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Gender differences in academic performance in a large public university in Turkey

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Abstract. The paper attempts to determine whether there are significant gender differences in academic performance among undergraduate students in a large public university in Turkey based on three indicators; university entrance scores, performance in the English preparatory school and in the program the student is majoring in. The paper finds that a smaller number of female students manage to enter the university and when they do so, they enter with lower scores. However, once they are admitted to the university, they excel in their studies and outperform their male counterparts. This result holds after controlling for the field of study and individual attributes.

Keywords: academic achievement, gender disparity, placement exam, Turkey, undergraduate students, universities

Introduction

The paper attempts to determine whether there are significant gender differences in academic performance among undergraduate students at Middle East Technical University (METU), which is a large public university in Turkey, and if so, the factors that give rise to these differences. Academic performance is affected by a host of factors. These include individual and household characteristics such as student ability, motivation, the quality of secondary education obtained and the like. The gender of the student may also be a factor in determining student performance. Childhood training and experience, gender differences in attitudes, parental and teacher expectations and behaviors, differential course taking and biological differences between the sexes may all be instrumental in giving rise to gender differences in achievement (Feingold 1988). Gender disparity in various spheres of public life and the patriarchal social structure in Turkey may also lead to poorer academic performance among female university students.

In terms of educational attainment women lag behind men in Turkey. The 2000 Population Census records the illiteracy rate among

men at 6.1%, while that of women at 19.4% (SIS 2003). Among the literate population, men's average level of schooling far exceeds that of women though a faster improvement is observed among the latter (Dayıoğlu and Tunalı 2002). Gender disparity in schooling is also observed among the younger population, where female school enrollment in basic and secondary education falls behind male children (Tansel 2002; Ertürk and Dayıoğlu 2004). Despite the numerous studies that analyze the disadvantaged position of women as adults and children, there is almost no work on the educational experiences of women as young adults. The paucity of such work has been the main motivation for this study.

Following the introduction, the study looks at the literature on gender differences in scholastic achievement. After presenting a brief account of the education system in Turkey and giving information about METU, we describe the employed methodology and the data set used. Lastly, we present the results on student academic achievement and compare the performance of male and female students.

Review of literature

The question of gender differences in cognitive abilities has evolved out of the debate on biological vs. social determinism. The biological perspective on sex differences and cognitive performance considers social factors to be trivial or subordinate to biological factors like brain structure (see for instance Allik et al. 1999; Lynn 1999;). Mackintosh (1998), on the other hand, claims that there is no sex difference in general intelligence.

At the pre-collegiate level, female students are generally found to get better course grades but perform worse than males in achievement tests like SAT (Lao 1980; Kimball 1989; Wilberg and Lynn 1999). This pattern is explained by the better work habits and better language abilities of females. Young and Fisler (2000) explain the better performance of males in SAT-M by referring to the different socio-economic background of students. They note that males generally come from households where the parents' socio-economic status is higher. Others have argued that the content of the test or of its administration favors males (Bridgeman and Wendler 1991). Yet other researchers have explained the gap by adhering to such factors as differences in course taking behavior, classroom experiences and cognitive processing (Byrnes et al. 1997; Young and Fisler 2000).

The studies conducted outside of the US present differing outcomes. Younger et al. (1999) find girls to obtain better grades than boys in GCSE examinations in the UK. This phenomenon is explained by boys' disregard for authority, academic work and formal achievement, differences in students' attitudes to work and their goals and aspirations and girls' increased maturity and more effective learning strategies. Baker and Jones (1993) analyze sex differences in the eighth grade math performance of students in 19 countries. They find no evidence of a significant gender gap. Similarly, an OECD (2001) study conducted in 14 countries find no gender differences in mathematics achievement, except in the Czech Republic, but statistically significant gender differences in sciences in all but five countries including Turkey.

In higher education women are often found to outperform men. Hyde and Kling (2001) state this to be the case irrespective of the measure of success used. Betts and Morell (1999) report that sex remains a significant predictor of CGPA after controlling for various individual attributes such as ethnic background, SAT scores and the high school attended. Kim et al. (2003) find that SAT scores have a significant impact on student graduation, although at the individual level gender is a more powerful correlate of graduation than the SAT score. Similarly, women are found to obtain better grades than would be predicted from their SAT scores (Bridgeman and Wendler 1991; Wainer and Steinberg 1992; Leonard and Jiang 1999; Hyde and Kling 2001). Many researchers claim that a large part of the under-prediction derives from the difference in course taking patterns of male and female college students. Ruling this out, Leonard and Jiang (1999) suggest that females have better study skills than male students. Other researchers have argued that women receive higher grades than men because they work harder and attend class more frequently (Wainer and Steinberg 1992). Investigating success in terms of course grades, Wainer and Steinberg (1992) conclude that although women had lower SAT-M scores, they received similar grades from first-year math courses. Investigating the profile of economics students at METU, Şenses (1999) reports a higher percentage of female students with GPA of 3.00 and above.

