gap to 7.2 percentage points, so that the observed characteristics in our data account for 39.3% of the raw gender gap.

Panel B decomposes this change across the six covariate blocks. Differences in self-assessed abilities make the largest contribution, accounting for 26.0% of the raw gender gap, or 3.1 percentage points. Differences in prior academic preparation account for a further 12.1%. Measured academic achievement and ability account for only 4.5%, while parental characteristics and other self-assessed traits make very small contributions.

Most notably for our purposes, differences in general goals do not account for the gender gap in STEM choice. Instead, they work in the opposite direction: gender differences in goals are associated with a 4.6% smaller observed gap. Equivalently, controlling for goals makes the estimated gender gap modestly larger rather than smaller. Thus, although male and female students report systematically different priorities over future outcomes, those differences do not help account for women's lower propensity to choose STEM.

Prior academic preparation is nevertheless an important component of the gap. Although our point estimates are smaller, this finding is consistent with Delaney and Devereux (2019), who find that secondary-school subjects and grades together explain more than half of the

STEM gap in Ireland, with subject choices playing the larger role. In our sample, men enter college with more mathematics, physical science, and computer science coursework, while women have more coursework in several non-STEM subjects.

Table 2: **The gender gap in STEM choice**

	Raw gender gap		With controls	
	Point estimate	Std. error	Point estimate	Std. error
Female	-0.1178	0.0083	-0.0716	0.0049
Observations	731,428		731,428	

Panel B: Gelbach decomposition	Point estimate	Std. error	% of gap
Measured ability	-0.0053	0.0016	4.5
Self-assessed ability	-0.0306	0.0017	26.0
Prior academic preparation	-0.0143	0.0011	12.1
Parents	0.0004	0.0002	-0.4
General goals	0.0055	0.0010	-4.6
Other self-assessed traits	-0.0020	0.0008	1.7
Total	-0.0463	0.0047	39.3

Notes: Panel A reports the coefficient on female from linear probability models with year fixed effects, with and without the full set of covariates. Panel B reports the Gelbach decomposition. The final column reports each contribution as a percentage of the raw gender gap. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

4.2 General goals and field-specific aspirations

Our primary specification focuses on general goals that are not tied to particular fields or occupations. We now compare these with the more field-specific aspirations described in Section 2. Table 3 shows how the decomposition changes when we add vocational goals and students' intended occupations.

The contrast is substantial. When vocational goals are added to the decomposition, gender differences in these goals account for 20.7% of the raw STEM gender gap. When intended occupation is also included, vocational goals account for 14.0% of the gap and intended occupation accounts for a further 23.3%. Together with the other covariates, these measures increase the share of the gender gap accounted for from 39.3% in our primary specification to 64.7%.

General goals, by contrast, remain relatively unimportant. Their contribution reverses sign once field-specific aspirations are included and accounts for only 4.6–5.5% of the raw gap in these augmented specifications. The distinction between different types of "preferences" is therefore empirically important. Broad priorities over outcomes such as financial success, family, and helping others account for little of the STEM gender gap, while aspirations that are already closely connected to particular occupations or fields account for a substantial share.

Table 3: **Gelbach decomposition: general goals and field-specific aspirations**

	(1) Primary			(2) + Vocational goals			(3) + Intended occupation		
	Est.	SE	% gap	Est.	SE	% gap	Est.	SE	% gap
Measured ability	-0.0053	0.0016	4.5	-0.0055	0.0015	4.6	-0.0044	0.0012	3.7
Self-assessed ability	-0.0307	0.0017	26.0	-0.0176	0.0011	14.9	-0.0141	0.0010	11.9
Prior academic preparation	-0.0143	0.0011	12.1	-0.0090	0.0009	7.7	-0.0075	0.0009	6.3
Parents	0.0004	0.0002	-0.3	0.0003	0.0001	-0.2	0.0005	0.0001	-0.5
General goals	0.0054	0.0010	-4.6	-0.0055	0.0009	4.6	-0.0065	0.0008	5.5
Vocational goals				-0.0245	0.0019	20.7	-0.0165	0.0014	14.0
Intended occupation							-0.0276	0.0028	23.3
Other self-assessed traits	-0.0019	0.0008	1.6	0.0010	0.0007	-0.8	-0.0003	0.0007	0.3
Total accounted for	-0.0463	0.0047	39.3	-0.0608	0.0050	51.5	-0.0764	0.0053	64.7
Raw gender gap	-0.1181			-0.1181			-0.1181		
Observations	724,389			724,389			724,389		

