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ABSTRACT

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We investigate how the benefits of publicly financed higher education in Turkey are distributed among students with different socioeconomic backgrounds. We use a unique dataset from a nationally representative sample of university entrance exam takers together with data on government subsidies to public universities. We compare the characteristics of students who succeed in the exam to those who do not and those who enter public universities to those who go to private ones. Our econometric analyses based on a three-stage selection model reveal that students from wealthier and more educated families are more likely to be successful at university entrance. Unlike the findings in other countries, students who enroll in private universities come from higher income and more educated families. However, among those who enter public universities, students from higher income and more educated families are more likely to go to universities that receive larger subsidies from the government.

JEL Classification: O12, I22, I24, O15

Keywords: higher education, public finance of higher education, Turkey

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1. Introduction

In many countries, governments heavily subsidize higher education. There are two main economic arguments in favor of this policy. First, in the absence of government involvement, borrowing against future human capital is very limited and in particular, students from low income families are likely to find it difficult to afford college even when their private returns to higher education are greater than their costs. Second, social returns to higher education are likely to be higher than private returns and hence in a free market the level of higher education is likely to be less than the socially optimal amount. However if government is subsidizing higher education of students from high income families who would have gone to college in the absence of government subsidies, then these subsidies may not be justified with either of these arguments and may simply result in an income transfer from the poor to the rich.

In this paper, we examine empirically the characteristics of the beneficiaries of public expenditure on higher education using a nationally representative survey of university entrance exam applicants from Turkey, merged with data on government subsidies to public universities. In Turkey, higher education is heavily subsidized. Households with students in public universities receive in-kind benefits in the form of tuition fee subsidy. Most university students attend public universities. In the survey year of 2002, only about 4 percent attended private universities.

There are only a few studies that empirically examine the characteristics of the beneficiaries of public expenditure on higher education. Rozada and Menendez (2002) analyze the socioeconomic characteristics of individuals attending and not attending university in the Buenos Aires metropolitan area and find that no socioeconomic variables are statistically significant in determining public university attendance. Liu et al. (2006) examine the characteristics of the beneficiaries of public expenditure on higher education in Taiwan, where subsidies for higher education generally come in the form of government-financed low tuition public universities. Liu et al. (2006) advance the approach in Rozada and Menendez (2002) by using a two part model to estimate the conditional probability of entering a public university and the conditional probability of entering different types of public universities. They categorize public universities into three groups and find that students entering public universities tend to come from

wealthier families compared to students of private universities and students that attend the top five public universities come from wealthier families than students that attend the lower tier public universities which also on average receive lower government subsidies than the top five.

In this paper we contribute to this small literature in several dimensions. First, we use data from a nationally representative survey of university entrance exam applicants from Turkey where the private higher education sector is not subject to price regulation. In Taiwan where the only other national study is from, private higher education institutions are subject to price controls which may affect the quality of these institutions. Second, we merge these data with administrative data on public expenditures on higher education differentiated by university and faculty. Thus, we can observe the amount of per student subsidy not only at a national or university level, but separately for universities and faculties. Third, we estimate a three-stage Heckman model where in the first stage we analyze the determinants of university entrance, in the second stage we analyze the determinants of public versus private university choice among the entrants and in the third stage we analyze the allocation of students among public universities based on government subsidies to these universities. Students in Turkey prepare their choice lists after observing their scores on the exam. Only those who score above a certain threshold are asked to submit their choice lists. The multi-level analysis enables us to observe the determinants of the decisions at each stage separately. We supplement our findings with a three-part model which can be used to derive the marginal effects of socio-economic characteristics on the educational subsidy received from the government by an average exam taker in Turkey. Our categorization of public universities is much richer and precise than in Liu et al (2006) since we use the implicit per student subsidy in a program-university pair as our measure.

We find that students entering public universities come from lower income families than students entering private universities. This is a strikingly contrary result to Liu et al (2006) and can be attributed to the lack of price controls in the private higher education sector in Turkey. This result has important policy implications. A private higher education sector that is not subject to price controls can provide a high quality product that attracts wealthier students in a country where public provision has traditionally been the norm.

Sorting of high income students into private universities and low income students into public universities results in a higher education system where government subsidizes higher education of low income students who may not have gone to college due to borrowing constraints.

However among those entering public universities, students who come from higher income and more educated families tend to enter the public universities that receive higher government subsidies. There is tough competition to enter the better funded public universities. Students spend significant amounts on private tutoring in order to get into the better programs/ universities. It appears that the students that come from wealthier families spend more on private tutoring and are also able to get into universities that receive higher government subsidies.

The plan of our paper is as follows: In the next section, we discuss the related literature. Section 3 presents the setting for the university entrance exam and the government financed higher education system in Turkey. Section 4, presents the data and the descriptive statistics. Section 5 provides the econometric framework. In Section 6, we present and discuss our results. In Section 7, we discuss the policy implications of our analysis; Section 8 concludes.

2.Related Literature

There is a sizable literature on the public finance of higher education and its distributional consequences. In the economics of education, it has been argued that subsidies to higher education have a regressive distributional effect. Given that wealthier families enroll more children in higher education, there may be an unwanted "perverse" distributional impact of these subsidies to higher education. (Friedman, 1962, p. 105).

Public finance of education can be seen as a case of a publicly provided private good, financed by a proportional income tax, such as in the public economics textbook by Atkinson and Stiglitz (1980). There are implications of such a model on both the resources devoted to education and on income redistribution implicit in the financing scheme. In such a model, if income distribution is skewed so that the mean income is

greater than the median income, if there is proportional taxation and if collective choice on whether education should be financed publicly is determined by majority voting, then the majority chooses public finance of education. This outcome involves a net transfer of resources from higher-income individuals to lower-income individuals.

However, as shown by a branch of political economy literature that evolved from the Fernandez and Rogerson (1995) study, the opposite result, i.e. regressivity of education subsidies, is possible. If households are credit constrained and they vote over the extent to which education is subsidized, higher income individuals choose to subsidize the cost of education only partially. This effectively excludes poorer individuals from receiving this education and simultaneously extracts resources from them.

The earliest, and very commonly cited, empirical study on the subject shows that in California worse-off households benefit less from higher education subsidies than better-off households do, even after taking into account the fact that they also contribute less in taxes to support public higher education (Hansen and Weisbrod, 1969). The findings of this study were criticized on the grounds that the analysis does not compare the benefits and payments of different income groups as it should do, but it compares only families with children to childless families and that the public higher education system in California is actually progressive when the analysis is based on different income groups (Pechman, 1970).

A number of other studies contributed to this debate. For example Fields (1975) finds that the higher education system is regressive in Kenya where "… a select few receive a very large payoff …" (ibid. p.257). In Canada (Crean, 1975), in Japan (James and Benjamin, 1987) and in Germany (Barbaro, 2005), the public finance of higher education is found to have a progressive effect on the income distribution. In contrast, the effect is found to be regressive in Quebec (Lemelin, 1992). In Greece, the distributive effect of public higher education is also regressive; moreover, the children of the "most well-off" segments of the population are reported to be significantly over-represented in the faculties with the highest cost per student, such as medicine and engineering (Antoninis and Tsakloglou, 2001). In the Greek study the subsidy received by each household is determined by the average spending per student, which is differentiated very roughly by the type of the

higher education institution (universities versus technological institutes). Our data allows us to implement a much finer breakdown and differentiate per student subsidy by faculty of each public university.

Some authors stated that the analysis should focus on lifetime income distribution within cohorts instead of the current income distribution within the population (Crean, 1975; James and Benjamin, 1987). Parents of university-age children are usually between their late thirties and mid-fifties, and therefore in an advanced stage of their earnings profile. For this reason, they will appear in the cross-section as high earners. When the extent of progressivity is estimated by considering whether these families are subsidized by other families in the cross section, the result is to overemphasize the attractiveness of education subsidies for the richer groups and to overestimate the regressivity of subsidies. However, redistribution from those who never benefit from the program to those who do and redistribution that takes place between families who at some time or another send their children to higher education are two different concepts that should not be confused. The latter shifting should not be regarded as redistribution. In our study, we have the opportunity to observe the family backgrounds of a nationally representative sample of all exam takers, i.e. all university age children who apply for a place at a university. Within this group we compare the background variables of those who entered a university to those who did not, therefore our study is not subject to such bias.

These empirical studies evaluate the progressivity of the public provision of higher education typically by comparing the benefits received and costs borne by households in different socio-economic groups. Our study asks a related but different question: We ask how the subsidy per student is distributed across students who apply to receive higher education, and whether the family characteristics of students who go to public universities are different from those who go to private ones. We also compare university applicants that succeed in the university entrance exam and are placed at a program university pair with those who are not placed in any university as a result of their exam score and preference list.

Our study is related also to the "equality of opportunity" literature. As Roemer (1998) suggests, equality of opportunity is realized when the circumstances that are beyond the

control of an individual (such as the family, the neighborhood, the genes) but that affect the achievements in life do not matter for the determination of the achievements. This means that the playing field should be leveled before the game begins. This implies that resources should be distributed in such a way that the differential abilities of individuals to turn resources into achievements are compensated for; but of course differential achievements due to the application of own effort should not be leveled. Ferreira et al. (2010) use the educational attainment of parents and the number of siblings a person grew up with as indicators, among others, of circumstances in Turkey. In our study, we include these two variables in our set of controls to investigate how circumstances influence students' exam performance and the amount of subsidy they receive.

Most similar to our study are the Rozada and Menendez (2002) and Liu et al. (2006) studies. The former finds that in Argentina, individuals attending the university are in the top deciles of the income distribution and come from relatively highly educated families. Moreover, there is little difference in terms of socioeconomic variables between those attending tuition-free public institutions and those attending private colleges, which implies that there is an implicit transfer to the richest individuals in society. As poor students in Argentina are excluded from higher education, tuition-free education at public universities does not benefit them. The latter study is on Taiwan where students take a nationwide university entrance examination, as in Turkey, and are assigned to major in a particular field and university based on their score. The authors find that, consistent with the former study, family background variables such as family income and parental education have an important impact on the educational achievements of children and that government spending on higher education actually subsidizes richer families.

We know that in many developing countries demand for higher education exceeds supply by a considerable margin and the excess demand is satisfied by the private provision of higher education. There are studies that report that public universities are better and more prestigious than the private ones and that members of richer households have a substantially higher probability to enter the public institutions (for example in Greece, Antoninis and Tsakloglou, 2001; in Taiwan, Liu et al. (2006)). The policy proposal to enhance the distributional performance of higher education system in such a situation is to introduce tuition charges combined with a selective scholarship scheme (see for

example, Rozada and Menendez, 2002; Antoninis and Tsakloglou, 2001; Psacharopoulos et al., 1986). In our analysis, we compare the family background of public university students and compare them to private university students. Unlike the findings in Greece and Taiwan, we find that students of private universities come from richer families.

