

Marriage and Graduate Student Outcomes^{*}

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Abstract

This paper examines how graduate outcomes for humanities students differ by the student's gender and marital status when they enter graduate studies. I find that being married has a positive effect on both male and female students. Male students who are married at the start of graduate school are on average 3.9% more likely to graduate by any given year and they complete their degree .32 years quicker than single male students. Married female students are not any more likely to graduate but they do complete their degree .21 years quicker than single female students.

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1. Introduction

The attrition rates and time to degrees of graduate students, especially in the humanities, has become a major issue in the US higher education system. Many policy makers and researchers find that high levels of attrition and long time to degree are a waste of both student and higher education resources.¹ High attrition rates and longer time to degrees also increases the cost of entry into jobs that require a PhD, which in turn deters many able students from pursuing careers in academia. If attrition and time to degree differ between men and women then this will affect the gender mix of faculty in the future.

Many studies in the past have measured the differences in outcomes for graduate students by gender. However, few of them are able to account for the graduate student's marital status because past datasets related to graduate students have not included this information. This study uses a dataset that was collected by the Andrew W. Mellon Foundation to evaluate the Foundation's Graduate Education Initiative (GEI). This dataset is unique in both its size and the fact that it includes information on the student's marital status at both entry to and exit from graduate school.

The purpose of this paper is to look specifically at the question of how a student's marital status at the start of graduate school affects the likelihood of graduating and the time to degree of those that graduate.

The paper proceeds as follows. Section 2 describes past research related to marriage and graduate student outcomes. Section 3 contains a description of the data

¹ See Barbara Lovitts (2003) for evidence in favor of this argument and factors that appear to influence graduate student outcomes.

collected by the Mellon Foundation. Section 4 examines differences in graduation rates and time to degree by gender and marital status. Section 5 concludes.

2. Past Research

As mentioned in the introduction, there has been significant research devoted to understanding gender differences in graduate student outcomes. Bowen and Rudenstine (1992) look at gender differences in enrollment, completion of program, and time to degree. Other studies include Seagram et al (1998) and Ferreira (2003). Understanding gender differences in graduate student outcomes is important because it affects the gender mix of nation's future faculty which can in turn affect the educational outcomes of female undergraduate students.

However, a neglected area of research has been the difference in graduate student outcomes by their marital status. This paper examines how marriage affects male and female students differently. Finding a gender differential in the effect of marriage provides a potential explanation for gender differences in student outcomes. The findings in this paper also address the concern that married life and graduate student life are incompatible.

Solomon summarizes nearly all of the research that had been conducted prior to the mid-1970's on gender and marriage differences in graduate student outcomes. One of the explanations that he provides for why marriage would impact outcomes is that it places different demands on the time and mobility of men and women. He cites a study by Patterson and Sells (1973) that shows that single graduate students of either gender spend about equal time doing household chores. However, married female graduate

students spent more time than the single students and married male students spent less time. He also cites comments by Cross (1974) that indicate that women are more likely to drop-out to accompany a spouse to a new location than vice versa. These older studies would appear to indicate that marriage would negatively affect female students. Social norms with regards to balance of duties within marriage have changed since the 1970's and so it is possible that these earlier results no longer apply to the situation of the 1980-90's, which is the period of this study

More recent research, in areas unrelated to higher education, indicates potential explanations to expect a causal link between marriage and graduate student's outcomes. These include the effect of marriage on time use, productivity, risky behaviors, and mental and physical health. A good summary of studies that have explored these explanations is provided by both Waite and Gallagher (2000) and Akerlof (1998). The findings from these studies show that, compared to single men, married men are more productive, healthier (both physically and mentally), and engage in less risky behaviors. The effects of marriage are usually smaller for women since the behavioral changes that accompany marriage are smaller for women than for men.