Notes: All specifications use the same sample of respondents with non-missing values for the full set of covariates in column (3): this is slightly less than the primary sample used in Table 2. Column (1) includes the primary covariate set; column (2) additionally includes vocational goals; column (3) additionally includes intended occupation. The "% gap" columns report each contribution as a percentage of the raw gender gap. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

4.3 Gender gaps across fields of study

We next examine whether the factors associated with the overall STEM gender gap play similar roles across individual fields of study. This exercise serves two purposes. First, the broad STEM category combines fields with very different gender compositions, so the factors associated with gender sorting need not be the same across them. Second, examining non-STEM fields allows us to assess whether the limited role of general goals is specific to STEM or instead reflects a broader lack of explanatory power of these measures.

Table 4 reports raw gender gaps across major categories and the share of each gap accounted for by the full set of covariates. Gender differences vary substantially across fields. Women are considerably more likely than men to intend to major in education, health, and the social sciences, while men are more likely to choose engineering, business, and computer science. The largest gap is in engineering, where women are 13.6 percentage points less likely than men to intend to major in the field.

Table 4: **Gender gaps across fields of study**

Major	Raw gap	SE	Accounted for	SE	% of gap
Education	0.0618	0.0041	0.0187	0.0015	30.3
Agriculture	-0.0007	0.0004	0.0003	0.0001	–
Business	-0.0811	0.0055	-0.0375	0.0023	46.2
Engineering	-0.1355	0.0106	-0.0444	0.0049	32.8
Computer science	-0.0310	0.0017	-0.0098	0.0007	31.6
Nursing	0.0233	0.0018	0.0036	0.0004	15.6
Other health	0.0561	0.0033	0.0132	0.0010	23.6
Communications/journalism	0.0195	0.0015	0.0046	0.0006	23.7
Social work/protective services	-0.0034	0.0012	0.0039	0.0005	–
Humanities	0.0103	0.0017	0.0165	0.0009	159.9
Biology	0.0252	0.0024	0.0120	0.0011	47.8
Mathematics/physical sciences	-0.0113	0.0013	-0.0125	0.0007	110.4
Social sciences	0.0430	0.0024	0.0128	0.0014	29.8
Other	0.0059	0.0023	0.0187	0.0013	–
Observations	731,428				

Notes: The raw gender gap is the coefficient on female from a linear probability model of intending to major in the indicated field, including survey-year fixed effects. Positive values indicate that women are more likely than men to choose the field. "Accounted for" reports the total change in the female coefficient associated with the full set of covariates. Percentages are not reported when the absolute raw gender gap is less than one percentage point. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

The share of these gaps accounted for by our observed covariates also varies considerably across fields. Among majors with gender gaps of at least one percentage point, the covariates account for between about 16% of the gap in nursing and more than the entire small gap in mathematics and physical sciences. In the latter case, accounting for observed characteristics reverses the sign of the estimated gender gap.

Table 5 decomposes these changes across the six covariate blocks, restricting attention to fields with raw gender gaps of at least one percentage point in absolute value. The role of general goals varies sharply across fields. Gender differences in goals account for 30% of the gender gap in biology, 26% in business, 17% in education, and around 12–14% in the two health categories. By contrast, goals account for only 4% of the gender gap in engineering, 5% in computer science, and essentially none of the gap in mathematics and physical sciences.

This pattern is important for interpreting our main STEM result. The limited contribution of general goals to the overall STEM gender gap does not arise because these measures are generally uninformative about gender sorting across majors. The same measures account for substantial shares of gender differences in several other fields. Rather, their explanatory power is particularly limited in the male-dominated STEM fields. Biology is the notable exception: women are somewhat more likely than men to choose biology, and gender differences in goals account for a large share of that gap.

Other covariate blocks also vary in importance across fields. Self-assessed abilities are especially important for mathematics and physical sciences, while prior academic preparation contributes substantially to the gender gaps in several STEM fields. Parental characteristics make very small contributions throughout.