3. The Setting:

a) The University Entrance Exam in Turkey

Students need to take a highly competitive nationwide test, (called OSS during the period of study), in order to be enrolled in a university in Turkey. This test is given once a year and more than one million students participate each year.

In 2002, the year that our data was collected, the exam was composed of verbal, quantitative and foreign language sections. The raw OSS score was a weighted average of the scores on these sections. Students decided which sections to answer based on their major choices.

The raw OSS scores were further adjusted for high school performance. In Turkey, high school students choose fields of study. In the 2002 data provided by the Student Selection and Placement Center (OSYM), there were four fields; Science, Turkish-Math (TM), Social Sciences and Foreign Languages.

Once the OSS scores were available, students who scored above a certain threshold were asked to submit their choice lists. Each candidate could include up to 24 choices (program-university pairs) in the list, ranked from the most preferred to the least preferred. The students were ranked by their OSS scores. The candidates with the highest scores were admitted to the top listed programs in their choice lists. As the quotas of the programs preferred by the candidates with the highest scores were filled, candidates with lower OSS scores were assigned to their less preferred programs, or to no programs at all if the quota of all the programs in their choice lists had already been filled. Therefore, assignment to a program-university pair was a function of both the OSS score and the choice list of a candidate. Knowing his own score and the minimum acceptance scores of programs in the previous year, a student could have some rough idea about the feasible set of program-university pairs.

b) Government Financing of Higher Education

In Turkey, higher education is largely subsidized by the government. As of 2005, there existed 53 public universities and 24 private universities; however, about 95 percent of students were enrolled in public universities (OSYM Higher Education Statistics). While a public university existed in many cities, private universities were located only in Istanbul, Ankara and Izmir, the largest cities in the country.

Table 1 presents the sources of revenue for the 53 Turkish public universities, in years 2000 through 2005. The second column of the table shows the share of funds that come in the form of government subsidies. The second source of revenue is the funds generated by the universities themselves. These include revolving funds revenues (such as from the provision of health services by university hospitals and consulting or educational services by professors) and the revenues of cafeterias, parking lots, dormitories etc. owned by the universities. Student fees are the third source of revenue.

Table 1: Sources of Revenue in Public Universities (% in total)

Year	Government Subsidies	Funds Generated by the Universities	Student Fees
2000	57	38	5
2001	52	44	4
2002	52	44	4
2003	57	39	4
2004	56	40	5
2005	57	38	4

Source: The Turkish Council of Higher Education (YOK), The Current State of Turkish Higher Education, November 2005, Table 8.16.

Note: The percentages may not always add up to 100 due to rounding.

According to Table 1, government subsidies are the major source of revenue for public universities, with a share that ranges from 52 to 57 percent of the total. Universities' own revenues are the second biggest source. Student fees constitute a very small share in total revenues, amounting to only 4-5 percent.

In this study, we estimate the per student subsidy implicit in the (almost) tuition-free provision of higher education in Turkey by the per student public cost of providing higher

education. This is calculated by dividing the total recurrent expenditures of faculties (i.e. the funds allocated from the national budget to cover the usual overall cost of providing educational services) by the number of students enrolled in those faculties. The data section presents a more detailed definition.

There were a total of 1,256,920 undergraduate students (excluding open university-distance education-students) enrolled in the 53 public universities in year 2005. The average per student subsidy in our data is 2,713 TL. However there is non-negligible variation in the per student subsidy by faculty (the field of study). Table 2 shows the mean, median, minimum and maximum values as well as the standard deviation and the number of observations of per student subsidy at various faculties. We observe that per student subsidy tends to be high in medical faculties, in dentistry and pharmacy, while it is low in education, management and economics.

There is also substantial variation across universities. For example, among the 59 management or economics programs in Turkish public universities, the minimum is 855 TL per student while the maximum is 7941 TL. Which universities spend more per student? In Appendix Table A1, we present the universities that are the recipients of highest per student subsidies in some randomly selected programs. Most of the universities in the table are well established and prestigious universities. Although the Ministry of Finance intends to equalize per student expenditures across universities when preparing the budget, the realization is that these expenditures vary substantially. The factors that can account for the higher per student expenditures at some universities are having a larger campus, having old (sometimes historical) buildings, being located in a colder part of the country or having priority due to being in a less developed area, as suggested by the Ministry of Finance personnel. Our observation is that while these factors may be valid, the universities with the highest per student expenditures are typically the most prestigious public universities that are very highly demanded by students.

Table 2: Per student subsidy at some faculties (TL per student, 2005 prices)

	Mean	*Median*	*Minimum*	*Maximum*	*StDev*	*N*
Medicine	20300	19961	1702	10578	2100	37
Dentistry, Pharmacy	8395	19961	566	68306	10793	25
Faculty of Arts and Science	3266	2464	1016	16360	2531	65
Engineering, Architecture	3979	2939	1701	14814	2527	71
Law	3235	2750	1087	8586	1950	14
Management, Economics	2318	1841	855	7941	1403	59
Fine Arts, Literature, History	3769	3524	1473	9172	1515	27
Education	2068	1839	1120	6757	937	63

Source: Authors' calculations based on Ministry of Finance and OSYM data.

Notes: The number of observations (N) may exceed the total number of public universities in year 2005, which was 53, in cases where there are more than one faculty in the same university. For example, if a university has both an engineering and an architecture faculty, that university is counted twice in the "Engineering, Architecture" faculty group.

Another important observation is the small enrollment fees charged by public universities. The annual fees varied from 147 TL to 458 TL per student in 2005, depending on the major of study[1]. The highest fees were paid by students in medicine, dentistry, pharmacy and state conservatory for the arts. It is clear that students at public universities in Turkey pay only a small share of the cost of higher education, in other words they contribute very little to cost recovery. In private universities, whose main source of revenue is tuition fees, students paid as much as 26,500 TL (Turkish Liras) and as little as 4,266 TL annually in 2005.[2]

4. The Data

The data used in this study come from two main national sources: (1) the university entrance exam data, provided by the OSYM and (2) data on the funds allocated to public universities from the national budget, provided by the Ministry of Finance (MOF).

There is only one dataset available in Turkey that includes both the applicants' and their families' characteristics. This unique dataset from year 2002 combines the

[1] Authors' calculations based on fee information from the University Entrance Exam Application Booklet, year 2005, OSYM. The average US$/TL exchange rate in 2005 was 1 USD=1.34 TL. Thus, 147 TL and 458 TL are about US$ 110 and 342, respectively.

[2] Based on the 1 USD=1.34 TL exchange rate in 2005, the highest fee was US$ 19,776 and the smallest was US$ 3,184.

information from the students' application documents with the information from a number of survey questions that the students were asked to answer at the time of their applications. The dataset was provided by the OSYM of Turkey and it contains one random sample from each of the four high-school fields; Science, Turkish-Math (TM), Social Sciences and Foreign Languages. Each sample contains data on about 40,000 students. We pool the four samples and hence use the data from all four high-school fields. In the OSS data, for each student we have his OSS scores, the student's choice list which includes the codes of program-university pairs that the student ranks in his list, whether the student entered university and if so, the program-university pair that he was admitted to. In 2002, there were about a hundred different four year degree programs.

Our dataset also includes information on family and individual characteristics such as the gender of the student, the number of children in the family, education of the parents, employment and social security status of the parents, family income (in terms of income brackets), expenditures on private tutoring to prepare for the exam, the number of times that the student has taken the exam and population of the area that student attended high school. The data on the socio-economic background of the students were collected via a survey of the students registering to take the OSS.

We merge the OSS data with the per student subsidy data which come from the MOF. The merge is done by the code of the program-university pair that the student is admitted to. With this merger, we are able to tell how much per student subsidy each student receives if he is admitted to university. We exclude students who were admitted to Open University programs since these are part-time distance education programs with very low per student subsidies. We also exclude students at evening programs, since we cannot calculate the per student subsidy received by these students based on the data that we have. Students enrolled in either type of programs have usually jobs and careers. These restrictions bring the dataset down to 93266 observations.

The per-student subsidy calculations in this study are based on the data from the final accounts of public universities for year 2005, the closest year to 2002 for which detailed data could be obtained from the MOF. These data include budget realizations of expenditures of public universities. The data are organized in economic and institutional classification as explained below.

In the MOF data, total expenditures of public universities are broken down into the following economic categories: (1) Personnel expenditures; (2) Government premium payments to social security agencies; (3) Purchase of goods and services (includes office equipment, stationary, periodicals, utilities, small repair and maintenance, materials for laboratory experiments, travel allowances, etc.); (4) Current transfers (includes payments to retirees, treatment of students in university medical center, etc.); (5) Capital expenditures (includes new construction, major repair and maintenance, lump-sum purchases of books and journals, real estate purchases, etc.). As part of capital expenditures, there are some items which are large but happen once in a lifetime, such as real estate purchases. These items are subtracted from the total; all other items constitute the recurrent expenditures of a university, in other words they are the expenditures that are essential for the continuation of educational activities at the university.

Important for our study, we can also see the breakdown of recurrent expenditures by institutional divisions, which can be grouped into administrative (such as the President's Office, Personnel Department) and academic divisions (faculties). The administrative divisions do not have educational functions; however their existence is essential for a university to function properly. Therefore their expenditures are distributed to faculties, in proportion to the shares of the faculties in total recurrent expenditures of all academic divisions. In other words, the subsidy allocated from the national budget to an academic division of a university is defined as the total recurrent expenditures of the academic division plus its estimated share in total administrative recurrent expenditures. Per student subsidy is this total amount divided by the number of students in the academic division.

An advantage of the MOF data is that we can identify the per student subsidy not only at the university level but also at the faculty level. This is important, since previous studies estimate per student subsidy very roughly and only at the national level (by dividing the total higher education expenses by the total number of students) and therefore overlook the variation in per student subsidy across universities and faculties. We assume that students of all departments at a faculty (for example all Engineering students at a Faculty of Engineering) receive the same per student subsidy, since we do not have data on expenditures at the departmental level.

The descriptive statistics of the data used in the econometric analysis are reported in Table 3. The dummy variables for parental education are illiterate, literate, primary school graduate (5 years of schooling), junior high school graduate (8 years of schooling), high school graduate (11 years of schooling), junior college graduate (2 years of vocational college), college graduate (4-6 years of college) and master's or Ph.D. degree, respectively. The other variables shown in Table 3 are the logarithm of family income[3], male (equal to 1 if the student is male and 0 if female), the number of children in the family, the student's high school field, a dummy variable for whether the father is affiliated with the public sector, the number of times the student has taken the exam (1 if it is the first time, 2 if it is the second time and so on), and the logarithm of the population of the area in which the student went to high school.

