IS THERE A GENDER GAP IN COLLEGE ACADEMIC SUCCESS?

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Abstract

The purpose of this research is to detect whether gender is a meaningful predictor of academic success. In other words, is there a gender gap in college achievement? The Beginning Postsecondary Students Longitudinal Study (BPS) surveyed around 22,500 students at the end of their first year, and then three and six years after first starting their postsecondary education. Together with linear regression models, we measure the impact of gender on the two variables used to quantify student success: the number of courses failed, and, overall GPA, controlling for student and institution characteristics. Based on previous literature, gender is expected to account for a percentage of academic success, the value of that percentage changing between studies.

Introduction

Gender differences are present in many aspects of our daily life, sexes think differently, and it impacts the way they act and perform. This paper focuses on the education field, and it aims to see just how much of an impact gender has on academic success, specifically college students. Understanding how grades and other measures of achievement change between both sexes is extremely important since it allows for better design of evaluation policies that capture both the male and the female strengths.

Literature review

Gender plays a role when it comes to academic success, and (Bahar, 2010) sought to understand just how much of it is predicted by sex, social support, and socioeconomic status and discovered that gender and family support represent 15% of academic success.

According to previous research male students outperform females in IQ and other performance tests, such as the college entrance exams, however, female students show throughout the different education levels, consistently higher grades (Pomerantz, 2002; Wei-Cheng, 2001). This is mostly due to non-cognitive variables mainly a higher level of motivation, commitment (Rodriguez, 2016; Sheard, 2009), work ethics (Mikk, 2012), and self-discipline (Duckworth, 2006) of female students compared to their male counterparts (Hicks, 2008). “Women spend more time studying, attending class, engaging in extracurricular activities and discussing academics outside of class, the less academically engaged behavior of men may contribute to a lower GPA” (Kahn, 2011, pg. 66). Johnson W. (2008) found that even if with higher results on tests, men are more volatile, bring overrepresented in both the top and the bottom of the grid. Men have been underperforming in academics at the college level, they have a higher risk of being on academic probation and a higher probability of being suspended from college for academic reasons (Kahn, 2011).

Due to girls being more vulnerable to internal distress, they tend to perform worse on tests, but with higher commitment perform better on assignments. In a Turkish research case, even though a smaller number of women enter university and with lower rates, once they enter, they excel and outperform male students (Dayioğlu, 2007). However even achieving higher grades, female students are less likely to obtain a prestigious degree (McNabb, 2002). Zhang found that female college students do not outperform male students due to their ability, family background, or other student characteristics, but simply by putting in more effort (2011).

Data

This paper expands on previous research by utilizing a national survey to corroborate previous findings. The dataset used to answer the research question is the Beginning Postsecondary Students Survey (BPS), which surveyed the same population of students between the years of 2012, 2014, and 2017. This questionnaire was conducted by the National Center for Education Statistics (IES-NCES). This specific survey includes 22,500 students, which were questioned at the end of the respondent's first year of post-secondary education and then again at the end of their third and sixth year. The National Institute of Statistics makes certain to select a random sample of students from all over the nation to better represent the population of American postsecondary school students. A total of 1386 institutions were sampled from the 50 American states. Full details of the sample and the sampling procedures can be accessed through the IES-NCES DataLab. The sample was weighted to adjust for sampling error.

For a better understanding of what the sample looks like, it was below provided in Table I and Table II the summary statistics of some of the most relevant variables, according to the present research question. The variables were separated into continuous or categorical, where Table I focuses on continuous and Table II on categorical.

From Table I, we learn how each variable is measured, from the Minimum and Maximum columns, but we are also told the sample average and the correspondent standard deviation. Grade Point Average (GPA), has a 0 to 4 scale, with 4 being the best possible grade, and in this case, the sample presets an average of 2.68. Courses failed, on the other hand, does not have a predefined scale, but it also starts at the zero courses failed during college studies and, has a maximum of 29, averaging to 1.61 failed courses per student. We can also deduce that the youngest person to attend college of the 22,500 is only 15 years old, while the oldest is 75, but on average respondents are 21 years old. The table also presents information on high school test scores, so we have a measure of the student's success before entering university, we have data on income, the number of jobs worked by the student between 2014 and 2017, and how much each student spent on total college expenses (tuition, fees, housing, textbooks) for the academic 2011-12 year.