Table 5: **Decomposition of gender gaps across fields of study**

		Percent of raw gender gap					
Major	Raw gap	General goals	Self-assessed	Measured ability	Prior preparation	Parents	Other traits
Education	0.0618	16.7	0.5	10.1	3.9	0.7	-1.6
Business	-0.0811	25.8	4.1	7.4	5.6	1.5	1.8
Engineering	-0.1355	4.1	11.8	5.1	10.4	0.1	1.3
Computer science	-0.0310	5.1	8.8	5.5	16.9	-0.8	-3.9
Nursing	0.0233	11.8	-5.7	8.6	0.1	0.7	0.1
Other health	0.0561	13.9	-2.6	13.8	2.4	0.2	-4.1
Communications/journalism	0.0195	-16.3	27.8	2.9	2.0	-0.3	7.5
Humanities	0.0103	4.5	102.1	14.5	42.2	-0.7	-2.6
Biology	0.0252	29.8	-6.0	2.5	23.6	0.1	-2.2
Mathematics/physical sciences	-0.0113	-0.8	72.5	14.1	16.0	-1.1	9.8
Social sciences	0.0430	4.7	21.6	-9.5	5.2	0.8	7.0
Observations	731,428						

Notes: Showing fields with an absolute raw gender gap of at least one percentage point. Columns 3–8 report each covariate block's Gelbach contribution as a percentage of the raw gap. Negative values indicate contributions working in the opposite direction. All specifications are weighted using HERI student weights, with standard errors clustered by institution.

4.4 STEM persistence

We next examine whether the same characteristics that account for gender differences in initial STEM choice also account for gender differences in persistence. This is a distinct margin: the sample is restricted to students who initially intend to major in STEM and are subsequently observed in the senior-year survey. The students in this sample are therefore already selected on characteristics associated with initial STEM choice, and the relative importance of the covariates need not be the same as in our analysis of incoming freshmen.

Table 6 presents the results. Among students in the persistence sample, women are 12.4 percentage points less likely than men to remain in STEM by senior year. After accounting for the full set of covariates, the gap falls to 6.8 percentage points, so that observed characteristics account for 44.6% of the raw persistence gap.

Panel B shows that self-assessed abilities again make the largest contribution, accounting for 21.3% of the raw persistence gap. Measured academic achievement and ability account for a further 13.6%, substantially more than in the initial-choice decomposition, while prior academic preparation accounts for only 4.3%, compared with 12.1% for initial choice. Family background and other self-assessed traits make very small contributions.

General goals again account for almost none of the gender gap, explaining only 2.6% of the raw persistence gap. Thus, the limited role of general goals is similar across two different margins of STEM participation. Gender differences in these broader priorities account for neither the large gender gap in initial STEM choice nor the lower probability that women who initially choose STEM are still in STEM when observed as seniors.

Table 6: **The gender gap in STEM persistence**

Panel A: Gender gap	Raw gender gap		With controls	
	Point estimate	Std. error	Point estimate	Std. error
Female	-0.1236	0.0151	-0.0684	0.0141
Observations	8,512		8,512	
Panel B: Gelbach decomposition				
	Point estimate	Std. error	% of gap	
Measured ability	-0.0168	0.0076	13.6	
Self-assessed ability	-0.0263	0.0047	21.3	
Prior academic preparation	-0.0053	0.0035	4.3	
First-generation status	0.0001	0.0003	-0.1	
General goals	-0.0032	0.0039	2.6	
Other self-assessed traits	-0.0036	0.0041	2.9	
Total	-0.0551	0.0084	44.6	

Notes: Panel A reports the coefficient on female from linear probability models with freshman-cohort fixed effects, with and without the full set of covariates. Panel B reports the Gelbach decomposition. The final column reports each contribution as a percentage of the raw gender gap. Parental background in this analysis is measured by first-generation status. Specifications are unweighted; standard errors are clustered by institution.

4.5 Robustness checks

We conduct four sets of robustness checks on our primary results. First, we examine whether the decomposition differs across more- and less-selective colleges. Second, because SAT scores are missing for a substantial share of TFS respondents, we examine whether the resulting sample restriction affects our conclusions. Third, we decompose the contribution of general goals into the contributions of the individual goal measures. Finally, we examine alternative treatment of undecided majors, a narrower definition of STEM, and earlier and later survey cohorts.