In the first part of the table we show the means and standard deviations of our control variables for the entire sample. In the second and third parts of the table we show the statistics for the sample of students who were successful in the exam and who were not, respectively. It seems that successful students come from families with higher income, fewer children and better educated parents. Within the group of successful students, 23 percent have a college graduate father, whereas the fathers of unsuccessful students are mostly primary school graduates (only 9.8 percent of unsuccessful students have college graduate fathers). The corresponding figures for mothers are 9.2 percent and 2.7 percent. Successful students appear to come from bigger cities. Repeat-taking is very common in Turkey; an average successful student has taken the exam 1.6 times, an unsuccessful one has taken the exam about two times. There is evidence that a student's field choice in the high school may be correlated with his exam success. Although the four fields are quite evenly distributed in the whole sample, 38 percent of successful students come from the science field. The fathers of successful students are more likely to be employed in (or retired from) the public sector.[4]

[3] In January 2005, 6 zeros were omitted from the Turkish currency unit. We express 2002 monetary values without the 6 zeros.

[4] Public sector employment is known to offer job security and stability. According to the Turkish social security system valid in 2002, a person was either covered by the public sector program (called Emekli Sandigi), covered by a private sector program (called SSK or Bag-kur), or not covered at all. The public sector social security program offers the most generous retirement and health benefits (Caner and Okten (2010)).

In the fourth and fifth parts of the table, we restrict the sample to those who were successful in the exam and compare the students who were placed at a public university to those who were placed at a private university. Students who go to private universities in Turkey seem to come from higher income families as opposed to those who go to public ones. They also have better educated parents. About 7.8 percent of private university students have fathers with a master's or Ph.D. degree, while only 1.9 percent of public university students do. The corresponding figures for mothers' education are 20.3 percent versus 7.7 percent. The students who are placed at a public university appear more likely to have fathers who are public sector employees than private university students (32.1 percent versus 25 percent). Students that are placed in private universities seem less likely to be in the science field and more likely to be in the social field indicating possible specialization of private universities in certain fields.

We conduct t-tests on the equality of means of two groups. Comparing those who were placed at a public university to those who were placed at a private university, the hypothesis of the equality of mean family incomes is rejected with a very small p-value (t=43.28). Similarly, those who were placed at a public university had higher mean family income when compared to those who failed in the exam, again with a very small p-value (t=28.75). These findings tell us that private university students come from higher income families than public university students and that public university students are richer than those who failed in the exam, without controlling for any other factor.

Table 3: Descriptive Statistics

Type of Variables	Variables	(1) All (N=93,266)		(2) Success=1 (N=18,464)		(3) Success=0 (N=74,802)		(4) Public=1 (N=16,251)		(5) Public=0 (N=2,213)	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St.Dev.	Mean	St.Dev.
Family resources	Logarithm of family income	5.692	0.752	5.911	0.810	5.638	0.727	5.820	0.756	6.578	0.881
	Male	0.508	0.500	0.476	0.499	0.516	0.500	0.473	0.499	0.503	0.500
	Number of children	3.234	1.211	2.877	1.156	3.322	1.208	2.929	1.155	2.494	1.090
High school field	Science	0.225	0.418	0.380	0.485	0.187	0.390	0.394	0.489	0.276	0.447
	Social	0.259	0.438	0.094	0.292	0.300	0.458	0.089	0.285	0.129	0.335
	Language	0.237	0.425	0.314	0.464	0.218	0.413	0.310	0.462	0.345	0.475
Father's education variables	Literate	0.050	0.218	0.029	0.168	0.055	0.229	0.030	0.171	0.019	0.138
	Primary school graduate	0.396	0.489	0.294	0.456	0.421	0.494	0.311	0.463	0.170	0.376
	Junior high school graduate	0.134	0.340	0.112	0.315	0.139	0.346	0.117	0.322	0.071	0.258
	High school graduate	0.202	0.401	0.224	0.417	0.197	0.397	0.228	0.419	0.193	0.395
	Junior college graduate	0.053	0.223	0.069	0.254	0.049	0.215	0.072	0.259	0.044	0.206
	College graduate	0.124	0.330	0.230	0.421	0.098	0.298	0.205	0.404	0.414	0.493
	Master's or Ph.D. degree	0.009	0.096	0.026	0.159	0.005	0.072	0.019	0.136	0.078	0.269
Mother's education variables	Literate	0.094	0.292	0.067	0.250	0.101	0.301	0.071	0.257	0.038	0.190
	Primary school graduate	0.465	0.499	0.394	0.489	0.483	0.500	0.417	0.493	0.230	0.421
	Junior high school graduate	0.071	0.257	0.078	0.267	0.070	0.255	0.078	0.268	0.077	0.267
	High school graduate	0.130	0.336	0.207	0.405	0.111	0.314	0.191	0.393	0.319	0.466
	Junior college graduate	0.031	0.172	0.056	0.230	0.024	0.154	0.055	0.229	0.059	0.235
	College graduate	0.040	0.195	0.092	0.290	0.027	0.161	0.077	0.267	0.203	0.403
	Master's or Ph.D. degree	0.002	0.048	0.008	0.089	0.001	0.030	0.005	0.069	0.031	0.173
Other control variables	Father works in the public sector	0.258	0.438	0.313	0.464	0.245	0.430	0.321	0.467	0.250	0.433
	Times exam taken	1.985	1.170	1.696	0.949	2.057	1.208				
	Ln population	12.143	1.945	12.500	1.791	12.055	1.972				

Source: Authors' calculations.

5.Econometric framework

We conceptualize the decision-making process of a student as follows: The student takes the OSS exam and observes his score. If he earns a score high enough to be admitted to a university, he decides whether he prefers to attend a public or a private university based on his own characteristics and his preferences for what these universities have to offer. If a student goes to a public university, he receives an implicit education subsidy from the government. We are interested in finding out the characteristics of students who have been successful in the exam, who go to public versus private universities and the characteristics of students who receive a high subsidy.

We estimate two models: a three stage Heckman selection model and a three-part model. We explain the selection model first. In the first stage of the model the outcome variable "s" is success at the university entrance exam where the student earns the right to be placed at a program-university pair. We estimate this by a probit equation where the dependent variable "s" takes the value of 1 if the student is successful at the university entrance exam and earns the right to be placed at a program-university pair as a result of his university exam score and preference list.

$$s^* = X_1\beta_1 + \varepsilon_1, \quad s = \begin{cases} 1 \; if \; s^* \geq 0 \\ 0 \; if \; s^* < 0 \end{cases} \qquad \text{(for the entire sample)} \qquad (1)$$

In the second stage, we look at the sample of students who were successful in the exam. The outcome variable "p" is placement at a public university. We estimate a probit equation where "p" takes the value of 1 if the student was placed at a public university and 0 if placed at a private university as a result of his preference list and exam score. To control for the possible effect of selection into "success", we use the inverse Mills ratio from the first stage as an explanatory variable in the second stage probit.

$$p^* = X_2\beta_2 + \varepsilon_{2,} \quad p = \begin{cases} 1 \; if \; p^* \geq 0 \\ 0 \; if \; p^* < 0 \end{cases} \qquad \text{(for the subsample } s = 1) \qquad (2)$$

In stage three, the outcome "c" is the recurrent expenditures of the program-university pair which indicates the amount of subsidy received by each student from the government. We call this variable the "subsidy per student". We observe this variable only for public universities; hence at this stage our sample is restricted to students who

entered a public university. To control for the possible effect of selection into "public university", we use the inverse Mills ratio from the second stage in this regression.

$$c = X_3\beta_3 + \varepsilon_3 \qquad \text{(for the subsample } p = 1\text{)} \qquad (3)$$

The matrix X_3 includes:

(1) income measures, we use two alternative income measures in our estimations:
a) "lnincome" variable: In the survey, applicants are asked to choose one of the seven family income brackets. Hence, we generate an income variable that is equal to the midpoint of the income bracket chosen and use the natural logarithm of this variable as a measure of family income in our regressions.
b) income dummy variables: In order to capture the non-linear effects of income (and also not to impose any artificial income distances between applicants as is the case with the midpoint method), we generate four income dummy variables based on income percentiles[5] as explained in Section 6.
(2) "male" dummy variable, which is equal to one if the student is male, zero otherwise,
(3) the "number of children" variable that indicates the number of children in the family,
(4) the "science", "social" and "language" dummy variables that indicate the high school field of the student (the omitted category is "Turkish and mathematics"),
(5) seven dummy variables for father's education, as explained in Section 4; the omitted category for education is illiterate,
(6) seven similarly defined dummies for mother's education.

The matrix X_2 includes all variables in matrix X_3 besides a dummy variable that indicates whether the student's father works in the public sector. This variable is used as an exclusion restriction in the per student subsidy equation in stage 3. We assume that this variable affects the student's preference towards getting an education from a public university, but has no direct effect on the subsidy she receives from the public university.

[5] The categorical monthly family income variable takes seven values (less than 250 TL, 200-500 TL, 500-750 TL, 750-1000 TL, 1000-1500 TL, 1500-2000 TL and more than 2000 TL). The "Income1" dummy is one for the lowest income group (37% of the population), "Income2" dummy is one for the 200-500 TL group (40% of the population), "Income3" dummy is one for 500-750 TL (13% of the population) and "Income4" dummy is one for more than 750 TL income group (the richest 10% of the population). The highest three income brackets are grouped into Income4 dummy variable due to their low observation frequency.

Caner and Okten (2010) find that in Turkey, students whose fathers are public sector employees are more likely to choose majors that lead to careers in the public sector.

The matrix X_1 includes all variables in matrix X_2 besides two variables. The first of these variables is "lnpopulation", defined as the logarithm of the population of the area in which the student went to high school. The population variable is used as an indicator of the learning resources (such as high quality schools, private tutoring centers, libraries etc.) that the student has access to while in high school. The other is "times exam taken", defined as the number of times that the student has taken the exam. The "times exam taken" variable is considered as a regressor in the first stage since it influences the chances of success via two channels: first, repeaters may be less able students, second, repeaters may be more willing to enter university and make their choices accordingly, while first time exam takers may be more comfortable with taking the risk of failure and may target highly demanded programs. Therefore, the direction of influence on success is ambiguous.

These variables are used as exclusion restrictions in the public university equation in stage 2. Our assumption here is that these variables affect the student's probability of success in the exam, but have no direct effect on the probability that she is placed at a public university.[6]

We next explain our choice of the variables in matrix X_3 which are also used as explanatory variables in the first two stages. One of our main interests is to find out how the financial resources of the family affect a student's chances of receiving higher education. We include family income and number of children in the family variables in our regressions, both of which determine the amount of resources that are available to the student.