The literature survey on gender differences in scholastic performance at different levels indicate mixed results. However, one common finding is that females outperform their male counterparts in higher education. In what follows next, we shall try to see whether this is also true for Turkey.

Education system in Turkey and at METU

The formal education system in Turkey includes basic education, secondary education and higher education institutions. Basic education is compulsory and lasts for eight years. Secondary education, on the other hand, is composed of general, and technical and vocational high schools. While the former is geared more toward preparing students for tertiary education, the latter aims to equip students with marketable skills for immediate employment after graduation. The high schools offering general education may differ from each other on various grounds. While some schools emphasize mathematics and sciences in their teachings, others are more social sciences oriented. Another differentiation is in regard to the medium of instruction, which can be in a foreign language. A significant proportion of the specialized public high schools – in particular those that teach in a foreign language – admit students through a centralized exam. The overwhelming majority of basic and secondary education schools (including the specialized high schools) are public. The proportion of the student population enrolled in private basic and secondary schools is limited to 1.5% (MNE 2004).

Progression to higher education

Admittance to higher education is through a central examination given once a year. The applicants get placed into the departments and universities of their choice depending on their placement score which includes the examination score along with the high school CGPA of the student. The latter is weighted by the standing of the student's school in the placement exam. Following the exam, the student submits a list containing his/her department and university preferences. Depending on the score obtained, s/he may get placed into any one or none of his/her submitted choices as placement starts from the applicant with the highest score and moves down until the allocated slots for each department is filled. The minimum score above which a department in a given university admits students may change from one year to the next depending on the demand for the department in that specific university and the available seats. Medical schools and engineering departments are usually high in demand requiring top scores. So do the departments of more established universities due to the vastly different quality of education offered. On a yearly basis, 1.5 million high school graduates take the exam though only

1 out of 10 applicants gets placed into a four-year program. An additional 20% are placed into open-university or two-year programs.[1]

The university entrance exam has taken on such a paramount importance in the lives of the young people that many devote a good part of their last two years in high school preparing for this examination. In fact, the struggle starts earlier in trying to get into a high school that is reputed to succeed in getting the largest number of students placed in prestigious universities. But the struggle hardly ends there. Besides following the high school curriculum, students attend specialized private courses geared toward preparing them for the university examination during their high school years. The cost of such private courses is often rather high. The end result is that the chances that a young adult of modest background will enter a highly competitive university are rather slim.

Middle East Technical University

Middle East Technical University (METU), located in the capital city Ankara, is one of the larger public universities in Turkey with nearly 14,500 undergraduate and 5,200 graduate students, and 700 faculty members (METU 2004). It operates on a semester system. Students obtain credits from the courses they take and graduation is conditional on obtaining the required amount of credits from a minimum number of courses within a maximum of 14 semesters. Being a public university the tuition fee is relatively low. Yet, students who do not have the financial capability of meeting the minimum fees can apply for various types of student grants. In this sense, METU is open to students with various socio-economic backgrounds, provided that they manage to get through the highly rigorous (and costly) selection process described earlier.

There are 39 departments at METU organized under five schools; Architecture and City Planning, Economics and Administrative Sciences, Education, Engineering and Arts and Sciences. METU was originally established as a technical university. Although social sciences were later added to it, it has nevertheless continued to have a technical character with over half the student body enrolled in the school of engineering. Entry into METU is highly competitive. The majority of departments admit students from the top 1% of applicants taking the university placement exam. Being a well-reputed university, it attracts students from all over the country though the main crux of the student body comes from Ankara and western provinces. The proportion of

students coming from east and southeast, which are relatively poorer regions of the country, is limited to less than 5% of the student body.

The medium of instruction at METU is English so that before the students are admitted to their respective departments, they need to pass an English language test. If their background in English is found to be unsatisfactory, they enroll in the preparatory school. Progression to departments requires receiving a passing score in the language test.

Methodology

A number of indicators can be used to determine the academic achievement of an undergraduate student. In the literature, the most frequently employed measure is students' cumulative grade point average (CGPA). In this paper, we also primarily rely on CGPA to measure academic success though we employ additional measures such as university entrance scores and progression from preparatory school to departments to capture student performance at different stages of students' academic life.