Appendix Table A4 reports the decomposition separately for students attending colleges with average SAT scores of at least 1200 and those attending less-selective institutions. The broad pattern is similar across the two groups. Our covariates account for 41.3% of the gender gap at more-selective institutions and 31.1% at less-selective institutions. Self-assessed abilities make the largest contribution in both groups, while prior academic preparation accounts for about 13% of the gap in each. Most importantly for our main result, general goals work in the opposite direction in both groups, corresponding to -4.7% and -4.3% of the raw gender gap respectively.

We next examine the consequences of requiring non-missing SAT scores. Appendix Table A5 first re-estimates the decomposition on our primary sample after removing SAT scores from the measured academic achievement and ability block. The overall share of the gap accounted for falls from 39.3% to 31.2%. With only high school GPA remaining in this block, gender differences in measured achievement work in the opposite direction, while the contribution of self-assessed abilities rises from 26.0% to 31.2%.

We then estimate the same specification without SAT scores using the much larger sample of respondents with complete data on the remaining variables. The decomposition is very similar: the covariates account for 31.5% of the gender gap, compared with 31.2% in the restricted sample. General goals remain unimportant in both specifications and continue to work in the opposite direction. These results suggest that although SAT scores themselves contribute information to the decomposition, restricting the primary analysis to respondents who report SAT scores is not driving our main conclusions.

Appendix Table A6 treats each of the 11 general goals as a separate block. The small aggregate contribution of general goals masks modest contributions that work in opposing directions across individual goals. For example, differences in the importance placed on influencing social values account for 6.4% of the raw gap, while helping others and participating in community action work in the opposite direction, corresponding to -5.3% and -4.6% of the raw gap.

Finally, Appendix Table A7 shows that the main conclusion is insensitive to several alternative sample and outcome definitions. Excluding students who report being undecided yields a general-goals contribution of -4.7%, very close to the baseline. Using a narrower STEM definition that excludes pre-medicine and pre-pharmacy reduces the contribution of general goals to essentially zero (-0.3%). College students' goals and abilities have changed considerably over time (Leighton and Speer, 2026); however, splitting the sample into earlier (1994–2001) and later (2006–2010) cohorts also leaves the qualitative result unchanged. General goals work in the opposite direction in both periods, accounting for -3.0% and -8.1% of the raw gap respectively.

5 Conclusion

Gender differences in field of study remain large despite substantial convergence in many other educational outcomes. In this paper, we ask whether gender differences in the broader outcomes that students hope to achieve through their education and careers help account for the persistent gender gap in STEM. Using unusually rich data on incoming college students, we consider initial STEM choice, gender sorting across individual fields, and persistence in STEM through the senior year.

Our main result is that gender differences in general life goals do not account for the gender gap in STEM. In our primary specification, observed characteristics account for about 39% of the initial gap, with self-assessed abilities and prior academic preparation making the largest contributions. General goals, by contrast, work slightly in the opposite direction. The same conclusion holds for STEM persistence: among students who initially intend to major in STEM and are observed as seniors, our covariates account for about 45% of the gender gap in remaining in STEM, but general goals account for almost none of it. This does not mean that these goals are generally unimportant for gender sorting across fields. They account for substantial shares of the gender gaps in biology, business, education, and health, but very little of the gaps in the male-dominated STEM fields.

The distinction between general goals and more field-specific aspirations is also important. Vocational goals and intended occupations account for a substantial share of the STEM gender gap, while broader priorities such as financial success, family life, and helping others do not. Measures commonly grouped together as "preferences" or "aspirations" can therefore have quite different explanatory power depending on how closely they are already tied to particular educational and occupational paths. Because these field-specific aspirations are reported at the same time as intended major, we do not interpret their contribution causally; rather, the contrast helps clarify what kinds of preferences are—and are not—associated with gender sorting into STEM.

Taken together, our results suggest that gender differences in broad life priorities are not the missing explanation for women's underrepresentation in STEM. Even with unusually detailed measures of academic preparation, achievement, self-assessed abilities, family background, and goals, a substantial portion of the gender gap remains unexplained. In that sense, the persistent gender gap in STEM major choice remains a puzzle.