Past research on the relationship between marital status and student outcomes has been limited by either the availability of data that contains measures of both the student's marital status and student outcomes or by a limited sample size that does not lend it self well to statistical analysis. The closest attempt is work by Feldman (1973) which uses a survey conducted by the Carnegie Commission on Higher Education of 33,000 graduate and professional school students in the US. This survey contains information on the student's age, gender, and marital status as well as many of the inputs in the PhD

production process. However, its major limitation is that it lacks a measure of the student outcome, such as whether they graduated or their time to degree. The next section describes a survey that does include measures of student outcomes.

3. Data

The data for this paper was provided by the Andrew W. Mellon Foundation as part of an analysis of its Graduate Education Initiative (GEI). The GEI provided \$80 million to 51 departments at 10 select research universities. The GEI began in 1991 and continued through the 2000-01 school year. The intent of the initiative was to provide these departments with the ability to offer competitive financial packages to students, improve the quality of advising, and increase the clarity of departmental rules and guidelines. To evaluate the effectiveness of the GEI, the Mellon Foundation collected data annually on the progress of each student that entered PhD programs in these departments and in a set of control departments, as well as extensive data from a survey of many of these individuals that was administered in 2001.

The institutional dataset includes information on 22,607 students from 100 departments spanning 10 fields of study and 13 institutions. This institutional data was collected for ten years prior to the start of the program, creating a sample that includes 108,000 student-year observations from the entering cohorts of 1982 to 2001. This data includes information on each student's gender, race, GRE verbal and quantitative score, field of study, institution, and the amount and type of financial aid that the student received during each year in graduate school. This data also includes the student's entry and exit date and whether they left with a degree or attrited.

In addition to collecting data from the graduate departments, the Mellon Foundation also administered an extensive survey directly to the students. The survey included questions about the student's age, marital status, advisor, publications, and characteristics of their first job. The response rate for the survey was about 74%, and of those who took the survey nearly every responder answered the questions about age and marital status.

Table 1 provides summary statistics for each gender and marital status combination. This table shows some of the differences between the single and married students. On average, the married students are 5 years older, have lower undergraduate GPA's and GRE verbal scores, and are less likely to receive a fellowship or tuition grant during their first year of graduate studies. Failing to account for these differences would bias the results against finding a positive impact of marriage. All of these differences are controlled for in the models used in the following section.

4. Empirical Analysis

There are various ways to measure graduate student outcomes. This paper employs the two most commonly used measures: the percentage of students who graduate by a certain year and the number of years it takes completers to finish their degree.

To look at graduation rates, I use a cumulative probability model that estimates the effect that a student's gender or marital status has on graduating or attriting by a given year in school.² At the end of each year one of three outcomes has occurred for each student: (1) they have graduated by that point, (2) they have dropped out by that point, or

² This is an approach similar to the one used by Ehrenberg and Mavros (1995) to examine the impact of financial aid on student outcomes.

(3) they are still pursuing a degree. These three outcomes are used as the dependent variables in a multinomial logit model. As control variables, I include the student's gender, marital status, GRE verbal and quantitative score, race, age, and whether he or she had a masters degree prior to entering graduate school. I also control for the student's field of study and institution. For attrition, I look at years 1-11 and for graduation I look at years 4-11.³

I use the coefficients from the multinomial logit model to predict what the outcomes would have been for the entire sample if all the students had been of a certain group, say single men. I calculate these predictions for each of the four gender/martial status combinations. The advantage of using a simulation is that it controls for all of the effects of a students characteristics, field, and institution and isolates the true effect of a student's gender and marital status.

Table 2 contains the simulated probability of graduating or attriting by a certain year for each group.⁴ The numbers from this table are plotted for male and female students separately in figures 1 and 2. These figures allow us to see visually that there are large differences by marital status in the cumulative graduation and attrition rates for male students, but almost no noticeable difference for female students.

Figure 1 shows that for male students the difference in the cumulative graduation rate widens during years four through seven and then narrows over years eight through eleven. Married male students are 75% more likely to complete their degree by the 4th

³ There were only 42 students in the sample that graduated prior to the 4th year.