As mentioned earlier, a whole host of factors affect student achievement. The variable of prime interest for this study is the sex of the student. To see whether females have an advantage over males, we use a multivariate analysis and thereby, control all other possible predictors of CGPA. Among individual level effects we consider student's age and his/her year of entry to university. For reasons such as repeated classes, not being able to enter university right after graduation from high school, or being on leave for a period of time, the age of the students will show variations within a given class. We might expect older students to perform better than their younger classmates for the reason they are likely to be more mature. However, if they are composed of class repeaters this might indicate either that their ability is lower than the average or that they are not as motivated as others, causing their performance to suffer.

The student's university entrance score and the type of high school attended will also be important in determining student achievement as they would be indicative of student ability and motivation. The studies that explore the determinants of university/college GPAs use mainly SAT scores, high school GPA and class rank to predict success in higher education. Among these variables SAT has long been advocated as a necessary check on potentially heterogeneous high school grading policies so as to decrease the influence of high school grade inflation (Rothstein 2004). The university entrance score used in this study is an

amalgam of the entrance examination score, student's high school CGPA and the relative success of the student's high school in the placement exam. The use of this three-parameter scale avoids the problem of grade inflation and hence, is a better measure of student ability. Also, assuming that the student's achievement depends on his/her willingness to graduate from the department that s/he is in, we include the preference rank for his/her department as another factor. Whether or not the student was enrolled in preparatory school and the number of semesters spent there, are also controlled for to see whether or not language ability affects academic achievement.

The socio-economic background of the student may also be important in determining his/her academic achievement. Unfortunately, the data set we employ lack information relating to parental characteristics. To partly proxy for the socio-economic standing of the family, we employ student's place of permanent residence and the type of high school attended, i.e. whether it was private or not.

In the multivariate analysis, we also employ a number of control variables reflecting departmental/school characteristics. For instance, we control for the school that the student is enrolled in for the reason that the average CGPA in a given school might be traditionally lower or higher in comparison to others. Other control variables include the gender composition of the student body and that of the faculty in the department that the student is enrolled. We conjecture that the higher is the representation of women in the form of fellow students or faculty the greater will be the academic success of female students as the former will help create a support group and a network, while the latter will act as role models. Empirical research finds mixed support for the role model hypothesis (see for instance Canes and Rosen 1995; Jacobs 1996; Robst et al. 1998).

In addition to the CGPA of students, we analyze university entrance scores and the number of semesters spent in the preparatory school. In the analysis of the former, our interest lies in determining whether or not there are appreciable differences between male and female students in terms of educational achievement at the time they enter the university. The performance at the preparatory school, which is measured by the semesters spent there until the student achieves a passing mark in the English language test, will indicate the language ability of the student. Based on these three indicators – CGPA, university entrance scores and the number of semesters spent in the preparatory school – we hope to get an understanding about academic performance at different stages of student's life; at the time of college entry, before the

progression to departments and during the time spent in the department itself.

One potential caveat in our analysis might be university drop-outs since information on them is not available. However, the rate of dismissal at METU is rather low, which is reported to be 0.6% of all undergraduates in the 2002–2003 academic year (METU 2004). Given the small number of drop-outs, we do not expect them to impact on our results significantly.

The data

The data for this study come from the undergraduate student records compiled by the registrar's office of METU. We were provided with an extract of this data reflecting the academic standing of the students as of Spring 2003. Table 1 presents the descriptive statistics on the undergraduate population based on key variables. The original data included 11,560 students. We excluded international students (who constitute 4.6% of the sample) and those who have transferred from abroad for the reason that they have no university entrance score. We also dropped departments such as physical education and vocational training for the same reason that they admit students not through the university exam but via an alternative mechanism. Additional exclusions include a small number of students with missing information. With all these exclusions, the data set is reduced to 10,343 individual cases.

Female students constitute 37.4% of the total student body[2] and are heavily represented in non-engineering departments though as mentioned earlier, METU has an engineering bias. Whether this is the result of women's choice, societal discrimination or failure to receive high enough placement scores is a question that begs an answer. As will be illustrated later in the paper, lower placement scores might partly explain the gender imbalance though considering that the teaching staff and the guidance councilors in basic and secondary schools in Turkey often carry and, consciously or unconsciously, reflect onto their students notions of gender appropriate traits and competencies and often use gender biased teaching materials (Acar et al. 1999; Helvacıoğlu 1996), the role of societal discrimination cannot be ruled out. It has also been suggested that women who expect interruptions in their work careers choose those fields that have low cost of exit and re-entry (Polachek 1981; Blakemore and Low 1984) which might also explain their lower concentration in engineering departments.