We control for the gender of the student because both the success in the exam and the preference towards a private university can be influenced by this characteristic. There is a large literature on son preference and its consequences on children's mortality and

[6] One can develop arguments against this assumption and argue that our exclusion restrictions are weak in controlling for selection. For example, the "lnpopulation" variable might have a direct effect on preferences for a private versus a public university since private universities were located only in the three largest cities in 2002. Similarly, if repeat takers prefer to wait and retake the exam in order to have another chance to be admitted to a well-known public university, the "times exam taken" variable might have a direct effect on preferences for a public university in addition to its indirect effect via success in the exam.

educational achievements. These studies list the social, cultural and economic reasons behind such a preference. Rosenzweig and Schultz (1982) find that children who are anticipated to be more economically productive adults receive a larger share of family resources and have a greater chance to survive. Recent studies on China provide alternative explanations for the higher than normal male-female ratio in the country, two of which are the practices of sex selective abortion and infanticide by the parents (Ebenstein, 2010). Tansel (2002) finds a larger effect of family income on schooling of girls than that of boys in primary and secondary education in Turkey, and interprets that this finding could be due to a taste effect as much as a more effective income constraint for girls than for boys. Based on these, we include the gender control in our regressions to account for the possibility that the willingness to pay for the education of a son is greater than that of a daughter, which would affect both the exam success of a student and the likelihood of attending a private university by influencing the amount of family resources devoted to male children.

Parental education variables are included in the regressions as they are considered to be good indicators of both ability and socioeconomic status. Income is another indicator of socioeconomic status, and probably of ability; however there are reasons to prefer education as a measure of the social position of a student's family. As written by Lemelin (1992, p.178), "First, education and social position are highly correlated; education has been used to estimate permanent income in economics, and social prestige of occupation in sociology. Second, it can be assumed that the education level of parents is better known than their income by university students."

The controls for the student's high school field ("Science", "Social" and "Language") are included since there might be selection at the time the student chooses his high school field and these variables might affect the probability of success. The omitted field is the Turkish-Math (TM) field. For instance, higher ability students might choose to be in the "Science" field while others may prefer the broader "Social Science" or "Turkish-Math" fields. It is likely that only students who are genuinely interested in languages choose to be in the "Language" field. These variables can also influence the student's public university choice since all majors are offered by public universities whereas private universities may choose to specialize in certain programs. For instance, economics and

business majors are offered by almost all private universities, whereas civil engineering programs are mostly offered by public universities in Turkey.

Per student subsidy also differs across fields. Programs such as medical school and engineering where students with science fields are mostly placed may be categorically more expensive and hence receive higher subsidies than programs such as economics and business where students with TM fields are mostly enrolled. Hence including field dummies in the third stage per student subsidy regression might underestimate the effect of income on placement in higher subsidy programs. Therefore we also present the third stage regression where the X_3 matrix does not include field dummies.

In studies related to ours, researchers have used the "two-part model" to estimate similar equations. For example, Liu et al. (2006) estimate a model that consists of two equations, the first of which explains the probability of attending a college or university and the second of which explains the conditional probability that a potential college student will attend a public university. They state that they have no good exclusion restrictions and therefore estimate these equations by using the "two-part model" as in Leung and Yu (1996) instead of the Heckman type selection model. Although we do have good candidates for exclusion restrictions, we supplement our results from the selection model with the estimates from a "three-part model" for two reasons. One is comparability with the literature. The other is the ease of computing the overall marginal effects from the three-part model. The selection model yields the marginal effects at each step separately; the three-part model can be used to compute the overall impact of a small change in an explanatory variable on per student subsidy received by an average exam taker in the country.

The model consists of the same three equations (1)-(3) described above, except that there is no selection correction. The equations are estimated separately, equations (1) and (2) by probit and (3) by OLS. The expected value of per student subsidy among exam takers is expressed as the product of the probability of success, the probability of public university attendance among those who succeed in the exam and the expected value of per student subsidy among those attending a public university:

$$E(c) = \Phi(X_1\beta_1)\,\Phi(X_2\beta_2)\,X_3\beta_3, \qquad (4)$$

where $\Phi(.)$ shows the cumulative normal distribution function.

With the three-part model, we can estimate the marginal effects easily without having to deal with the selection correction terms. We derive the marginal effect of each independent variable in a similar way to Dow and Norton (2003), by taking the derivative of the expected value of per student subsidy with respect to the particular explanatory variable. The marginal effect of a variable X_j is expressed as the following and estimated at sample averages:

$$\frac{\partial E(c)}{\partial X_j} = \phi(X_1\beta_1)\beta_{1j}\Phi(X_2\beta_2)X_3\beta_3 + \Phi(X_1\beta_1)\left\{\beta_{2j}\phi(X_2\beta_2)X_3\beta_3 + \Phi(X_2\beta_2)\beta_{3j}\right\}, \qquad (5)$$

where $\phi(.)$ shows the normal density function and $\Phi(.)$ shows the cumulative normal distribution function. We estimate the standard errors of these marginal effects via bootstrapping with 50 replications. As indicated before, these marginal effects tell us the overall impact of a small change in an explanatory variable on per student subsidy received by an average exam taker in the country.

6.Results and Discussion

a. The Three-Stage Heckman Model

We estimate a three-stage Heckman selection model. In the first stage, we estimate equation (1) by probit. In our first set of results we use the natural logarithm of family income which is constructed using the midpoints of the seven family income brackets that applicants were asked to choose from. In Table 4, we observe that family income has a positive and statistically significant effect on university entrance (column 1a). An approximately ten percent increase in family income increases the probability of university entrance by ten percentage points (column 1c). Number of children in the family as a measure of resources available to the student has a negative and significant effect on the probability of success while sex of the student does not have a statistically significant effect.

Both father's and mother's education levels appear to be very important determinants of university entrance. As compared to students whose parents received a junior high school education or less, students whose mothers received a high school education were 4.7 percentage points more likely to enter university, those whose fathers

had a high school degree were 1.7 percentage points more likely to enter university. As compared to students whose parents received a high school education or less, students whose mothers received a four year college education were 5.6 percentage points more likely to enter university, those whose fathers had a college degree were 7 percentage points more likely to enter university. Similar to existing studies on human capital (Liu et al. (2006), Haveman and Wolfe (1995), Behrman (1999)), we also find that in general mother's education level is economically more significant than father's educational attainment. However we fail to reject the equality of father's and mother's relevant educational attainments in all categories except for high school graduates in statistical tests of relevant coefficients.

Number of times exam taken has a negative and significant effect on success in university entrance and hence we interpret this variable as a measure of ability. As expected, the population of the city where the student went to high school has a positive and significant effect. Population is a relevant measure of availability of private tutoring centers that help students prepare for the university entrance exam and quality of high schools. These variables are also our exclusion restrictions and hence excluded from the second stage probit. We tested the joint significance of these two variables in our first stage regression and found that they are jointly significant with a Chi-square distributed Wald test statistic of 313.79 and a p-value that is almost zero.

In the second stage, the outcome is entering a public university. We estimate equation (2) by probit. We observe this outcome for students that have succeeded in the university entrance exam. Hence we use the inverse Mills ratio (mills1) from the first stage as an explanatory variable in the second stage probit. In Table 4, columns (2a) through (2c), we present these results. We observe that contrary to the results in Liu et al. (2006), students from higher income families are more likely to go to private universities. A one percent increase in family income decreases the probability of going to a public university by 9 percentage points. This is a positive result in terms of public policy. We attribute the difference in findings from Liu et al. (2006) to the lack of price regulation in Turkish private higher education sector and the existence of price controls in the Taiwanese private higher education market. The Turkish private higher education sector is able to provide a product that is perceived to be of high quality and hence attracts

students from high income families. This finding contradicts also with Rozada and Menendez (2002) study on Argentina where public and private university students have the same characteristics and both come from the highest income families. Another finding is that, as expected, students that come from families with more children are more likely to go to public universities than private ones, since the number of children in the family decreases per student resource availability. Interestingly, male students are more likely to go to private universities rather than private ones. This result is consistent with the earlier results in the literature on families' willingness to expend more resources on male children.

We also observe that students whose parents have high educational attainment are more likely to go to private universities. As compared to students whose mothers received only a primary school education degree, students whose mothers received a four year bachelor's degree are 16.6 percentage points more likely to enter a private university than a public university (Table 4, column 2c). The finding that students from high income, high education families are more likely to enter private universities implies that these universities are prestigious. These universities offer tuition-free education to a small group of students (based on merit) while charging the full tuition to the majority of their students. The existence of such a group is expected to motivate others to study harder. We exclude these few students from our sample since they neither receive an implicit government subsidy nor pay for the tuition. We deduce that the combined effect of the existence of this group of students and the lack of price-ceilings on the tuition fees charged by private universities help maintain the quality of education provided by these institutions.

Interestingly, father's public sector employment status increases the probability of entering a public university as opposed to a private university by 7.2 percentage points (Table 4, column 2c) although its effect on success at university entrance was negative and significant (Table 4, column 1a). This result seems to support our assumption that that father's public sector status affects the student's preference towards getting an education from a public university.

Table 4: Regression results on university attendance and public university attendance

Type of Variables	Variables	University entrance				Public University			
		Coef. (1a)		Robust Std. Err. (1b)	Marg. effect (1c)	Coef. (2a)		Robust Std. Err. (2b)	Marg. effect (2c)
Family resources	Lnincome	0.037	***	0.008	0.010	-0.585	***	0.025	-0.090
	Male	-0.010		0.01	-0.003	-0.181	***	0.028	-0.028
	Number of children	-0.047	***	0.005	-0.012	0.058	***	0.019	0.009
High school field	Science	0.529	***	0.013	0.153	-0.236	**	0.102	-0.038
	Social	-0.280	***	0.016	-0.067	0.099		0.088	0.014
	Language	0.357	***	0.014	0.100	-0.325	***	0.077	-0.055
Father's education variables	Literate	0.005		0.043	0.001	-0.010		0.149	-0.002
	Primary school graduate	0.036		0.036	0.009	0.153		0.132	0.023
	Junior high school graduate	0.062	*	0.039	0.016	0.121		0.139	0.018
	High school graduate	0.123	***	0.038	0.033	0.028		0.139	0.004
	Junior college graduate	0.199	***	0.044	0.055	-0.067		0.152	-0.011
	College graduate	0.358	***	0.041	0.103	-0.520	***	0.154	-0.097
	Master's or Ph.D. degree	0.613	***	0.061	0.197	-0.977	***	0.187	-0.255
Mother's education variables	Literate	0.007		0.023	0.002	-0.142	**	0.083	-0.024
	Primary school graduate	0.023		0.018	0.006	-0.193	***	0.069	-0.031
	Junior high school graduate	0.054	**	0.026	0.014	-0.358	***	0.085	-0.067
	High school graduate	0.220	***	0.024	0.061	-0.658	***	0.091	-0.131
	Junior college graduate	0.294	***	0.033	0.085	-0.540	***	0.11	-0.113
	College graduate	0.391	***	0.032	0.117	-0.841	***	0.114	-0.197
	Master's or Ph.D. degree	0.745	***	0.098	0.249	-1.413	***	0.184	-0.427
Other control variables	Father's public sector status	-0.086	***	0.013	-0.022	0.529	***	0.038	0.072
	Number of times exam taken	-0.076	***	0.005	-0.020				
	Lnpopulation	0.020	***	0.003	0.005				
	Constant	-1.373	***	0.065		7.084	***	0.476	
	Mills1					-1.478	***	0.241	
	Chi/F squared	8100.7				1749.77			
	log likelihood	-41693				-5597.5			
	R-squared	0.1				0.173			
	Number of observations	93266				18464			

Source: Authors' calculations.

