



Drop out, switch majors, or persist? The contrasting gender gaps

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HIGHLIGHTS

- Men are more likely to drop out of college; women are more likely to switch majors.
- Overall, effects offset so there is no gap in major persistence.
- In STEM, gender gap in switching swamps drop-out gap.
- Conditional on starting in STEM, women are much less likely to persist in STEM.
- We find no evidence that women are more responsive to low early-college grades.

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ABSTRACT

Men and women respond differently to early-college struggles. Men are more likely than women to drop out of college, while women are more likely to switch majors. These effects offset so that there is no gender gap in the probability of graduating in one's initial major choice. For students who begin in STEM majors, however, women are far less likely to graduate in the field, driven by the fact that they are twice as likely to switch majors. We find no evidence that women are more sensitive to poor academic performance in the switching or dropout decisions.

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1. Introduction

This paper studies two ways students respond to struggles in college: dropping out and switching majors. Overall, we find that there is no gender gap in the probability of graduating in the student's initial major (what we call major persistence). However, men and women who do not persist leave their majors in different ways. Men are more likely than women to drop out of college, while women are more likely to switch majors. These effects offset perfectly. However, women are far less likely to persist in STEM (science, technology, engineering, and mathematics) fields, driven by the fact that they are twice as likely to switch majors. We find no evidence that women are more sensitive than men to low grades.

While dropping out and major switching have been studied from both academic (e.g. Arcidiacono, 2004) and nonacademic (e.g.

Gerdes and Mallinckrodt, 1994) angles, our paper is the first to document the contrasting gender gaps in the two decisions.

2. Data

Our data source is the National Longitudinal Survey of Youth's 1997 cohort. The NLSY97 is a nationally representative panel data set of 8,984 individuals born between 1980 and 1984, who have been followed from 1997 through the present.

Respondents are asked their major field of study and GPA each time they are interviewed. Our sample consists of all students who attend a four-year college or university and ever report a GPA, giving us 2997 observations.¹ We define early GPA as the reported GPA in the student's first year of college. The initial major choice is the first major the student reports (other than "No major", and the

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¹ We lose about 50 dropouts who never report a GPA, but this does not affect our results. Results are also nearly identical when restricting to those who ever report a major, which shrinks the sample by 247.

Table 1

Dropping out, switching majors, and major persistence (full sample)

	Drop out (1)	Switch majors (2)	Major persistence (3)	Drop out (4)	Switch majors (5)	Major persistence (6)
Female	−0.077*** (0.017)	0.076*** (0.017)	0.001 (0.017)	−0.075*** (0.017)	0.075*** (0.017)	0.001 (0.017)
Black	0.081*** (0.022)	0.025 (0.023)	−0.107*** (0.025)	0.081*** (0.022)	0.025 (0.023)	−0.107*** (0.025)
Hispanic	0.062*** (0.025)	0.020 (0.025)	−0.082*** (0.026)	0.063*** (0.025)	0.019 (0.025)	−0.082*** (0.026)
Asian	−0.191*** (0.060)	0.078 (0.048)	0.112** (0.048)	−0.190*** (0.060)	0.078 (0.048)	0.112** (0.048)
AFQT	−0.106*** (0.009)	0.044*** (0.009)	0.062*** (0.010)	−0.106*** (0.009)	0.044*** (0.009)	0.062*** (0.010)
Early GPA	−0.074*** (0.012)	0.000 (0.012)	0.075*** (0.013)	−0.094*** (0.018)	0.016 (0.019)	0.079*** (0.019)
Female × Early GPA				0.037 (0.024)	−0.027 (0.025)	−0.010 (0.026)
Observations	2,997	2,997	2,997	2,997	2,997	2,997
Pseudo-R ²	0.055	0.055	0.055	0.055	0.055	0.055
Mean of dependent variable	0.38	0.29	0.34	0.38	0.29	0.34
Mean for males	0.42	0.25	0.34	0.42	0.25	0.34
Mean for females	0.35	0.32	0.34	0.35	0.32	0.34

Note: The sample is from the NLSY97 and includes all students who attended a four-year college and reported a GPA. The estimates reported are marginal effects from a multinomial logit regression. Columns 1–3 and columns 4–6 represent two different multinomial logit regressions.