Table 1. Descriptive statistics on key variables

	All	Male	Female
Age	21.43 (1.52)	21.57 (1.58)	21.18 (1.39)
University entrance score: 1999–2002	210.60 (11.11)	213.85 (9.50)	205.68 (11.55)
University entrance score: 1996–1998	527.95 (31.23)	533.27 (30.71)	514.43 (28.35)
CGPA	2.56 (0.65)	2.48 (0.67)	2.70 (0.61)
Year at university			
First year	26.54	25.50	28.29
Second year	25.33	25.17	25.60
Third year	23.11	22.41	24.28
Fourth year	25.02	26.92	21.84
School			
Architecture	5.64	3.84	8.64
Arts and Sciences	11.29	7.38	17.86
Economics and Administrative Sciences	16.36	12.53	22.77
Education	15.15	11.31	21.58
Engineering	51.56	64.93	28.14
High school type			
Anatolian (public foreign language)	36.95	35.11	40.03
Sciences	9.33	10.97	6.57
Regular high school	19.90	22.64	15.30
Private sciences	4.07	5.09	2.36
Private regular	1.55	1.85	1.04
Private school (foreign language)	17.82	16.18	20.57
Other	10.38	8.16	14.13
Preference rank for department	4.82 (3.37)	5.06 (3.46)	4.42 (3.17)
Prep school: Yes	72.21	74.74	68.43
Semesters in prep. school	1.83 (0.64)	1.85 (0.65)	1.80 (0.63)
Resides in dormitory	40.07	35.51	47.70
Permanent residence in Ankara	34.21	34.26	34.11
No. of observations	10,343	6,479	3,864

Notes: For continuous variables standard deviations are given in parentheses. The discrete variables are given in percentage terms.

The gender composition of the teaching staff also shows wide variations across schools, which is not a surprising finding given the imbalance in the gender distribution of majors (see Table 2). While women constitute 34% of the full-time teaching staff, their representation in the school of education reaches 64.2%, but goes down as low as 23.4% in the school of engineering. The scoring system in the centrally managed university entrance examination changed in 1999 so that in Tables 1 and 2 we report two sets of entrance scores. Both scores indicate that the engineering school accepts students with relatively higher university entrance scores. Interestingly though, the engineering students have the lowest CGPA[3] of all schools, which might be indicative of its more demanding nature in relation to others.

When the CGPA of male and female students are compared, a difference in favor of the latter is observed. An opposite observation is made in terms of university entrance scores, though female applicants seem to be more successful in getting into the department of their choice which might indicate that they have lower aspirations. While male students, on average, enter their fifth choice, female students manage better, the average of their department rank being 4.4.

A substantial portion of the students (36.9%) come from Anatolian High Schools where the medium of instruction is in a foreign language, usually in English. Students from private schools make up a little more than one fifth of the student body, which considering the overall share of private schools in secondary education, is quite substantial. This finding goes to indicate that students at METU are a select group. Based on their high school background, a significant number of students (mostly coming from public Anatolian and science high schools and private schools) are expected to have a fair amount of knowledge in the English language. Despite this, over 70% of the student body is found to enroll in the preparatory school before proceeding on to departments. The average number of semesters spent in the preparatory school is close to two semesters or one academic year. These results imply either that high school English does not equip students with the required language skills or that students opt to enroll in the preparatory school (by purposely not doing well in the English proficiency exam) to have a break from their studies.

As students mature and get used to their department, their performance improves so that higher CGPAs are recorded in upper classes. The distribution of CGPA by year is distinctly different so that pooling students from all years might not be appropriate. Therefore, in what follows next, we analyze the academic performance of genders

Table 2. Statistics on schools

Schools	University entrance scores		Standardized entrance scores		*p*-Value for the difference in average entrance scores	Number of students		Proportion of		
	1996–1998	1999–2002	Male students	Female students		Male	Female	Female students	Female faculty	CGPA
Architecture	539.74	214.54	2.567	2.271	0.297	249	334	57.29	46.62	2.56
	(20.82)	(5.43)	(0.214)	(0.185)						(0.46)
Arts and Sciences	503.06	203.61	4.241	2.391	0.000	812	880	52.01	36.12	2.53
	(27.56)	(11.27)	(0.216)	(0.134)						(0.70)
Economics and Administrative Sciences	509.00	201.35	1.611	1.505	0.325	733	834	53.22	40.57	2.73
	(12.22)	(4.36)	(0.082)	(0.070)						(0.63)
Education	503.69	200.10	2.806	1.947	0.001	478	690	59.08	64.23	2.61
	(16.24)	(11.44)	(0.237)	(0.143)						(0.62)
Engineering	544.36	217.57	2.222	1.807	0.000	4,207	1,126	21.11	23.37	2.51
	(27.66)	(6.62)	(0.053)	(0.085)						(0.66)
All	528.95	210.60	2.462	1.940	0.000	6,479	3,864	37.36	33.99	2.56
	(31.23)	(11.11)	(0.050)	(0.052)						(0.65)