⁴ Ideally we would like to look at the impact of marriage on those students who become married during graduate school. Unfortunately, the data only has information about the marital status of the students at the date of entry to and exit from the department. Students with a longer time to degree are more likely to get married during graduate school. Thus whether a student gets married or not during graduate school is endogenous to the outcomes of interest. As a result, I look only at the impact of being married at the start of graduate school in estimations of graduation, attrition, or time to degree.

year and 66%, 39%, and 29% more likely than single male students to complete their degree by the years 5,6, and 7 respectively. The difference for female students is 25%, 32%, 17%, and 9% for years 4, 5, 6, and 7 respectively. The difference for female students disappears after year 7 but persists through all years for male students. These results suggest that the largest impact of marriage occurs in the form of helping students get done quickly.

Table 3 summarizes the results of table 2 by averaging the difference between groups in the cumulative graduation over years 4 through 11. The same is done for the cumulative attrition rates over all eleven years. I replicate the results using 1,000 bootstrap samples to test for the statistical significance of these differences. The 95% confidence interval of each estimate is providing in brackets on table 3.

These results show that the average difference in cumulative probability of graduating between single and married male students is 3.4% points and is statistically significant. The average difference for female students is 0.9% points and not statistically significant.

In order to estimate differences in the average time to degree, I calculate the graduation rate for each year in school by differencing the cumulative probabilities. Let G_{it} indicate the fraction of students in group i that have graduated by time t . The fraction of students that graduate in each year in school is given by $g_{it} = G_{it} - G_{it-1}$. Using the graduation rate each year, I calculate the average time to degree of each group by the following formula:

$$TTD_i = \sum_{t=4}^{11} (g_{it} \cdot t)$$

where t indicates the number of years it took the student to complete his or her PhD. This measure is simply a weighted average of time to degree across all of the students, where the weights are determined by the fraction of students who finished in that amount of time.

The 3rd column of table 3 shows the difference in time to degree between each gender/marital status group. The results show that married men complete their degree .32 years quicker than single male students, married female students complete their degree about .21 years quicker than single female students, and single male students complete their degree .12 years quicker than single female students.

5. Conclusion

This paper shows that, after controlling for individual characteristics, students married prior to starting graduate school do not have worse outcomes than single students. Married male students are much more likely to graduate by any given year than single students. The percentage difference in the probability of graduating between single and married students is positive for all years with the largest differences occurring in years four through seven. In fact, married male students are 75%, 66%, and 39% more likely than single male students to complete their degree by years 4, 5, and 6 respectively. This indicates that the biggest impact of marriage comes in the form of helping students get done quickly. In fact, when we simulate the time to degree of each group, the married male students complete their degrees .32 years quicker than single male students.

Married female students were 25%, 32%, and 17% more likely than single female students to graduate by years 4, 5, and 6. The difference does not persist after year 7, and the probability of a female student graduating by year 8-11 is essentially the same

between the two marital status groups. Married female students completed their degrees .21 years quicker than single female students.

It is possible that these results merely reflect a selection effect in which students who chose to marry have unobservable characteristics that make them more persistent and help them graduate quicker than single students. This issue was addressed by Korenman and Neumark (1991) who studied the impact of marriage on worker productivity. They compare estimates from cross section and fixed effects models and find that less than 20% of the difference in wages between married men and single men can be attributed to a selection effect. The methodology they use depends on having an outcome variable that varies over time for the individual, which is not the case in this paper, but it is possible that the split between fraction of the marriage affect that is due to selection is similar.