Standard errors in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

major of graduation is the last major reported before the student graduates from college.

There are three possible outcomes for each student. A student is a dropout if she attends a four-year college and does not graduate. A major switcher is a student who graduates in a different major than she first reported. The third outcome, major persistence, is graduating in the major one starts in; it is equal to one if the student does not drop out or switch majors. The three outcomes are exhaustive and mutually exclusive. The sample means of dropping out, switching majors, and major persistence are 0.38, 0.29, and 0.34, respectively. We also include age-adjusted AFQT scores — a measure of pre-college cognitive ability in our analysis.

3. Results

We run regressions of the form

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 \text{Female}_i + \beta_3 \text{GPA}_i + \beta_4 \text{Female}_i * \text{GPA}_i + \epsilon_i.$$

The subscript i denotes the student. The outcome variable Y_i can be dropping out, switching majors, or major persistence. X_i includes the student's race/ethnicity and AFQT score, and GPA_i is the student's first-year grade point average on a four-point scale. The interaction term between female and GPA tests if females are more sensitive to early-college grades.

Because the three outcomes are exhaustive, we run a multinomial logit regression, and Table 1 reports the marginal effects of each variable. The first three columns exclude the interaction between gender and GPA, while the last three columns include it. Results are similar when using linear probability models.

Males are 7.7 percentage points (or 22%) more likely to drop out. The male–female differential is about the same as the effect of one point of GPA. In column 2, the gender gap reverses for major switching: women are 7.6 percentage points more likely than men to switch majors. These effects perfectly offset so that there is no gender gap in major persistence. This is in contrast to the racial/ethnic gaps, as both blacks and Hispanics are more likely

to drop out and to switch majors. Students with low AFQT scores are also more likely to drop out.

Dropouts have the lowest GPAs, while major persisters have the highest GPAs. Columns 4–6 show only insignificant differences between men and women in the effect of GPA, although the point estimate hints that men may be more sensitive than women in the dropout decision.²

Men drop out of college more, while women switch majors more. There are many potential explanations for this. For example, women may possess higher noncognitive skills and be able to “try again” if they do not perform well in their first major (Jacob, 2002). Job opportunities may be greater for male college dropouts than for females, thus giving women more incentive to stay in college and try another major (Altonji, 1993). Men may be more averse to student loan debt than women, making them more likely to drop out (Dwyer et al., 2013).

3.1. Results for STEM fields

Our second set of results focuses on students whose initial majors are in STEM fields, which constitutes one-fifth of the full sample.³ Table 2 repeats the analysis of Table 1 for the STEM sample. Here, switching means leaving STEM, and STEM persistence means graduating in STEM. Results are similar when counting within-STEM switchers as major switchers.

Again, men are more likely to drop out of college, while women are more likely to switch out. Both gaps here are larger than in the overall sample, and the switching gap is particularly large.⁴

² The GPA variable is de-measured so that the main effect of gender is the effect at the average GPA.

³ Note that this restriction necessarily excludes the dropouts who never reported a major.

⁴ We have also run our analysis including all of the ASVAB test scores instead of just the AFQT score, as some of these scores are known to explain portions of the STEM gender gap (Speer, 2017). While this alters the gender coefficients in the dropout columns (but not the switching columns) a bit, the changes are not significant and do not affect our conclusions, either for the overall sample or for STEM.

Table 2

Dropping out, switching out of STEM, and STEM persistence.