Notes: For standardized scores, standard errors are given in parentheses, for others standard deviations.

separately for each year. Before proceeding on to presenting our results, it is also important to emphasize that the student body at METU represents the best students in Turkey so that the conclusions drawn from this study may not be applicable to students enrolled in other universities.

Academic performance by sex

University entrance scores

As the summary statistics indicated in Table 1, there is a gender gap in favor of male students in terms of university entrance scores. The observed difference in scores may originate from two sources; (1) female students are less successful in the placement exam so that they enter their respective departments with lower scores, (2) female students prefer less competitive departments that admits students with lower scores, which reduces their motivation to do well in the entrance exam or that due to their lower scores they get placed into departments with lower entrance requirements. The distribution of students across schools given in Table 1 indeed shows that female students are concentrated in schools with less competitive entrance requirements. To allow comparability across departments, we standardize the entrance scores using the score obtained by the last student admitted to the department in question. Standardization, which is done by subtracting the student's score from the minimum score, accounts for interdepartmental demand and supply differences as well as the change in the scoring scheme in 1999.

The mean standardized university entrance scores for male and female students by schools along with the associated p-values reflecting the results of the hypothesis that there is no gender gap in entrance scores are given in Table 2. For female students the average standardized entrance score is found to be 1.94 points, whereas for male students this figure stands at 2.46 points. Although, in comparison to the crude differential the gender gap is substantially reduced, it nevertheless remains statistically significant at conventional levels ($p < 0.000$). These results confirm that while a good portion of the crude gap stems from females being placed into less competitive departments, it is also the case that female students enter their respective departments with lower scores.

Analyzing the gender gap by schools shows that the gap is statistically significant to the disadvantage of women in all schools except for

the school of architecture and the school of economics and administrative sciences (see Table 2). The difference is especially big in the school of arts and sciences because rather diverse departments are gathered under the same school, ranging from such technical fields as physics to departments that are more social sciences oriented such as sociology and history.[4]

These findings are consistent with the literature on gender disparity in SAT scores in the US. However, the gap cannot be explained by differential course taking patterns between sexes since unlike the American students who can choose among courses, all Turkish high school students are required to take the same mandatory courses.[5] Neither is there evidence that the university entrance exam is biased against a given sex or that male and female examinees differ in terms of socio-economic background.[6] Hence, the reason for the gap must lie in the pre-collegiate experience of students.

Preparatory school

An imbalance is also observed in the gender composition of the preparatory school. While the proportion of male students enrolling in preparatory school at the start of their college life is 74.5%, the corresponding rate for female students is 68.4%. There is also a small but statistically significant gap in the number of semesters male and female students spend in the preparatory school before they pass the English language test. While male students spend, on average, 1.85 semesters learning English, this figure is 1.8 semesters for females. These observations can be taken to indicate the higher language ability of female students in comparison to their male counterparts, though differences in motivation may also be a factor.

Cumulative grade point average

Next, we consider the academic achievement of male and female students in terms of CGPA. The summary statistics presented in Table 1 showed that female students, on average, outperform their male counterparts. To see whether this result holds when other relevant factors determining CGPA are controlled for, we run a series of OLS estimations disaggregated by year (freshman, sophomore, junior, and senior).

Running the model on a pooled sample of male and female students reveal that holding individual characteristics constant and controlling

for differing departmental characteristics, females are expected to have CGPAs that are 0.12–0.13 points higher than that of their male counterparts. This result holds regardless of the year that the student is in. To determine the factors that are instrumental in bringing about an advantage for females, we run separate regressions for male and female students. The results are presented in Tables 3 and 4.

Age is an important determinant of the CGPA of male students but not of females, with the exception of first-year women. This result possibly stems from the fact that girls mature faster than boys. In a given class, younger students outperform their older counterparts who are likely to be composed of either class repeaters or those who have entered the university after a number of tries. Since we are controlling for the year of entry, which has a positive effect on CGPA indicating that more recent entrants are more successful, it must be that older students are class repeaters. The results seem to be indicating that, in a given class, a larger proportion of males are composed of class repeaters.