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A Appendix Tables and Figures

Table A1: **Major choice by gender**

Major	Women (%)	Men (%)	Female/male ratio
Education	9.5	3.5	2.7
Agriculture	0.3	0.3	0.8
Business	13.0	20.9	0.6
Engineering	4.5	18.6	0.2
Computer science	0.8	4.1	0.2
Nursing	3.5	1.2	2.8
Other health	11.2	6.0	1.9
Communications/journalism	5.2	2.8	1.9
Social work/protective services	1.3	1.4	0.9
Humanities	9.8	7.9	1.2
Biology	12.2	9.0	1.3
Mathematics/physical sciences	4.6	6.0	0.8
Social sciences	15.5	10.7	1.5
Other	8.6	7.6	1.1
Total count	349,001	326,158	

Notes: Shares are calculated within gender among students in the primary analysis sample who report an intended major. Undecided students are omitted. Statistics are unweighted.

Table A2: **Summary statistics: matched TFS–CSS sample**

	Gender		
	Men	Women	Test
N	3,880 (45.6%)	4,632 (54.4%)	
STEM persistence	0.680 (0.466)	0.551 (0.497)	<0.001
Math ability (SA)	0.759 (0.811)	0.354 (0.859)	<0.001
Writing ability (SA)	-0.038 (1.035)	-0.028 (0.958)	0.623
Academic ability (SA)	0.525 (0.889)	0.277 (0.901)	<0.001
Artistic ability (SA)	-0.008 (0.991)	-0.005 (0.916)	0.913
Creativity (SA)	0.028 (0.976)	-0.157 (0.960)	<0.001
Public speaking ability (SA)	-0.007 (0.975)	-0.106 (0.958)	<0.001
SAT Math score	0.575 (0.903)	0.141 (0.921)	<0.001
SAT Verbal score	0.223 (0.938)	0.090 (0.942)	<0.001
High school GPA	0.309 (0.847)	0.427 (0.771)	<0.001
Social confidence (SA)	-0.018 (1.043)	-0.128 (0.961)	<0.001
Intellectual confidence (SA)	0.388 (0.949)	-0.003 (0.971)	<0.001
Drive to achieve (SA)	0.110 (1.018)	0.210 (0.915)	<0.001
Leadership ability (SA)	0.029 (1.000)	-0.091 (0.989)	<0.001
Understanding of others (SA)	-0.134 (1.046)	0.018 (0.956)	<0.001
Cooperativeness (SA)	-0.026 (1.031)	0.036 (0.971)	0.004
Emotional health (SA)	0.195 (1.009)	-0.020 (0.970)	<0.001
Physical health (SA)	0.304 (0.998)	-0.101 (0.947)	<0.001
Years study: English	0.003 (0.771)	0.027 (0.759)	0.152
Years study: Mathematics	0.386 (0.779)	0.283 (0.825)	<0.001
Years study: Foreign Language	0.097 (0.879)	0.253 (0.821)	<0.001
Years study: Physical Science	0.340 (1.026)	0.149 (1.010)	<0.001
Years study: Biological Science	0.030 (1.008)	0.309 (1.039)	<0.001
Years study: History/Govt	-0.036 (0.967)	0.003 (0.941)	0.063
Years study: Computer Science	0.161 (1.073)	-0.147 (0.925)	<0.001
Years study: Art or Music	-0.209 (0.979)	0.061 (0.970)	<0.001
First generation	0.203 (0.403)	0.229 (0.420)	0.004
Financial goal	0.136 (0.940)	-0.073 (0.961)	<0.001
Helping goal	-0.222 (1.000)	0.163 (0.965)	<0.001
Family goal	0.003 (0.984)	-0.037 (1.009)	0.062
Authority goal	0.053 (0.961)	0.031 (0.965)	0.289
Recognition goal	0.036 (0.974)	0.052 (0.965)	0.433
Meaning goal	0.019 (0.995)	0.025 (0.988)	0.782
Social values goal	-0.346 (0.982)	-0.138 (0.948)	<0.001
Community leader goal	-0.083 (0.963)	-0.063 (0.949)	0.328
Keep up with politics goal	-0.065 (0.939)	-0.177 (0.903)	<0.001
Community action goal	-0.202 (0.934)	0.161 (1.005)	<0.001
Racial understanding goal	-0.208 (0.947)	0.018 (0.944)	<0.001

Notes: Means with standard deviations in parentheses. Sample restricted to the persistence analysis sample and statistics are unweighted. Standardized variables are standardized using the full matched dataset. SA denotes self-assessed.