Notes: "Coef." is the estimated coefficient, "Robust Std.Err." is the robust standard error of the coefficient, "Marg.effect" is the marginal effect of an explanatory variable on the dependent variable.

Table 5: Regression results on per-student subsidy (with and without high school field dummy variables)

		Dependent Variable: Per-student Subsidy							
Type of Variables	**Variables**	**Coef. (1)**		**Robust Std. Err. (2)**	**dlny/dx (3)**	**Coef. (4)**		**Robust Std. Err. (5)**	**dlny/dx (6)**
Family resources	Lnincome	298.566	***	62.967	0.086	953.499	***	59.88	0.277
	Male	169.184	***	56.623	0.049	666.551	***	55.426	0.194
	Number of children	73.205	***	26.939	0.021	74.136	***	27.644	0.022
High school field	Science	2099.501	***	64.672	0.610				
	Social	463.89	***	49.018	0.134				
	Language	451.857	***	32.582	0.131				
Father's education variables	Literate	-88.592		225.526	-0.025	-32.987		228.767	-0.010
	Primary school graduate	-170.954		206.097	-0.049	-327.585	*	209.391	-0.095
	Junior high school graduate	-264.935		213.861	-0.077	-526.296	***	217.719	-0.153
	High school graduate	-137.612		217.117	-0.04	-461.795	**	220.587	-0.134
	Junior college graduate	14.233		240.686	0.004	-442.288	**	245.231	-0.129
	College graduate	452.227	**	224.888	0.131	511.866	**	228.657	0.149
	Master's or Ph.D. degree	1161.356	***	300.336	0.337	1722.781	***	311.296	0.501
Mother's education variables	Literate	-41.717		106.384	-0.012	67.080		107.842	0.020
	Primary school graduate	67.097		95.187	0.019	208.138	**	96.535	0.061
	Junior high school graduate	210.326	*	133.446	0.061	501.259	***	135.127	0.146
	High school graduate	529.784	***	123.416	0.154	1049.655	***	123.559	0.305
	Junior college graduate	682.509	***	168.137	0.198	835.698	***	173.133	0.243
	College graduate	933.864	***	157.834	0.271	1622.194	***	160.81	0.472
	Master's or Ph.D. degree	1586.767	***	322.703	0.461	3212.429	***	353.856	0.934
Other control variables	Father's public sector status								
	Number of times exam taken								
	Lnpopulation								
	Constant	403.272		395.906		-1842.56	***	385.238	
	Mills2	-1414.78	***	309.612	-0.4115	-6188.51	***	290.7828	-1.800
	Chi/F squared	94.49				48.1			
	log likelihood								
	R-squared	0.112				0.061			
	Number of observations	16251				16251			

Source: Authors' calculations.

Notes: "Coef." is the estimated coefficient, "Robust Std.Err." is the robust standard error of the coefficient, "dlny/dx" shows the derivative of the logarithm of per student subsidy with respect to each explanatory variable.

In stage 3, the outcome is the per student subsidy from government to the program-university pair (equation (3)). This is relevant for only public universities and hence here our sample is restricted to those who entered a public university. We use the inverse Mills ratio (Mills2) from the second stage in this regression. We estimate the per-student subsidy regression in two different specifications. The first specification includes all the explanatory variables from the second stage except for father's public sector status. The second specification excludes field dummies in addition to father's public sector status. When we control field dummies we are essentially estimating the effect of income within fields. However, it is clear that there can be important subsidy differences among programs that students from different fields are likely to enter. For example the science field includes more expensive programs such as engineering and medicine as opposed to Turkish-Math field which includes less expensive programs such as economics. Indeed the average per student subsidy in the science field is about 4629 TL which is substantially higher than the average per student subsidy of 2319 TL in TM field. The two averages are also found to be statistically different based on a t-test of means. Hence we would like to estimate if wealthier students are also more likely to enter categorically more expensive and hence more heavily subsidized programs. The OLS estimates of the third stage regressions are presented in Table 5. We find that students who come from higher income families are more likely to go to universities that receive greater subsidies from the government. When we control for field dummies, we find that a ten percent increase in student's family income increases the per student subsidy of the program that the student attends approximately by one percentage point. If we exclude field dummies, we find that a ten percent increase in family income increases the per student subsidy of the program by 2.8 percentage points. Interestingly, we find that both the number of children in family and being male increases the likelihood of entering a public university that receives higher subsidies from the government.

In our third stage regressions, we observe the importance of mother's education in determining student's allocation into a public university with a higher per student subsidy. As compared to students whose mothers are illiterate, students whose mothers received a four year bachelor's degree enter public universities whose per-student subsidies are 27 percent higher (47 percent when field dummies are excluded). Compared to students whose mothers are high school graduates, students whose mothers

received a four year bachelor's degree enter public universities whose per-student subsidies are 11.7 percent higher (16.7 percent when field dummies are excluded).

In Table 6, we replicate the estimations in Tables 4 and 5 using four income dummy variables instead of the natural logarithm of income. We do this primarily for two reasons. First, we only observe the seven income brackets. Using the mid-point of each bracket for all applicants is an approximation and imposition on the data. Using income dummies recognizes that a family belongs to an income group without imposing an assumption on the income distance between families. Second income may have non-linear effects on university outcomes. Using income dummies allow us to detect any such effects. We generate four income dummies based on income percentiles.

Interestingly, we observe non-linear effects of income on the university entrance success probit estimation. Income2 dummy variable does not have a significantly different effect than the omitted Income1 dummy while Income3 is negative and significant and Income4 is positive and significant. Hence at low income levels income has a decreasing effect while at higher income levels, there is an increasing effect on the probability of university entrance success. The effect of income on public versus private university choice and the matching of university/faculty specific government subsidies to public university entrants seem to be consistent with earlier results.

Our findings up to this point show that higher income students are more likely to enter university and more likely to go to universities that offer higher per-student subsidies. We also find that private university students come from higher income families compared to public university students. These results do not tell us how public university students (the ones who benefit from the public finance of higher education) compare to those who fail in the exam (the ones who cannot benefit from this system). In other words, we do not know how to rank the three groups according to family income. Therefore, we conduct a multinomial probit analysis where the dependent variable takes three values: public university entrance, private university entrance and failure in the exam (the base category).

Table 6: Regression results on the three-stage Heckman model with income dummies

Type of Variables	Variables	University entrance			Public University			Per Student Subsidy		
		Coef. (1a)		Robust Std. Err. (2a)	Coef. (1b)		Robust Std. Err. (2b)	Coef. (3a)		Robust Std. Err. (3b)
Family resources	Income2	-0.012		0.012	-0.226	***	0.042	173.893	***	61.809
	Income3	-0.035	**	0.018	-0.473	***	0.050	322.113	***	94.729
	Income4	0.116	***	0.019	-1.211	***	0.055	945.853	***	200.210
	Male	-0.010		0.010	-0.196	***	0.028	196.951	***	59.070
	Number of children	-0.048	***	0.005	0.055	***	0.019	70.564	***	26.935
High school field	Science	0.530	***	0.013	-0.136	*	0.101	2062.208	***	68.649
	Social	-0.281	***	0.016	0.048		0.087	500.385	***	53.135
	Language	0.356	***	0.014	-0.254	***	0.076	436.695	***	33.336
Father's education variables	Literate	0.009		0.042	-0.038		0.146	-75.222		225.285
	Primary school graduate	0.044		0.036	0.095		0.130	-163.575		206.016
	Junior high school graduate	0.074	**	0.039	0.025		0.137	-236.623		213.499
	High school graduate	0.140	***	0.039	-0.077		0.138	-95.914		216.073
	Junior college graduate	0.219	***	0.044	-0.174		0.152	57.899		239.805
	College graduate	0.371	***	0.041	-0.580	***	0.154	512.607	**	224.737
	Master's or Ph.D. degree	0.604	***	0.061	-0.973	***	0.185	1209.079	***	300.806
Mother's education variables	Literate	0.013		0.023	-0.182	**	0.081	-7.470		107.712
	Primary school graduate	0.030	**	0.018	-0.234	***	0.068	105.581		96.951
	Junior high school graduate	0.062	***	0.026	-0.393	***	0.085	262.599	**	136.389
	High school graduate	0.223	***	0.024	-0.648	***	0.091	583.306	***	128.148
	Junior college graduate	0.295	***	0.033	-0.471	***	0.111	662.313	***	166.725
	College graduate	0.379	***	0.032	-0.756	***	0.112	931.411	***	158.475
	Master's or Ph.D. degree	0.719	***	0.098	-1.287	***	0.180	1636.793	***	325.691
Other control variables	Father's public sector status	-0.074	***	0.013	0.507	***	0.038			
	Number of times exam taken	-0.076	***	0.005						
	Lnpopulation	0.021	***	0.003						
	Constant	-1.188	***	0.054	3.736	***	0.407	1928.796	***	239.247
	Mills1				-1.240	***	0.238			
	Mills2							-1857.366	***	398.556
	Chi/F squared	8161.9			1964.9					
	log likelihood	-41671			-5629					
	R-squared	0.102			0.168			0.112		
	Number of observations	93266			18464			16251		

Source: Authors' calculations.

Notes: "Coef." is the estimated coefficient, "Robust Std.Err." is the robust standard error of the coefficient.

The results, presented in Table 7, tell us that on average public university students are poorer than those who fail in the exam. So, in this sense, public provision of higher education supports the poor families. The OSS is a great opportunity for poor but bright and hard-working students to receive subsidized higher education. However, there are subtleties involved. First, public universities in Turkey do not form a homogenous group. A degree from a more prestigious public university leads to better employment opportunities. The fact that higher income students are more likely to attend higher subsidy and better-known universities indicate that there are regressive distributional effects of government subsidies for higher education among their recipients. Second, although on average public university students are poorer than those who fail in the exam, the parents of the earlier group have more education than parents of the latter. Since education is known as a good indicator of socio-economic status, the combined evidence suggests that the public university system in Turkey supports students from higher socio-economic groups.

b. The Three-Part Model

In the three stage Heckman model the Mills' ratios were statistically significant in all regressions, which can be taken as evidence that there is selection. However, we think that it is worthwhile to consider an alternative approach to analyze the university entrance problem which we will refer to as the "Three-Part Model". This model is based on the idea that the existence of a high number of missing values of the dependent variables does not create a selection problem. The censoring of the dependent variable is taken into account, but no correction is made for selection bias. As mentioned before, Liu et al. (2006) use this method to study university choice in Taiwan.