The type of high school attended also matters. Male students graduating from Anatolian and science high schools and private schools that teach in a foreign language outperform other male students during freshman and senior years. The language skills acquired in these schools might be instrumental in helping the first-year students follow classes, while making it easier for seniors to fulfill their written assignments which intensify in the final year. However, it is interesting to note that in their second and third years, male students graduating from general public high schools that manage to send only a small number of their graduates to METU outperform others. A plausible explanation is that these are a select group of students who probably have above average skills (though not necessarily language skills) making it possible for them to enter METU. Among females, the effect of high school differences on CGPA is not so pronounced. Graduating from sciences oriented high schools help, we suspect because they equip students with better academic skills.

The (standardized) university entrance scores impact positively on CGPA though the effect is observed most strongly in the first year. While its effect lingers on to the second year for male students, it disappears for female students only to reappear in the third year, but with a much weaker effect. Even among freshmen, the impact of university entrance scores on CGPA is rather minimal. This may be due to the fact that there is not much variation in the placement scores especially when differences among departments are controlled. A student entering his/her department with an extra point as compared to the student with the

Table 3. OLS estimates for the determinants of CGPA for male students by year

	First-year students	Second-year students	Third-year students	Fourth-year students
Age	−0.068***	−0.073***	−0.038**	−0.048***
	[0.025]	[0.017]	[0.018]	[0.014]
High school type (ref. Other)				
Anatolian	0.287***	−0.106	−0.137*	0.115**
	[0.102]	[0.076]	[0.075]	[0.050]
Sciences	0.248**	−0.108	−0.037	0.162**
	[0.112]	[0.084]	[0.085]	[0.065]
Regular high school	−0.022	−0.207***	−0.259***	−0.017
	[0.110]	[0.076]	[0.073]	[0.047]
Private sciences	−0.088	−0.268***	−0.153*	−0.001
	[0.135]	[0.094]	[0.093]	[0.069]
Private regular	−0.083	−0.379***	−0.256**	0.085
	[0.151]	[0.114]	[0.128]	[0.094]
Private school in foreign language	0.216**	−0.136*	−0.158**	0.133**
	[0.105]	[0.077]	[0.080]	[0.060]
Std. university entrance score	0.038***	0.019***	0.001	0.003
	[0.009]	[0.006]	[0.004]	[0.002]
Preference for department	−0.044***	−0.018***	−0.022***	−0.024***
	[0.007]	[0.004]	[0.004]	[0.003]
Year of entry to university	0.101	0.293***	0.278***	0.248***
	[0.065]	[0.033]	[0.030]	[0.020]
Prep school: Yes	0.209**	−0.148**	0.164***	0.291***
	[0.082]	[0.064]	[0.058]	[0.047]
Semesters in prep school	−0.250***	0.198***	0.073***	−0.021
	[0.053]	[0.030]	[0.027]	[0.019]
Schools (ref. Engineering)				
Architecture	0.437***	0.203***	0.109	−0.013
	[0.114]	[0.064]	[0.073]	[0.058]
Arts and Sciences	0.05	0.279***	0.338***	0.053
	[0.076]	[0.052]	[0.054]	[0.044]
Economics and Administrative Sciences	0.343***	0.294***	0.347***	0.045
	[0.087]	[0.056]	[0.056]	[0.050]
Education	0.093	−0.089	0.181**	0.219***
	[0.108]	[0.075]	[0.079]	[0.057]

Table 3. Continued

	First-year students	Second-year students	Third-year students	Fourth-year students
Prop. of female students in department	−1.171*** [0.240]	−1.065*** [0.169]	−0.900*** [0.170]	−0.126 [0.148]
Prop. of female faculty in department	0.803*** [0.198]	0.651*** [0.135]	0.662*** [0.144]	0.213* [0.125]
Resides in dormitory	0.211*** [0.050]	0.083*** [0.032]	0.090*** [0.031]	0.012 [0.028]
Ankara	0.201** [0.081]	0.075 [0.053]	0.244*** [0.048]	0.111*** [0.041]
Constant	2.823*** [0.795]	2.537*** [0.485]	2.264*** [0.501]	3.007*** [0.390]
No. of observations	1652	1631	1452	1744
R-squared	0.217	0.218	0.227	0.254

Notes: ***significant at 1%, **significant at 5%, *significant at 10%. Huber-White standard errors are reported in brackets. Regions indicating permanent place of residence are omitted for brevity.

lowest placement score expects to have a CGPA that is only 0.02–0.04 points higher. Holding the placement score constant, getting into a less favored department, on the other hand, decreases the CGPA of male and female students quite significantly. The effect is not only stronger – a freshman entering his/her 10th choice expects to have 0.4 points lower CGPA than a fellow student entering the department as a first choice – but also persists throughout the student's college life.