	Drop out (1)	Switch out (2)	STEM Persistence (3)	Drop out (4)	Switch out (5)	STEM Persistence (6)
Female	−0.120*** (0.036)	0.199*** (0.033)	−0.079** (0.038)	−0.118*** (0.036)	0.206*** (0.034)	−0.088** (0.040)
Black	−0.037 (0.051)	0.010 (0.051)	0.027 (0.057)	−0.037 (0.051)	0.008 (0.051)	0.029 (0.057)
Hispanic	0.037 (0.053)	0.056 (0.055)	−0.093 (0.062)	0.037 (0.053)	0.055 (0.055)	−0.091 (0.062)
Asian	−0.220** (0.101)	0.112 (0.080)	0.108 (0.089)	−0.217** (0.101)	0.111 (0.080)	0.106 (0.089)
AFQT	−0.118*** (0.020)	0.004 (0.021)	0.114*** (0.023)	−0.117*** (0.020)	0.004 (0.021)	0.113*** (0.023)
Early GPA	−0.106*** (0.023)	−0.033 (0.025)	0.140*** (0.029)	−0.095*** (0.030)	−0.028 (0.035)	0.123*** (0.035)
Female × Early GPA				−0.039 (0.053)	−0.017 (0.052)	0.056 (0.066)
Observations	613	613	613	613	613	613
Pseudo- R^2	0.095	0.095	0.095	0.095	0.095	0.095
Mean of dependent variable	0.31	0.28	0.41	0.31	0.28	0.41
Mean for males	0.36	0.20	0.45	0.36	0.20	0.45
Mean for females	0.25	0.40	0.35	0.25	0.40	0.35

Note: The sample includes all students who attended a four-year college, reported a GPA, and first reported a STEM major. The estimates reported are marginal effects from a multinomial logit regression. Columns 1–3 and columns 4–6 represent two different multinomial logit regressions. Standard errors in parentheses.

*** $p < 0.01$.

** $p < 0.05$.

* $p < 0.1$.

Women are 19.9 percentage points more likely to switch out of STEM, doubling the switching rate of men.

Unlike the overall results, there is a substantial gender gap in persistence for those who start in STEM fields. Women are 7.9 percentage points (18%) less likely to graduate in a STEM major conditional on starting one, driven by the huge gap in switching behavior. Not only is there a gender gap in who starts a STEM field, but this gap also grows considerably from the initial major choice to graduation. In our data, 60% of STEM starters are men, while 68% of STEM finishers are men.

The outcomes are strongly related to grades, with persisters having the highest grades and dropouts the lowest.⁵ For STEM, we also find no significant evidence that men or women are more sensitive to low grades in either decision.⁶

4. Conclusion

Many students struggle in college, but men and women cope with these struggles differently. Men are more likely than women to drop out of college, while women are more likely to switch majors, leaving no gender gap in major persistence. However, there is still a large gender gap in STEM persistence, where women's high switch-out rates swamp the male dropout effect. Something about STEM majors seems to repel women to a degree not seen in other majors.

While some evidence has shown that, on average, women are more sensitive to grades than men in choosing a major (e.g. Ost, 2010; Rask and Tiefenthaler, 2008), our results do not support this conclusion. We find only insignificant differences in sensitivity,

⁵ Other recent work has focused on the impact of grades on students' likelihood of majoring in STEM fields (e.g. Arcidiacono et al., 2016; Stinebrickner and Stinebrickner, 2013). Our GPA measure represents overall grades rather than GPA in specific courses. Thus, if grades in STEM courses are what matter most for STEM attrition, our estimates of the effects of grades will be muted.

⁶ Many other papers study attrition from STEM and the mechanisms involved in more detail, including Bettinger (2010), Fischer (2017), and Bostwick (2017).

and if anything, men are more sensitive to low grades in the dropout decision. As the major switchers are those left after some students drop out, they are a selected sample. Any study of the switching decision must take into account the fact that the most "sensitive" students – especially men – may have dropped out before the major-switching phase.

From a policy perspective, our dropout results suggest that men and women may respond differently to initiatives meant to improve retention and graduation rates. As men are more likely to drop out, and are potentially more sensitive to low early grades in the dropout decision, these initiatives may have larger positive effects for men. Given that only 43% of college degrees in the U.S. are currently awarded to men, initiatives to improve graduation rates would then also have the surprising effect of narrowing the gender gap in attainment. However, men's higher dropout rates are actually keeping the STEM gender gap from being even larger, so better retention might also widen the gender gap in STEM.

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