Table I – Continuous summary data characteristics

VARIABLES	Min	Max	Average	Sta. Dev
GPA	0.1	4	2.68	0.89
Courses Failed	0	29	1.61	3
Age	15	75	20.54	5.95
ACT	6	36	21.74	5.1
Gross Income	100	1000000	66682	69977
Student Budget	2204	123700	20478	14351
Number of Jobs	0	11	1.79	0.99

Table II – Categorical summary data characteristics

VARIABLES	PERCENTAGE
Gender	
Male	43.5%
Female	56.5%
Degree of Urbanization	
City	53.9%
Suburb	23.8%
Town	12.1%
Rural	10.2%
Selectivity of Instittution	
Very Selective	15.9%
Moderatly Selective	20.9%
Minimally Selective	10.2%
Open Admission	11.5%
Not 4-year institution	41.5%
Attended Institution in State	
Yes	81.2%
No	17.6%
International	1.2%
Highest Degree Obtained (2017)	
Certificate	7.0%
Associates's Degree	8.7%
Bachelor	28.5%
Masters	15.8%
Doctoral	0.1%
No degree	53.6%
Region	
Northeast	20.8%
Midwest	21.9%
South	37.4%
West	19.9%

Table II focuses on the summary statistics for the full dataset for the categorical variables. It includes information on what percentage of the total population fits into each of the categories. We can see there are more women than men in higher education with females accounting for 56.5% of the total population. Most of the institutions are located in an urban setting, only 10% being in a rural area. Most of these schools., however, are not 4-year institutions (41.5%), and only 15.9% can be considered very selective universities. While the majority of the students attend university in the same state as their legal residence (81.2%), there are a few out-of-

state students (17.6%). From Table II we can also see that only around half the students achieved some sort of certificate or diploma by the end of the period, most commonly a bachelor's degree (28.5%). When it comes to the origin of respondents, there is a good distribution between the main four regions of the continental US.

Table III - Continuous summary characteristics per gender

	Undergraduate GPA	Number of courses failed	Age as of 12/31/2011	ACT score	Gross Income	Number of jobs (2014-2017)
Total	2.7	1.6	20.5	21.7	62,045.6	1.6
Gender						
Male	2.6	1.8	20.6	22.2	64,916.6	1.5
Female	2.8	1.5	20.5	21.4	59,836.1	1.6

Moving onto the second set of tables, where the same relevant variables are presented, but this time divided by gender, it is clear that while females have higher grade point averages and fail fewer courses, males have higher ACT test scores, just as the literature suggested. The women were also slightly younger than their male counterparts and even though they worked more jobs, they had a lower income.

Table IV demonstrates how the genders are divided into each of the categories of the dummy variables. It is visible, how even though for those who did not get a degree, women took the lead, but when we continue to the diplomas attained in all of them females came first. For the subsequent variables, the results are very similar to the overall division between men and women, surrounding 43% for men and 56% for women.

Table IV - Categorical data characteristics per gender

	MALE	FEMALE
	(%)	(%)
Total	43.49	56.51
Highest degree attained (2017)		
No degree	47.54	52.46
Certificate	33.49	66.51
Associate's degree	44.37	55.63
Bachelor's degree	40.71	59.29
Attend institution in state		
Yes	43.42	56.58
No	43.76	56.24
International student	44.66	55.34
Selectivity of institution		
Not 4-year institution	43.43	56.57
Very selective	45.88	54.12
Moderately selective	43.06	56.94
Minimally selective	42.74	57.26
Open admission	41.87	58.13
Region of first institution 2011-12		
Northeast	43.81	56.19
Midwest	44.58	55.42
South	41.89	58.11
West	44.96	55.04
Degree of urbanization 2011-12		
City	42.06	57.94
Suburb	44.43	55.57
Town	44.16	55.84
Rural	48.11	51.89