The preparatory school education, taking into the semesters spent there, impacts on student achievement positively. The only exception is observed for male students in the freshman year, for whom no significant effect is recorded. It is interesting to also note that additional semesters spent in the preparatory school, except for in the first year, has no negative effect on academic performance. The negative impact in the first year possibly stems from adjustment problems. Preparatory school education is relatively less demanding so that the longer the time spent there, the harder is the transition from the preparatory school to the department. The positive effect in upper years, on the other hand, implies that certain number of semesters in preparatory school is required to achieve competency in the English language.

Table 4. OLS estimates for the determinants of CGPA for female students by year

	First-year students	Second-year students	Third-year students	Fourth-year students
Age	−0.057**	−0.027	−0.022	−0.012
	[0.027]	[0.026]	[0.026]	[0.022]
High school type (ref. Other)				
Anatolian	0.121	0.082	0.066	0.059
	[0.090]	[0.082]	[0.071]	[0.072]
Sciences	0.395***	0.235**	0.158*	0.243**
	[0.119]	[0.102]	[0.091]	[0.095]
Regular high school	0.003	0.038	−0.019	0.03
	[0.137]	[0.088]	[0.075]	[0.070]
Private sciences	0.455**	0.055	0.19	0.035
	[0.182]	[0.134]	[0.125]	[0.160]
Private regular	−0.02	0.297**	−0.11	−0.326*
	[0.162]	[0.140]	[0.166]	[0.176]
Private school in foreign language	0.115	0.118	0.131*	0.108
	[0.093]	[0.083]	[0.073]	[0.084]
Std. university entrance score	0.028***	0.007	0.012*	0.001
	[0.010]	[0.008]	[0.006]	[0.003]
Preference for department	−0.033***	−0.026***	−0.014**	−0.012**
	[0.007]	[0.006]	[0.005]	[0.005]
Year of entry to university	0.062	0.380***	0.339***	0.343***
	[0.088]	[0.079]	[0.067]	[0.038]
Prep school: Yes	0.615***	−0.208	0.186*	0.359***
	[0.107]	[0.147]	[0.101]	[0.058]
Semesters in prep school	−0.534***	0.273***	0.06	−0.019
	[0.058]	[0.072]	[0.060]	[0.025]
Schools (ref. Engineering)				
Architecture	0.135	−0.085	−0.055	−0.115*
	[0.083]	[0.065]	[0.068]	[0.063]
Arts and Sciences	0.201***	0.08	0.148**	0.067
	[0.076]	[0.063]	[0.064]	[0.067]
Economics and Administrative Sciences	0.365***	0.181***	0.283***	0.064
	[0.077]	[0.062]	[0.060]	[0.062]
Education	0.404***	0.045	0.137	0.083
	[0.102]	[0.094]	[0.086]	[0.073]

Table 4. Continued

	First-year students	Second-year students	Third-year students	Fourth-year students
Prop. of female students in department	−0.033	0.009	0.047	−0.1
	[0.231]	[0.172]	[0.176]	[0.200]
Prop. of female faculty in department	0.159	0.436***	0.333**	0.449**
	[0.220]	[0.163]	[0.165]	[0.179]
Resides in dormitory	0.011	−0.046	−0.008	0.043
	[0.065]	[0.044]	[0.041]	[0.038]
Ankara	0.076	0.056	0.148**	0.188***
	[0.088]	[0.071]	[0.063]	[0.065]
Constant	3.165***	0.511	1.284*	1.546***
	[0.947]	[0.845]	[0.736]	[0.596]
No. of observations	1093	989	938	844
R-squared	0.187	0.143	0.167	0.217

Notes: ***significant at 1%, **significant at 5%, *significant at 10%. Huber-White standard errors are reported in brackets. Regions indicating permanent place of residence are omitted for brevity.

The department in which the student is enrolled also matters in determining his/her CGPA. For both the male and female students, there seems to be a ''penalty'' associated with being in the engineering school. Comparing the ''grade premium'' associated with not being an engineering student across male and female students reveal that only in the freshmen year and in the school of education do the female students have a premium over their male counterparts. Male students, on the other hand, have an advantage over females in the school of architecture and school of arts and sciences in sophomore and junior years and in the school of education in their senior year.