The selection model in section 6.a shows us the effect of each explanatory variable in each step of the model. In the three-part model we estimate the equations without any correction for sample selection and obtain results that are qualitatively similar to the selection model (the regression results are not presented for brevity). In addition, we compute the marginal effects of explanatory variables using the information from all three equations as shown by equation 5 and as explained in the econometric framework section. The marginal effects along with their standard errors and statistical significance

levels are reported in Tables 8 and 9. Here, the estimated marginal effects tell us how much a small change in an explanatory variable affects the amount of per student subsidy received by an *average* OSS applicant.

In Table 8, specification A, we show the results for the model described by equations (1)-(3). In specification B, we show the results when field dummies are excluded from equation (3). As another analysis to complement our findings, we check for any nonlinear effects of family income. In Table 9, we show the results using these income dummies instead of the "logarithm of family income" variable. In Tables 8 and 9, the only difference between the two specifications is in the field dummies in equation (3).

Table 7: Multinomial probit estimates for failure in the exam, public university entrance and private university entrance (Base category: Failure)

		Outcome: Public University Entrance				Outcome: Private University Entrance			
Type of Variables	***Variables***	***Coefficient estimate***	***Standard Error***	***Z***		***Coefficient estimate***	***Standard Error***	***Z***	
Family resources	Logarithm of family income	-0.036	0.011	-3.18	***	0.519	0.021	25.05	***
	Male	-0.035	0.015	-2.35	***	0.122	0.028	4.37	***
	Number of children	-0.064	0.008	-8.50	***	-0.062	0.015	-4.13	***
High school field	Science	0.788	0.019	40.91	***	0.290	0.038	7.71	***
	Social	-0.420	0.023	-17.91	***	-0.126	0.044	-2.88	***
	Language	0.519	0.020	26.27	***	0.309	0.036	8.47	***
Father's education variables	Literate	0.010	0.060	0.16		-0.035	0.137	-0.26	
	Primary school graduate	0.071	0.051	1.39	*	-0.175	0.121	-1.44	*
	Junior high school graduate	0.107	0.054	1.96	**	-0.171	0.128	-1.34	*
	High school graduate	0.193	0.054	3.55	***	-0.076	0.126	-0.60	
	Junior college graduate	0.294	0.062	4.76	***	0.021	0.138	0.15	
	College graduate	0.450	0.058	7.77	***	0.474	0.129	3.69	***
	Master's or Ph.D. degree	0.696	0.088	7.94	***	0.918	0.150	6.14	***
Mother's education variables	Literate	0.010	0.033	0.31		0.055	0.077	0.72	
	Primary school graduate	0.034	0.026	1.30	*	0.100	0.064	1.56	*
	Junior high school graduate	0.066	0.037	1.76	**	0.235	0.080	2.94	***
	High school graduate	0.266	0.035	7.69	***	0.542	0.075	7.27	***
	Junior college graduate	0.418	0.048	8.74	***	0.465	0.092	5.03	***
	College graduate	0.475	0.047	10.18	***	0.758	0.085	8.94	***
	Master's or Ph.D. degree	0.763	0.142	5.37	***	1.390	0.163	8.54	***
Other control variables	Father's public sector status	-0.121	0.007	-17.28	***	0.002	0.013	0.14	
	Number of times exam taken	0.021	0.004	5.32	***	0.079	0.008	9.28	***
	Lnpopulation	-0.036	0.019	-1.91	**	-0.494	0.035	-14.12	***
	Constant	-1.428	0.094	-15.20	***	-6.770	0.199	-34.03	***
Log likelihood		-47238.754							
N		93266							
Wald Chi-Squared		10858.53							

Source: Authors' calculations.

In the three-part model, similar to the results from the selection model, we find that parental education affects the amount of subsidy that the student receives positively and that the effect is statistically significant when parents have at least a junior high school degree. For example, the subsidy received by a student whose father is a college graduate is 282.718 TL higher than a student whose father is illiterate (specification A). The corresponding figure for the effect of the mother having a college degree is higher, 371.087 TL. In all four specifications, we notice that the mother's education has a bigger effect on per student subsidy.

We find that the marginal effect of family income on per student subsidy received by an average university applicant is small and statistically insignificant. Here, we see the net effect of three opposing forces: Students coming from higher income families, first, are more likely to succeed in the exam; second, are less likely to attend a public university; and third, receive a higher amount of subsidy. When the three effects are combined, the net effect turns out to be statistically not different from zero. We observe a similar net effect for the male dummy variable. However, the male dummy becomes statistically significant when the field dummies are excluded, which tells us that male students choose faculties with higher per student subsidy, such as medicine and engineering. In the case of the number of siblings, the marginal effect is negative and statistically significant.

Although the marginal effect of family income is small and insignificant in Table 8, the results change somewhat when we use income dummies. In Table 9, we observe the nonlinear effect of income on per student subsidy received by an average university applicant. We observe non-linear effects of income on per student subsidy. While dummy variable Income2 is not statistically different from Income1, Income3 is negative and significant while Income4 is positive and significant. In other words at the highest income level (for the richest 10% of the population) the effect is positive and statistically significant, which suggests that students from the highest income families are more likely to attend universities that obtain a high amount of per student subsidy from the government.

Table 8: Estimates of marginal effects in the three-part model

		Specification A (with field dummies in equation (3))				Specification B (without field dummies in equation (3))			
Type of Variables	**Variables**	**Coefficient estimate**	**Standard Error**	**t-ratio**		**Coefficient estimate**	**Standard Error**	**t-ratio**	
Family resources	Logarithm of family income	2.136	6.826	0.313		-1.823	9.086	-0.201	
	Male	-6.700	13.396	-0.500		41.445	14.496	2.859	***
	Number of children	-21.166	2.773	-7.632	***	-25.050	5.993	-4.180	***
High school field	Science	754.053	22.303	33.810	***	440.357	9.041	48.708	***
	Social	-169.490	12.757	-13.286	***	-247.114	12.474	-19.810	***
	Language	332.709	5.869	56.687	***	284.080	12.471	22.779	***
Father's education variables	Literate	-10.522	33.981	-0.310		2.604	28.642	0.091	
	Primary school graduate	22.511	45.335	0.497		41.231	43.430	0.949	
	Junior high school graduate	17.517	65.399	0.268		42.245	47.028	0.898	
	High school graduate	75.005	54.559	1.375	*	111.506	46.858	2.380	***
	Junior college graduate	136.859	55.255	2.477	***	196.705	28.023	7.019	***
	College graduate	282.718	41.551	6.804	***	357.041	44.858	7.959	***
	Master's or Ph.D. degree	530.843	75.010	7.077	***	630.987	65.036	9.702	***
Mother's education variables	Literate	-15.267	21.703	-0.703		-2.213	23.085	-0.096	
	Primary school graduate	12.797	20.242	0.632		32.982	20.688	1.594	*
	Junior high school graduate	45.520	11.562	3.937	***	66.577	28.198	2.361	***
	High school graduate	195.746	23.413	8.361	***	229.872	24.539	9.368	***
	Junior college graduate	295.931	33.122	8.935	***	345.512	34.551	10.000	***
	College graduate	371.087	54.825	6.769	***	432.888	30.533	14.177	***
	Master's or Ph.D. degree	662.979	85.062	7.794	***	745.457	65.808	11.328	***
Log likelihood		-217291.98				-218034.71			
N		93266				93266			

Source: Authors' calculations.

Notes: The marginal effects are calculated based on the information from all three stages of regressions, as explained in the text. Standard errors are estimated via bootstrapping.

Table 9: Estimates of marginal effects in the three-part model (Non-linear effects of family income)

		Specification C (with field dummies in equation (3))				Specification D (without field dummies in equation (3))			
Type of Variables	**Variables**	**Coefficient estimate**	**Standard Error**	**t-ratio**		**Coefficient estimate**	**Standard Error**	**t-ratio**	
Family resources	Income2	-13.232	13.581	-0.974		-6.869	13.422	-0.512	
	Income3	-45.372	21.018	-2.159	**	-50.832	13.645	-3.725	***
	Income4	40.562	16.127	2.515	***	30.572	22.490	1.359	*
	Male	-7.727	13.345	-0.579		40.055	9.559	4.190	***
	Number of children	-21.241	6.148	-3.455	***	-25.097	9.440	-2.659	***
High school field	Science	753.716	17.263	43.660	***	441.291	8.288	53.244	***
	Social	-168.820	10.730	-15.734	***	-246.076	13.138	-18.731	***
	Language	331.227	9.830	33.694	***	282.766	9.631	29.359	***
Father's education variables	Literate	-9.232	50.296	-0.184		3.438	39.498	0.087	
	Primary school graduate	24.358	37.831	0.644		41.510	29.856	1.390	*
	Junior high school graduate	22.550	52.309	0.431		44.327	33.106	1.339	*
	High school graduate	83.450	35.969	2.320	***	116.314	43.842	2.653	***
	Junior college graduate	150.467	46.151	3.260	***	205.784	50.904	4.043	***
	College graduate	288.241	56.237	5.125	***	359.025	45.304	7.925	***
	Master's or Ph.D. degree	518.439	68.520	7.566	***	617.043	71.510	8.629	***
Mother's education variables	Literate	-13.768	34.599	-0.398		-1.722	22.662	-0.076	
	Primary school graduate	14.426	18.344	0.786		33.360	17.923	1.861	**
	Junior high school graduate	46.455	29.654	1.567	*	66.984	26.899	2.490	***
	High school graduate	192.908	22.874	8.434	***	227.233	20.840	10.904	***
	Junior college graduate	295.333	31.975	9.236	***	347.404	30.501	11.390	***
	College graduate	357.671	29.105	12.289	***	422.356	24.036	17.571	***
	Master's or Ph.D. degree	634.328	59.760	10.615	***	719.503	81.878	8.787	***
Log likelihood		-219451.18				-220202.62			
N		93266				93266			

Source: Authors' calculations.

Notes: The marginal effects are calculated based on the information from all three stages of regressions, as explained in the text. Standard errors are estimated via bootstrapping.

c. Through which channels does socio-economic background affect university entrance and public versus private university choice?