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Table 1 Summary statistics by gender and marital status

	Male		Female	
	Single	Married	Single	Married
Demographic				
Age (mean)	24.8	29.3	24.8	29.8
Age (median)	24	28	24	28
Non US citizen	0.126	0.165	0.1	0.104
US white	0.659	0.622	0.659	0.67
US non-white	0.106	0.098	0.14	0.104
Ability and Training				
Prior Masters degree	0.216	0.381	0.194	0.342
GRE verbal	680.5	660.3	676.3	660.5
GRE math	660.1	633.6	616.4	588.4
1st year Financial Aid				
Fellowship	0.284	0.228	0.274	0.205
Taship	0.19	0.206	0.202	0.233
Tuition Grant	0.756	0.725	0.749	0.688
Outcomes				
Graduation rate	0.552	0.621	0.527	0.535
Attrition rate	0.325	0.284	0.341	0.338
Time to Degree	6.142	6.226	6.215	6.246
Time to Attrition	3.698	4.376	3.753	4.101
N	4,640	1,237	4,461	968

Table 2 Simulated Cumulative Probabilities of Attrition and Graduation by Gender and Marital Status.

Graduation						
YIP	MF	SF	% Diff	MM	SM	% Diff
4	0.015	0.012	25.0%	0.028	0.016	75.0%
5	0.069	0.052	32.7%	0.113	0.068	66.2%
6	0.171	0.146	17.1%	0.245	0.176	39.2%
7	0.293	0.269	8.9%	0.405	0.313	29.4%
8	0.385	0.383	0.5%	0.501	0.420	19.3%
9	0.463	0.464	-0.2%	0.568	0.495	14.7%
10	0.519	0.518	0.2%	0.604	0.548	10.2%
11	0.548	0.553	-0.9%	0.622	0.577	7.8%

Attrition						
YIP	MF	SF	% Diff	MM	SM	% Diff
1	0.082	0.081	1.2%	0.062	0.094	-34.0%
2	0.133	0.137	-2.9%	0.103	0.156	-34.0%
3	0.164	0.184	-10.9%	0.134	0.193	-30.6%
4	0.209	0.219	-4.6%	0.178	0.233	-23.6%
5	0.238	0.245	-2.9%	0.200	0.254	-21.3%
6	0.284	0.268	6.0%	0.225	0.277	-18.8%
7	0.305	0.293	4.1%	0.245	0.296	-17.2%
8	0.315	0.308	2.3%	0.262	0.311	-15.8%
9	0.328	0.320	2.5%	0.28	0.321	-12.8%
10	0.337	0.331	1.8%	0.291	0.327	-11.0%
11	0.346	0.339	2.1%	0.298	0.332	-10.2%

The value in each cell in the MF, SF, MM, and SM (where MF represents married female) columns represent the probability that an individual will have graduated or attrited by the year in program (YIP) indicated by the row. % Diff is simply (MF-SF)/SF for the case of women and (MM-SM)/SM and represents the percentage difference in the probability that the student has graduated or attrited by that year. For example, the 25% value in the first row indicates that married female students were 25% more likely to graduate by the end of their 4th year in graduate school than a single female student.