The gender composition of the student body in the department that the student is enrolled does not impact on the success of female students. However, quite interestingly, higher female student composition works to reduce the CGPA of male students. Since almost the entire student body comes from co-ed schools, this effect is puzzling. A plausible explanation is that contrary to our conjecture, female students are more conservative about including their male classmates into their study groups so that where the latter constitute a minority they suffer from lack of study networks. Higher female faculty composition, on the other hand, increases the CGPA of both the male and female students.

Although the "role model" hypothesis would predict a positive effect for females, it is not clear why male students are also positively affected. In fact, except for the freshmen among whom the favorable effect is observed only for male students, higher female faculty ratio does not particularly bring about an advantage for female students. A plausible conjecture for the equally favorable effect of women faculty on male and female students' academic performance is that women faculty members are more generous in giving out grades compared to their male counterparts.

Students from Ankara, the majority of whom would be living at home, are predicted to have higher CGPAs. So do the male students residing in dormitories on campus. Female students' academic performance seem to be less affected from being away from their families, or having to live alone possibly because they have been brought up with skills to manage on their own. Alternatively, it might be that female students are freed from their domestic obligations and therefore, perform better.

Conclusion

The study has established that despite their lower university entrance scores and under-representation in most departments, female undergraduate students outperform their male counterparts during their college years. While it is true that higher grades in the school of education and the greater concentration of female students in education departments help explain the higher CGPA for the female student population, it is also the case that female students outperform their male counterparts in all the other four schools considered. The multivariate analysis has further shown that, controlling for all other relevant factors, belonging to a certain school does not bring about an advantage to female students. Quite the contrary, it is the male students who enjoy a "grade premium". To the extent that we are controlling for student ability and other relevant individual attributes, our results seem to indicate that female students are able to make better use of their individual endowments and the opportunities offered at METU in achieving higher grades. As suggested in the literature, this would most likely to entail such factors as better class attendance, study skills, and motivation on the part of the female students.

Amidst the gender inequality in much of the public life in Turkey, higher course grades achieved by female students are encouraging.

However, gender segregation by fields of study should not be overlooked. A significant portion of the gender earnings gap (as much as 45%) among university graduates in the US is attributed to differences in majors (Solnick 1995; Jacobs 1996). To the extent that females are less likely to get into lucrative fields of study, this may translate into lower earnings in the future. Labor market statistics in Turkey indicate that university educated women earn less than men. The most recent statistics put this gap at little under 25%.[7] It must also be considered that not all university educated women enter the labor market (62% do as opposed to 78% of men). If labor market discrimination is a factor in this, then the earnings gap reported above is probably underestimated. Since METU does not keep track of the labor market performance of its graduates, it is not clear whether women alumni constitute a happy minority who find the labor market as open and satisfying as men do. It might very well be that they end up becoming part of the larger crowd of highly qualified but underemployed women.

Our results being based on a limited and select sample of university students await generalization through similar studies undertaken in other public as well as private universities in Turkey. Doing so is important on two accounts. First, it will show whether our results can be generalized to the undergraduate population in Turkey. Second, it will provide insights into the relative importance of covariates identified in this study as determinants of academic performance. Indeed, if it is the case that our results hold for a select group of universities but not for others, then this could provide clues as to the way in which university administrators can enact women friendly policies to improve the performance of their female body. The results of wider scale comparative work can also provide important feedback and give direction to various educational policies enacted in Turkey both at the secondary and tertiary level.

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Notes

1. For more information see http://www.osym.gov.tr.
2. This figure is lower than the national average of 43% (see http://www.osym.gov.tr).
3. Courses taken from the preparatory school are excluded from CGPA calculations since they are evaluated on a pass or fail basis.
4. The analysis of placement scores by department does indeed show larger gender gaps in departments under the school of arts and sciences.
5. In their junior year, high school students choose among the four basic fields of study; the Turkish language and mathematics, sciences and mathematics, the Turkish language and social sciences, and languages by considering the entrance requirements of the department they hope to enter in. Within each field, the courses are mandatory though across fields courses may differ. However, all four fields share the same core courses that include basic courses in mathematics, sciences, social sciences, and the Turkish language. The university entrance exam is structured in such a way that students are expected to answer questions related to their field of study so that university entrance scores reflect the choices made.
6. Even if there is a gap, given the patriarchal social structure, we would expect it to be in favor of female examinees. Indeed, Şenses (1999) notes that in the Department of Economics at METU female representation increases with family income. Given the small sample size, it is not clear whether this finding can be generalized to the entire student population at METU or to all high school graduates taking the university entrance exam.
7. The figure is based on hourly earnings of men and women and is calculated by the authors using the 2002 Household Budget Survey conducted by the State Institute of Statistics of Turkey.

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