High-school students study hard for the university entrance exam since a university degree from a reputable university increases the chances of employment. Those who have access to more financial resources can prepare for the exam better. In Turkey, high school students attend tutoring centers in order to prepare for the exam. Tansel and Bircan (2006) find that households with higher incomes and higher parental education levels devote more resources to private tutoring using the 1994 Household Expenditure Survey. Based on our dataset we find that private tutoring expenditures and family income are significantly correlated with a correlation coefficient of 0.45. Furthermore, in a Tansel and Bircan (2006) style Tobit regression where private tutoring expenditures are the dependent variable and income and other family demographic variables are independent variables, income is found to be positive and significant. (This regression, though not presented for brevity, is available upon request.) Therefore, one important channel through which having a richer family affects the probability of success in the exam is better preparation for the exam.[7]

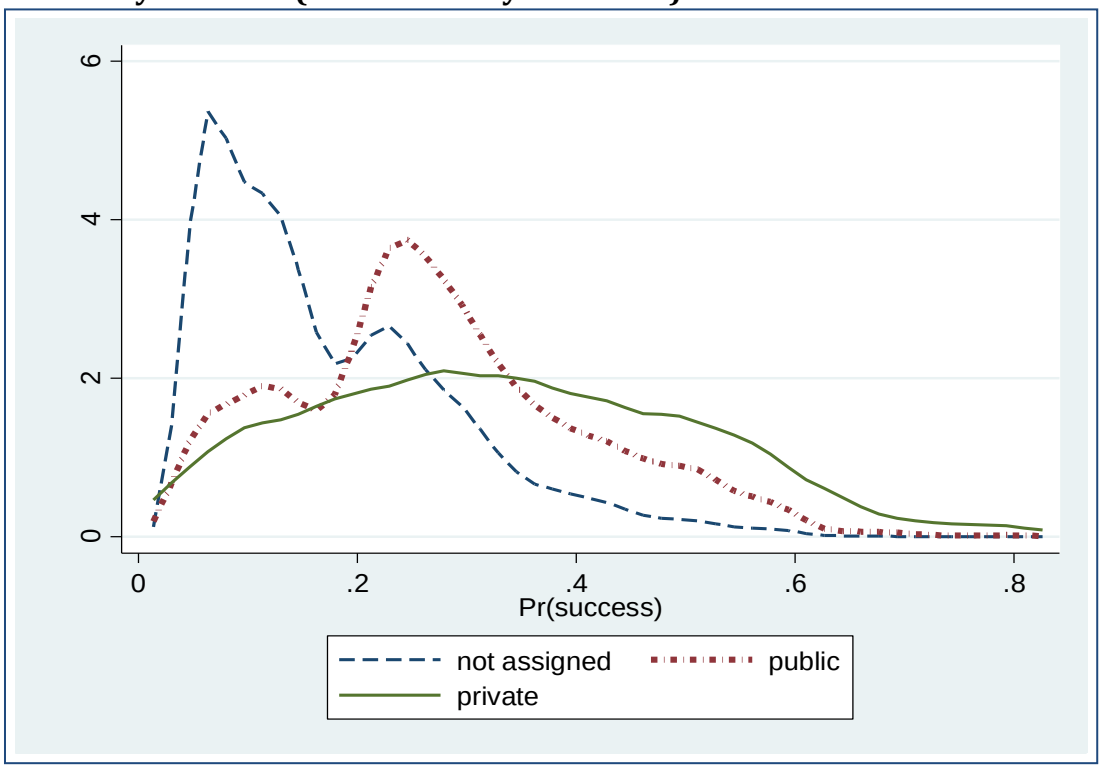
A second channel through which income may affect university entrance is the way it shapes preferences for certain types of universities. Students from higher income families who have more resources to prepare for the exam prefer to go to the most prestigious public universities. In Appendix Table A1, we present the names of the universities that offer the highest per student subsidies. Most of the universities in the table are established and prestigious universities. Based on our observations and our experience we know that those who are admitted to these universities have a higher chance of obtaining a better job after graduation. Companies often list some of these universities in their advertisements for jobs. So, we conjecture that income and other socio-economic characteristics affect not only the probability of success but also the type of university that a student chooses. Students with better background characteristics may have better

[7] Another channel could be that income influence the quality of the high school that the student attends. Hence family income may also play a role in tertiary level educational outcomes through its effect on secondary level educational outcomes. Rozada and Menendez (2002) find that low income students are excluded from higher education. We do not investigate here whether it is the case in Turkey. Such questions are beyond the scope of this paper and warrant further research.

information, via a better network, on what prestigious universities have to offer; they can have a preference for some amenities (such as social clubs and sports activities) that are more common in well-known universities. Some students with higher income and more educated families may prefer private universities to benefit from their smaller class sizes and better infrastructure. Hence preferences shaped by socio-economic characteristics also influence the university choice.

Regressions give us information about the average characteristics of different sub-samples of students, however they do not reveal much information about the distribution of the data and about the different groups of students within a sub-sample. To present more evidence on this, we generate kernel density estimates of the estimated probability of success in equation 1 (Figure 1). These probabilities are a weighted average of the students' characteristics in the X_1 matrix. Therefore this figure shows how students can be grouped according to their characteristics.

Figure 1: The predicted probability of success for the three groups of students: those who are not assigned to any program, public university students and private university students (kernel density estimates)



Source: Authors' calculations.

Comparing public university students to those who were not assigned to any program, we see that the characteristics of many of the latter group yield a low probability of success (Fig.1, the hump around 0.1). Most public university students have characteristics that yield a higher probability of success (Fig. 1, the hump around 0.25). Therefore, many public university students have different background characteristics from those who are not assigned. Hence, this figure provides further evidence that the publicly financed higher education system in Turkey supports the students with better socio-economic characteristics.

We also observe in Fig.1 that there are at least two groups of public university students (the first group represented in the hump around 0.1 and the second group represented in the hump around 0.25). Our regression analyses imply that among public university students higher subsidies accrue to students with better socio-economic characteristics (i.e. characteristics that yield higher probability of success). Hence, public university students in the second group in Fig. 1 (who have distinctly better socio-economic characteristics compared to students who are not assigned) are the recipients of larger public subsidies.

In our regression analyses we established that better socio-economic characteristics increases the likelihood of going to a private university than a public one. However, it is interesting to observe in Fig. 1 that there is considerable overlap of the curves of public and private university entrants. In other words, there are many public university students with characteristics that are very similar to private university students. We will examine the public policy implications of this observation in Section 7.

d. Further robustness checks

We have established that students with higher income and more educated parents receive higher subsidies from the government. One could argue that the amount of subsidy offered by a public university may also be influenced by the characteristics of that university such as its location and age. Hence, we should check whether our results will withstand the inclusion of university specific control variables.

We have also established that male students are more likely to go to private universities than public ones and among public university entrants males are more likely to go to universities that receive higher per student subsidy from government. In a developing and relatively traditional country such as Turkey, perhaps this result is not too surprising. However, it does warrant further analysis of the role that gender plays in our results. In this section, we check the robustness of our findings to university and further gender specific control variables. Below, we show that these variables help explain the variation in per student subsidy; but adding them to the regression does not change our previous results qualitatively.

1. University related control variables:

In some parts of Turkey, providing education is more costly due to severe weather conditions in long winters. The age of the university could be another important factor. Older, historical buildings are usually more expensive to maintain. Furthermore, in large and industrialized cities where the average cost of living is higher, one would expect labor and material to be more expensive. To account for these effects on per student subsidy, we add the age of the university and its square, the cost of living index and geographical region dummies as additional control variables.

The results are presented in Table 10. There is a nonlinear (concave) relationship between the age of the university and the subsidy per student. The effect of age is positive for universities younger than 75-80 years, which is the case for almost all Turkish universities. Older universities do spend more money per student. We should mention that the age of the university can represent both the extent of costs required to maintain the buildings and the reputation of the university. The Ministry of Finance may be inclined to provide higher financial support to better known, more reputable universities, although this is never officially acknowledged.

The province level cost of living index is adopted from Tuyluoglu and Albayrak (2010) and it is the average price of 375 goods and services in a group of provinces divided by the average of those prices over all provinces. The six most expensive provinces are İstanbul, Ankara, İzmir, Bolu, Kocaeli and Sakarya, the first three of which

are the biggest cities and the other three industrial centers. The index enters the regression with a positive sign, as expected, and the effect is statistically significant.

There are seven geographical regions in Turkey. The Southeast Anatolia region, the region with the lowest level of economic development has the highest subsidy per student, controlling for all other factors (The Marmara region is the excluded dummy). One explanation can be that relatively harsher weather conditions in the eastern regions require higher per student subsidies from government. A second explanation is that the government may have chosen to provide more support to universities in less developed regions.

Another consideration is whether our findings are robust within a university. We know that within each university, some faculties are more popular among students than others. This may be due to more reputable and better connected academicians present at a department or simply due to a more enjoyable curriculum and a more pleasant environment provided. Here we ask whether students from higher income and better educated families enroll at faculties that receive higher subsidies. In a fixed-effects regression with the same control variables listed in Table 5, column 1, we find that the coefficient estimate of "Lnincome" is 205.35 and that it is statistically significant at 1% level (full results not shown here for brevity). Therefore, there is evidence that even within the same university, the faculties that offer higher subsidies (that spend more money per student) are preferred by higher income students. The reputation of a faculty as well as its relative needs may affect how public funds are allocated within a university, similar to how they are allocated across universities.

To sum up, we find that the age, region and cost of living control variables help explain the variation in per student subsidy; but adding them to the regression does not change our previous results qualitatively.

2. Gender related controls variables:

We would guess that families from all socio-economic levels tend to support the education of their sons, but daughters have a higher likelihood of receiving support in

higher socio-economic groups. Therefore, the effect of family income on per student subsidy is expected to be higher for daughters. To test this, we add to our per student subsidy regression the "Lnincome*Male" interaction term. In the second part of Table 10, we see that this term has a negative sign, therefore family income has a bigger impact on the subsidy that a female student receives compared to a male student, as expected.

Furthermore, we question whether our results are driven by the female students in our dataset. To check this, we run the per student regression for males and females separately. Since we obtain similar results by excluding females from our sample (as shown in Table 11), we have more confidence in our findings. The main difference between the two regressions in Table 11 is that mother's education matters for female students at any level of education, but for male students the effect is positive and significant only if the mother has at least a high school degree.