Figure 1. Simulated Cumulative Graduation Rates

Female Students



Male Students

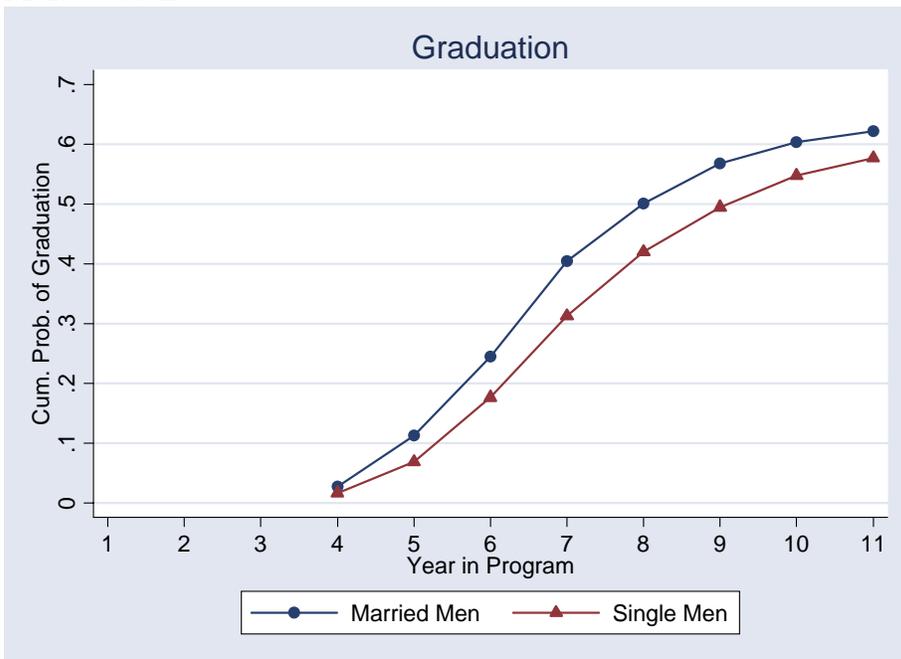
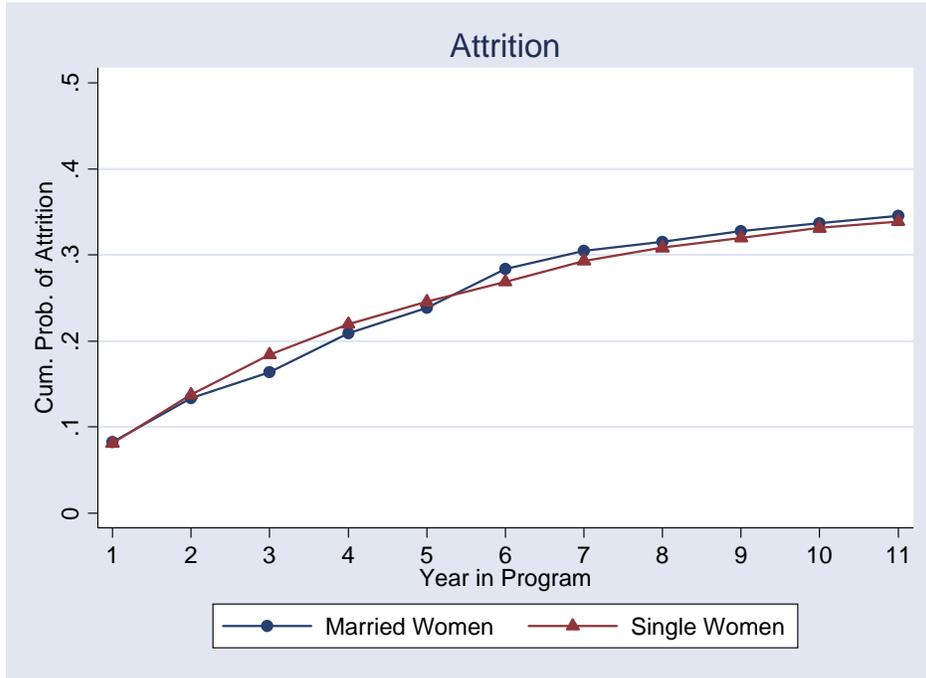


Figure 2. Simulated Cumulative Attrition Rates

Female Students



Male Students



Table 3 Impact of Gender and Marital Status on Student Outcomes

	N	Attrition	Graduation	TTD
Married Women	968	-0.009 [-.023, .007]	0.016 [.002, .030]	-0.210 [-.334, -.084]
Single Women	4,461	--	--	--
Married Men	1,237	-0.034 [-.048, -.020]	0.057 [.042, .071]	-0.319 [-.425, -.211]
Single Men	4,640	--	--	--
Single Women	4,461	0.002 [-.007, .011]	-0.021 [-.029, .013]	0.122 [.049, .192]
Single Men	4,640	--	--	--

**The 90% confidence intervals that are shown in brackets were derived by a bootstrap procedure with 1,000 repetitions. The group with dashes is the omitted group in each of the three comparisons. All results and confidence intervals refer to the difference between the two groups.*