Table A3: **Summary statistics: field-specific aspirations**

	Gender		
	Men	Women	Test
N	345,216 (47.7%)	379,173 (52.3%)	
Writing career goal	0.014 (1.009)	0.042 (1.024)	<0.001
Business career goal	0.049 (0.984)	-0.212 (0.961)	<0.001
Politics career goal	0.095 (1.033)	-0.049 (0.979)	<0.001
Performing arts career goal	-0.066 (0.956)	0.072 (1.016)	<0.001
Artistic career goal	-0.092 (0.940)	0.021 (1.000)	<0.001
Science career goal	0.100 (1.035)	-0.087 (0.984)	<0.001
Student intends STEM career	0.237 (0.425)	0.177 (0.382)	<0.001
Student intends non-STEM career	0.532 (0.499)	0.543 (0.498)	<0.001
Student career undecided	0.133 (0.339)	0.164 (0.370)	<0.001
Student other career intention	0.053 (0.225)	0.074 (0.262)	<0.001
Student career intention missing	0.044 (0.206)	0.043 (0.203)	0.008

Notes: Means with standard deviations in parentheses. Sample restricted to the common sample used in Table 3, and statistics are unweighted. Vocational goal measures are standardized using the full dataset.

Table A4: **Gelbach decomposition by college selectivity**

	High selectivity			Low selectivity		
	Est.	SE	% gap	Est.	SE	% gap
Measured ability	-0.0040	0.0015	2.8	0.0021	0.0014	-2.8
Self-assessed ability	-0.0408	0.0023	28.6	-0.0202	0.0013	26.2
Prior academic preparation	-0.0186	0.0016	13.0	-0.0097	0.0011	12.6
Parents	0.0008	0.0002	-0.5	0.0005	0.0002	-0.6
General goals	0.0068	0.0015	-4.7	0.0033	0.0011	-4.3
Other self-assessed traits	-0.0031	0.0011	2.2	0.0001	0.0009	-0.1
Total accounted for	-0.0589	0.0058	41.3	-0.0239	0.0029	31.1
Raw gender gap	-0.1426			-0.0769		
Observations	497,342			229,950		

Notes: High-selectivity institutions have average SAT scores of 1200 or above. The % gap columns report each contribution as a percentage of the raw gender gap. Observations with missing institutional selectivity are omitted. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

Table A5: **Gelbach decomposition: SAT robustness check**

	(1) Baseline			(2) Base sample, no SAT			(3) Expanded sample, no SAT		
	Est.	SE	% gap	Est.	SE	% gap	Est.	SE	% gap
Measured ability	-0.0053	0.0016	4.5	0.0100	0.0007	-8.5	0.0078	0.0005	-6.7
Self-assessed ability	-0.0306	0.0017	26.0	-0.0368	0.0021	31.2	-0.0339	0.0020	29.0
Prior academic preparation	-0.0143	0.0011	12.1	-0.0131	0.0011	11.1	-0.0111	0.0008	9.5
Parents	0.0004	0.0002	-0.4	-0.0002	0.0002	0.2	-0.0003	0.0002	0.2
General goals	0.0055	0.0010	-4.6	0.0049	0.0010	-4.2	0.0030	0.0009	-2.6
Other self-assessed traits	-0.0020	0.0008	1.7	-0.0016	0.0008	1.3	-0.0022	0.0007	1.9
Total accounted for	-0.0463	0.0047	39.3	-0.0367	0.0042	31.2	-0.0367	0.0034	31.5
Raw gender gap	-0.1178			-0.1178			-0.1166		
Observations	731,428			731,428			1,347,173		

Notes: Columns (1) and (2) use the primary analysis sample. Column (2) omits SAT scores from the measured-ability block. Column (3) also omits SAT scores and expands the sample to respondents with complete data on the remaining variables. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

Table A6: **Individual contributions of general life goals**

Goal	Contribution	SE	% of gap
Financial goal	-0.0017	0.0004	1.5
Helping goal	0.0062	0.0005	-5.3
Family goal	0.0002	0.0001	-0.2
Authority goal	0.0002	0.0001	-0.1
Recognition goal	-0.0002	0.0001	0.1
Meaning goal	-0.0000	0.0000	0.0
Social values goal	-0.0075	0.0005	6.4
Community leader goal	-0.0001	0.0001	0.1
Keep up with politics goal	0.0023	0.0002	-1.9
Community action goal	0.0055	0.0006	-4.6
Racial understanding goal	0.0006	0.0003	-0.5
General goals total	0.0055	0.0010	-4.6
Raw gender gap	-0.1178		
Observations	731,428		