Table 10: Robustness Checks: Per Student Subsidy Equation Estimates with University and Gender Specific Controls

		Per Student Subsidy					
Type of Variables	**Variables**	**Coeff.**		**Robust Std.Err.**	**Coeff.**		**Robust Std.Err.**
Family resources	Lnincome	233.008	***	61.549	280.835	***	63.557
	Male	168.145	***	55.176	846.709	***	331.830
	Lnincome*Male				-117.006	**	58.478
	Number of children	68.775	***	26.431	67.678	***	26.407
High school field	Science	1969.515	***	66.060	1977.422	***	66.872
	Social	408.068	***	46.451	400.582	***	47.050
	Language	195.278	***	31.962	196.733	***	32.021
University and region variables	Age (of the University)	68.432	***	5.856	68.347	***	5.857
	Age squared	-0.854	***	0.069	-0.852	***	0.069
	Cost of living index	69.078	***	4.350	68.841	***	4.359
	Aegean region dummy	687.641	***	97.021	687.236	***	96.996
	Mediterranean region dummy	933.678	***	110.916	936.428	***	110.906
	Central Anatolia region dummy	1103.759	***	74.723	1104.893	***	74.714
	Black Sea region dummy	143.282	*	106.635	141.194	*	106.684
	Eastern Anatolia region dummy	953.442	***	115.286	952.506	***	115.301
	Southeast Anatolia region dummy	2211.459	***	249.900	2206.481	***	249.940
Father's education variables	Literate	-134.278		222.007	-120.684		221.394
	Primary school graduate	-159.778		204.805	-140.396		204.300
	Junior high school graduate	-267.862		212.134	-245.990		211.353
	High school graduate	-159.688		215.444	-135.946		214.589
	Junior college graduate	-41.740		238.041	-15.714		237.276
	College graduate	341.374	*	223.063	361.079	*	222.055
	Master's or Ph.D. degree	955.999	***	293.950	969.592	***	293.039
Mother's education variables	Literate	59.911		102.951	66.300		103.044
	Primary school graduate	161.720	**	92.791	171.098	**	93.081
	Junior high school graduate	249.110	**	130.248	254.933	**	130.298
	High school graduate	487.637	***	121.263	487.814	***	121.228
	Junior college graduate	600.796	***	164.578	604.279	***	164.521
	College graduate	737.471	***	153.046	733.475	***	153.004
	Master's or Ph.D. degree	1136.465	***	297.314	1122.490	***	296.615
	Constant	-8074.438	***	524.112	-8363.500	***	523.004
	Mills2	-1398.944	***	291.703	-1352.311	***	295.626
	R-squared	0.159			0.1591		
	Number of observations	16266			16266		

Source: Authors' calculations.

Table 11: Robustness Checks: Per Student Subsidy Equation Estimates for Male and Female Exam Takers Separately, with University Specific Controls

		Males			Females		
Type of Variables	**Variables**	**Coeff.**		**Robust Std.Err.**	**Coeff.**		**Robust Std.Err.**
Family resources	Lnincome	206.483	**	97.205	245.959	***	79.621
	Male	(dropped)			(dropped)		
	Number of children	92.426	**	41.876	44.336	*	33.282
High school field	Science	2099.372	***	92.391	1855.912	***	98.974
	Social	447.631	***	67.920	383.971	***	66.560
	Language	233.707	***	50.700	135.035	***	39.448
University and region variables	Age (of the University)	53.500	***	9.292	80.690	***	7.433
	Age squared	-0.593	***	0.114	-1.059	***	0.083
	Cost of living	65.330	***	6.819	70.825	***	5.684
	Aegean region dummy	952.876	***	157.150	474.798	***	120.509
	Mediterranean region dummy	1036.863	***	176.539	876.665	***	141.110
	Central Anatolia region dummy	1077.423	***	123.977	1145.592	***	92.392
	Black Sea region dummy	68.565		159.088	250.371	**	145.955
	Eastern Anatolia region dummy	993.387	***	172.326	964.092	***	156.996
	Southeast Anatolia region dummy	2404.375	***	357.276	1996.253	***	339.176
Father's education variables	Literate	-191.553		281.588	107.862		222.123
	Primary school graduate	-121.961		260.388	-70.435		173.193
	Junior high school graduate	-198.445		274.716	-225.296		182.607
	High school graduate	-116.529		282.268	-87.019		188.052
	Junior college graduate	-18.649		332.755	73.089		221.053
	College graduate	533.513	**	298.802	275.389	*	197.388
	Master's or Ph.D. degree	1332.134	***	453.242	743.525	***	294.948
Mother's education variables	Literate	-26.899		144.543	276.180	**	127.669
	Primary school graduate	11.028		135.975	444.271	***	106.296
	Junior high school graduate	182.740		220.370	467.656	***	135.090
	High school graduate	339.341	**	194.444	734.646	***	137.554
	Junior college graduate	669.966	***	285.246	708.903	***	179.529
	College graduate	551.299	**	254.481	1031.627	***	172.003
	Master's or Ph.D. degree	1024.439	**	471.070	1344.403	***	367.041
	Constant	-7344.247	***	835.060	-8632.154	***	624.709
	Mills2	-1729.378	***	463.683	-983.264	***	374.689
	R-squared	0.1537			0.1687		
	Number of observations	7687			8579		

Source: Authors' calculations.

7. Should students pay more for higher education?

In Turkey, the fees that public university students pay are very low and constitute a very small portion of the total cost of education. In this section, we explore whether there is an economic rationale for increasing tuition fees and hence the share of private contributions in financing higher education. Some public university students come from poor families, so they cannot afford to pay tuition. Assuming that we can deal with the crucial issues of fairness and equal access to quality education by developing a well-functioning system of financial aid, the answer to the question of whether the students' share in financing the cost of higher education can be increased rests on whether there is the ability and willingness to pay for higher education. To evaluate the ability and the willingness to pay for higher education, we look at family income and how much families actually pay for private tutoring and higher education.

In Table 12, Panel I, we show the mean and standard deviation of family income and private tutoring expenditures for various sub-samples. Tutoring expenditures are reported as the total spending during the student's high school years, so we divide the total amount by three to find the annual amount. However, based on our own observations, we can say that most of the students attend private tutoring centers only in their senior year in high school, therefore the values reported in the table are probably underestimates of the true annual payments that parents make.

In panel II, we sort public university students by per student subsidy they receive and report the mean and standard deviation of family income and tutoring expenditures for various sub-groups. We present statistics for those who rank in the top 50 percent, top 25 percent and top 10 percent of the per student subsidy distribution. Although public university students are poorer than private university students, those who receive a higher subsidy from the government come from higher income families, again, consistent with our earlier findings.

In Table 13, we present the highest and lowest fees in public and private universities. In public universities, the highest fee is paid only by medical school and state conservatory students. Most faculties charge fees in the range 230-330 TL. Comparing the average income of public university students and especially the ones in the top 10% group to the fees they pay, we can clearly see that the fees are too low. The fees that are

paid are lower than private tutoring spending, which is likely to be underestimated. Therefore, clearly there is a gap between the willingness and ability to pay and the actual payment for this group of students. Consistent with this finding, Figure 1 shows that many public university students have family characteristics that are similar to those of private university students. These findings suggest that public university fees can be increased, at least in the universities with higher per student subsidy.

Table 12: Annual family income and private tutoring expenditures for various sub-samples in the 2002 survey (in 2005 prices)

Variable:	Family income		Tutoring expenditure	
	Mean	Stdev	Mean	Stdev
Panel I:				
All (n=93266)	6846.47	6295.38	394.32	447.82
Success=1 (n=18464)	8846.50	8311.24	523.64	511.54
Success=0 (n=74802)	6352.79	5579.74	355.10	418.81
Public=1 (n=16251)	7703.71	6637.19	472.70	459.72
Public=0 (n=2213)	17238.51	13148.84	889.74	686.23
Panel II:				
Per-student subsidy Above median (n=8081)	8678.48	7331.90	517.35	501.40
Per-student subsidy Top 25 percent (n=4098)	9337.92	7674.83	514.15	513.76
Per-student subsidy Top 10 percent (n=1668)	10094.87	8020.36	510.80	541.71

Source: Author's calculations.

Table 13: The highest and the lowest annual fees in public and private universities (in 2005 TL)

Year		*2000*	*2001*	*2002*	*2003*	*2004*	*2005*
Public universities	***Lowest fee***	181	209	157	150	148	147
	Highest fee	559	781	486	468	461	456
Private universities	***Lowest fee***	5103	8065	5151	3779	3114	4266
	Highest fee	31893	47908	14258	21870	25655	26500

Source: Author's calculations based on fee information from University Entrance Exam Application Booklets, various years, OSYM. We exclude open university, where the fee was 55 TL.

8. Conclusions:

In this study, we investigate the university entrance outcomes of students with diverse social and economic backgrounds using nationally representative data from Turkey. We find that the children of families with higher income and education are more likely to succeed in the highly competitive nationwide university entrance exam. Higher income students are more likely to enter private universities rather than public universities. However, among the students who are placed at public universities, those from families with higher income and more education enter public universities that receive higher per-student subsidies from the government.

We have data on per-student subsidy not only at a national level, but at the university and faculty level as well. Our econometric analyses enable us to control for possible selection problems and estimate the marginal effects of socio-economic characteristics on subsidy received for public university entrants as well as for an average exam taker.

Our results have important policy implications. When there is tough competition at the university entrance, socio-economic background becomes an important determinant of student success. Private universities can play an important role in providing higher education to students that come from high income families and increase supply of tertiary education. Within public university students, those from high income families seem to have an advantage in getting into better funded universities. The fact that many of these

students have similar socio-economic characteristics with private university students suggests that public university fees can and should be raised.

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Appendix Table A1: The universities that offer the highest per student subsidy in some majors.

	Major: Economics	
1	Orta Dogu Teknik	6922.98
2	Galatasaray	5626.66
3	Bogazici	5476.78
4	Hacettepe	5313.35
5	Harran	4744.37
6	Ankara	4361.66
7	Yıldız Teknik	3034.62
8	Dokuz Eylul	3017.91
9	Ataturk	2683.53
10	Ege	2622.76

	Major: Computer and Electronics Engineering	
1	Gebze Yuksek Tek Ens	17339.01
2	Izmir Yuksek Tek Ens	12508
3	Orta Dogu Teknik	7884.41
4	Hacettepe	6970.42
5	Bogazici	6469.54
6	İstanbul Teknik	5765.43
7	Ankara	4470.21
8	Dicle	4241.81
9	Ege	3691.38
10	Gaziantep	3535.54

	Major: English Education	
1	Orta Dogu Teknik	6945.64
2	Hacettepe	4665.86
3	Bogazici	4497.91
4	Cukurova	2446.75
5	Ataturk	2420.62
6	Inonu	2194.92
7	Dicle	2170.31
8	Kocaeli	2123.03
9	Dokuz Eylul	2119.95
10	Uludag	2087.98

	Major: Dentistry	
1	Dicle	14338.39
2	Hacettepe	13445.91
3	Gazi	12548.09
4	Ankara	11848.52
5	Ataturk	10346.75
6	Ege	8810.26
7	İstanbul	8377.06
8	Ondokuz Mayıs	7813.38
9	Cumhuriyet	7640.57
10	Suleyman Demirel	7244.59