Method

Model 1 & 3:

$$y = \beta 0 + \beta\, male + u$$

Model 2 & 4:

$$y = \beta 0 + \beta 1\, male + \beta 2\, ACT\ score + \beta 3\, major + \beta 4\, age + \beta 5\, attendance\ intensity + \beta 6\, all\ jobs + \beta 7\, school\ level\ of\ selectivity + \beta 8\, highest\ level\ of\ parents\ education + \beta 9\, attends\ school\ in\ stste\ of\ legal\ residence + u$$

Outcome Variables:

$$y = college\ GPA\ \&\ number\ of\ courses\ failed$$

Undergraduate GPA at all known institutions indicates the cumulative undergraduate GPA at all attended institutions as of June 2017 and is measured as a continuous variable. Excluding missing values, skipped values for the respondents for whom it was not applicable, and zero values we are left with 90.46 percent of the respondents. The other variable used to measure student success is the Number of known courses failed. For this variable, from the pool of respondents were dropped 1.06% where values were missing.

For both variables duplicate course records, created by the transfer of credits to one or more additional institutions, are only counted once. Courses that are a part of a graduate program as well as courses that end after June 2017 have also been excluded from the calculation.

In this model, the independent variable is gender, obtained from the base year student interview. There are no missing values, and there are only two options 1 for male and 2 for female. Leaving us with 43.49% male students and 56.51% female students.

When it comes to control variables, to account for high school success the ACT composite score was used. The ACT composite score was derived either from an ACT score report or the SAT I combined score converted to an estimated ACT score. These values come from the College Board. Given that 22.57% of respondents skipped the question only 77.43% of respondents are being used. To separate fields of study, the variable used is the major enrolled in, in 2017. The majors were divided into 10 categories, leaving out options for the undecided 8% and the not applicable 4.8%. Age was measured as a continuous variable as of 12/31/2011, from the 2012 FAFSA application, 100% of students are included. Because how they participate in school may affect someone's grades, a control variable for attendance intensity was used, where the base value is those who attend full-time. There is also a control for the number of jobs worked during the 6 years since working is time and energy-consuming and may, once again, affect the student's academic performance. To account for differences in institutions, the level of selectivity was included, a dummy variable that separates institutions by three levels of selectivity, open admission or not a 4-year institution. It might be harder to get higher grades in very selective institutions, especially when compared to 2-year colleges. Another variable represented was the parents' highest level of education. And the final variable of the model is whether the student is attending school in his state of legal residence or not, being dislocated not only presents itself as a monetary challenge but also mentally, from being without parental support.

Results

Table V - Linear Regression models

	Model (1)	Model (2)	Model (3)	Model (4)
VARIABLES	GPA	GPA	COURSES FAILED	COURSES FAILED
Male	-0.2044***	-0.1855***	0.3106***	0.3687***
	(0.0351)	(0.0371)	(0.0896)	(0.0944)
ACT	no	yes	no	yes
Major	no	yes	no	yes
Age	no	yes	no	yes
Intensity	no	yes	no	yes
All jobs	no	yes	no	yes
Level of selectivity	no	yes	no	yes
Parents education	no	yes	no	yes
In state	no	yes	no	yes
Intercept	2.7848***	0.7408**	1.4801***	6.0285***
	(0.0238)	(0.3381)	(0.0465)	(0.7604)
Observations	23500	12000	24600	12300
R-squared	0.0108	0.2654	0.0035	0.0808
Standard errors in brackets				
***p<0.01,**p<0.05, *p<0.1				

As discussed previously, the model analyzes the impact of gender on academic achievement for college students throughout the country. In Table V, these results are explicit, with models 1 and 2, having GPA as their dependent variable and models 3 and 4 having the number of courses failed as their output. While models 2 and 4 include a series of control variables, models 1 and 3 serve as a base, where the controls were not included. The base models were included in this group of linear regressions, so to present a simple picture of whether or not sex has any impact on college success. As we can see, in both models 1 and 3, there is a relationship between the dependent and the independent variable. In model 1, being a male decreases someone's GPA by -0.2, and this result is statistically significant at the 99% level, rejecting the null that sex has no impact on college grades. In model 3, where

we are measuring the impact of being male on the expected number of courses failed during postsecondary studies, we discover that being of male gender increases courses failed by 0.31. Once again, this result is statistically significant at the 99% level of confidence, and we reject the null.