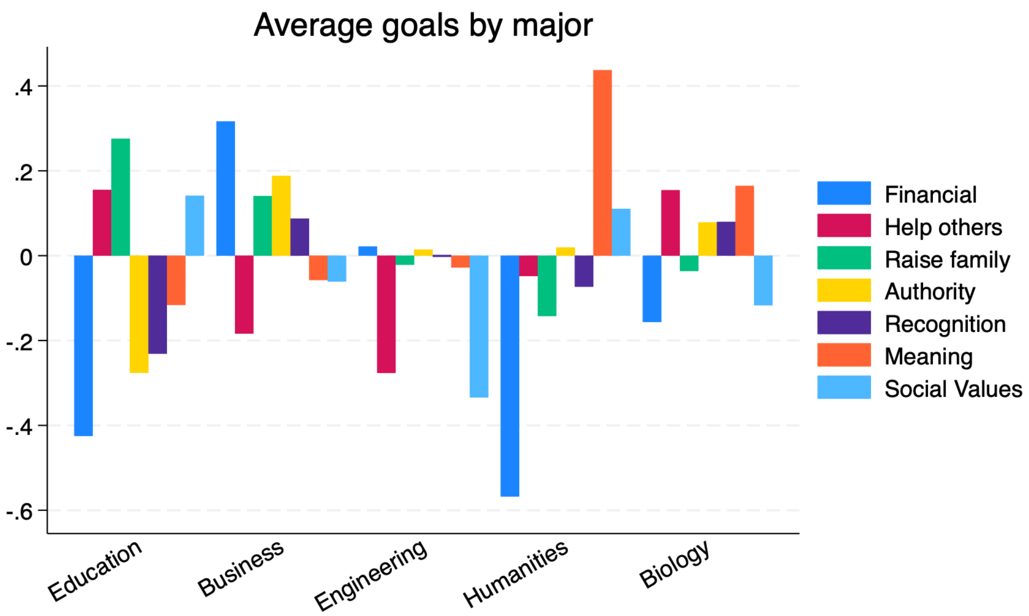
Notes: Each general goal is treated as a separate block in the Gelbach decomposition; all other covariate blocks are defined as in the primary specification. The final column reports each contribution as a percentage of the raw gender gap. All specifications are weighted using HERI student weights; standard errors are clustered by institution.

Table A7: **Robustness of the STEM gender-gap decomposition**

	(1) Baseline	(2) Excl. undecided	(3) Core STEM	(4) Early	(5) Late
Raw gender gap	-0.1178	-0.1202	-0.1527	-0.1349	-0.0938
General goals	-4.6	-4.7	-0.3	-3.0	-8.1
Self-assessed ability	26.0	27.1	18.6	20.7	37.7
Measured ability	4.5	5.8	6.3	4.5	4.5
Prior academic preparation	12.1	11.9	10.0	12.6	10.7
Parents	-0.4	-0.4	-0.2	-0.0	-1.1
Other self-assessed traits	1.7	2.3	1.4	1.8	1.6
Total accounted for	39.3	42.0	35.8	36.6	45.3
Observations	731,428	675,159	731,428	481,717	249,711

Notes: Column (1) reports the primary specification. Column (2) excludes students who report being undecided about their intended major. Column (3) defines STEM to include engineering and architecture, computer science, biological and interdisciplinary sciences, and mathematics and physical sciences, excluding pre-medicine and pre-pharmacy. Columns (4) and (5) restrict the sample to the 1994–2001 and 2006–2010 survey waves, respectively. Except for the raw gender gap and number of observations, entries report each Gelbach contribution as a percentage of the raw gender gap. Negative values indicate contributions working in the opposite direction. All specifications are weighted using HERI student weights, with standard errors clustered by institution.

Figure A1: **Average values of selected goals by major category**



Note: Data from the TFS. Goals are measured in standard deviations; major categories are a non-exhaustive selection.