For models 2 and 4, the control variables were included in the regressions. Given that, there were no major changes between the male coefficients once we included the controls and given that the 99% level of confidence was always maintained, we can say these results are robust.

While model 1 has an R-squared of only 1%, as we add the several control variables this number goes up to 26.5%. This means the variables included in the model account for 26.5% of the total causes of changes in GPA. For models 3 and 4, even after adding the list of controls, R-squared stayed below the 1% of changes in the number of courses failed.

A low R-squared, tells us there are other variables out there that impact student success and unfortunately many of those are not measurable or not asked in the questionnaire. For example, life events, such as health issues, for the student or their families, divorce, and financial restraints. All these situations may lead the student to fail a course or to get lower grades. While these omitted variables are related to the y variable because people cannot choose their gender, sex is randomly assigned, there are no variables correlated with it and with the outcome at the same time, and therefore no omitted variable bias.

A limitation of the present study is the lack of a different measure of academic success. Having access to a variable, such as “made the dean’s list”, would have been beneficial, to ensure the results spread throughout different measures and not only in the two accounted for.

Conclusion

Overall, the results are congruent with the literature reviewed, in the sense that, women do have higher grades, and they do fail fewer courses in college. While females perform better in assignments and with continuous evaluation methods, male students do better in test taking. Unlike, the literature, this paper used a national, randomly sampled dataset from the National Center for Education Statistics for students starting their postsecondary studies. Being a male harms GPA and it increases the number of courses failed. We conclude, that there is a slight gender gap in college academic success at the national level.

References

Bahar, H. H. (2010). The effects of gender, perceived social support and sociometric status on academic success. Procedia - Social and Behavioral Sciences.

Dayioğlu, M. T.-A. (2007). Gender differences in academic performance in a large public university in Turkey. *High Educ, 53*, 255–277. doi:https://doi.org/10.1007/s10734-005-2464-6

Duckworth, A. L. (2006). Self-discipline gives girls the edge: Gender in self-discipline, grades, and achievement test scores. *Journal of educational psychology*(98.1).

Hicks, B. M. (2008). Moderating effects of personality on the genetic and environmental influences of school grades helps to explain sex differences in scholastic achievement. *European Journal of Personality, 22*(3), 247–268.

Idaykis Rodriguez, G. P. (2016). How gender and reformed introductory physics impacts student success in advanced physics courses and continuation in the physics major. *Phys. Rev. Phys. Educ. Res*(12).

Jaan Mikk, K. T. (2012). Sex differences in educational attainment, Personality and Individual Differences. *53*(2), 132-136.

Johnson, W. C. (2008). Sex Differences in Variability in General Intelligence: A New Look at the Old Question. *Perspectives on Psychological Science, 3*(6), 518–531. doi:https://doi.org/10.1111/j.1745-6924.2008.00096.x

Kahn, J. S. (2011). Concerns with Men's Academic Motivation in Higher Education: An Exploratory Investigation of the Role of Masculinity. *The Journal of Men's Studies, 19*(1), 65–82.

McNabb, R. P. (2002). Gender differences in educational attainment: The case of university students in England and Wales. *Economics, 69*, 481-503.

Pomerantz, E. M. (2002). Making the grade but feeling distressed: Gender differences in academic performance and internal distress. *Journal of educational psychology*(94.2).

Sheard, M. (2009). Hardiness commitment, gender, and age differentiate university academic performance. *British Journal of Educational Psychology, 79*, 204.

Wei-Cheng, M. &. (2001). Gender differences on the scholastic aptitude test and college grades. *Educational Psychology, 21*, 133-136.

Zhang, J. (2011). Sex and Economics: The Paradox of Student Gender in China. Retrieved from https://ssrn.com/abstract=1747269