THE RETURNS TO UNIVERSITY EDUCATION IN TURKEY BY DISCIPLINES

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Abstract

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Turkey is expanding higher education rapidly, more than doubling the number of universities in the last six years. The Ministry of Development's goals are to expand access to university, while ensuring that higher education is sensitive to the labor market, and to the need for graduates in health and education are met. But the wage distribution shows inequality among Turkey's most highly skilled, suggesting the rewards for different majors may vary. However, until now no evidence existed on the labor market conditions facing graduates from different disciplines in Turkey. This study uses the labor force surveys to calculate the wage returns for different college fields of study. Employing ordinary least squares regression and a Heckman procedure to correct for selection bias, I find that while the average return to a university degree is 32% over a high school degree, this masks significant heterogeneity. Relative to an arts degree, health majors have a 40% markup, engineering, services, and social science/business/law are each between 12 and 14%, and an education degree has no significant premium. This evidence supports raising university fees for high-return majors, particularly health, in order to increase revenues for both those programs and to subsidize low-return programs like education. Disciplines like arts and humanities need to be more sensitive to the labor market. Making targeted investments in education based on evidence will remedy inequality among the highly skilled, improving welfare and economic growth.

Özet

ALANLARA GÖRE ÜNİVERSİTE EĞİTİMİN GETİRİSİ

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Anahtar sözcükler: eğitimin getirisi, yüksek öğrenim politikası, üniversite bilim alanları, eğitim economisi

Türkiye'de yüksek öğrenim hızla yaygınlaşıyor, son altı yılda üniversite sayısı iki kattan daha fazla arttı. Kalkınma Bakanlığı'nın (Kalkınma Bakanlığı) bu konuda hedeflediği amaçlar arasında bir yandan yüksek öğrenime erişimi kolaylaştırmak bulunurken, öte yandan emek piyasalarındaki gerekli alanlarda açığa duyarlı, özellikle de sağlık ve eğitim alanında yeterli sayıda mezun yetiştirmeyi eklemektedir. Ancak, yüksek becerili çalışanlara arsında ücret eşitsizliğinin arttığı da görülüyor. Bunun bir nedeni farklı alanlarda eğitimin değişen getirisi olması olabilir. Buna karşılık, Türkiye'de bu konuda, farklı alanlardan mezun olanların karşılaştıkları emek piyasası olanak ve kısıtları hakkında, yapılmış çalışma bulunmamaktadır. Bu çalışma Hanehalkı İşgücü Anketlerini kullanarak farklı disiplinlerde alınan eğitimin ücret getirisini ölçmeye çalışmaktadır. En küçük kareler ve Heckman iki-aşamalı yöntemi kullanılarak yapılan tahminler, üniversite mezunlarının lise mezunlarına oranla ortalama %32 daha fazla ücrete sahip olduğunu gösterirken, bu oran disiplinlar arası farklılıkları gözardı etmektedir. Oysa, sağlık eğitimi alanların beşeri bilimler ve sanat eğitimi alanlara oranla %40, mühendislik, hizmetler ve sosyal bilimler, işletme ve hukuk alanlarında eğitim alanlar ise, aynı gruba oranla, %12 ile %14 arası daha yüksek ücret kazanmaktadırlar. Eğitim alanında alınan eğitimin getirisi ise beşeri bilimler ve sanat alanlarından istatistiki olarak anlamlı bir fark göstermemektedir. Bu bulgu, yüksek getirili alanlarda, özellikle de sağlık alanında, eğitim ücretlerinin arttırılmasının, hem bu programlar için kaynakların çoğaltılması, hem de düşük getirili alanların desteklenmesi için gerekli olduğuna işaret etmektedir. Öte yandan, beşeri bilimler ve sanat eğitimlerinin de piyasanın ihtiyaçlarına göre yeniden düzenlenmesi gerekmektedir. Bulguya dayalı ve hedeflenmiş yatırımlar hem yüksek becerili grup içerisinde eşitsizliğin azaltılmasına hem de refahın arttırılması ve iktisadi büyümenin iyileştirilmesine katkı yapacaktır.

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Chapter 1

Introduction

Currently, expanding the number of universities and improving access to meet the demand for higher education are priorities for education policy in Turkey. In it's ninth development plan (covering the years 2007-2013), the Ministry of Development (MoD)[1] lists a target of increasing enrollment in higher education to 48% of 17-20 year-olds, a 10% increase over 2006 (Ministry of Development, 2006). Also, the Turkish Higher Education Council (YÖK) said in its most recent update on the Bologna Process [2] agreements, "in order to increase and widen participation and to overcome obstacles to access higher education, both the number of HEIs [Higher Education Institutions] and the seats in HEIs are increasing" (EHEA, 2012).

And indeed Turkey has succeeded in expanding higher education rapidly. From 2006 to 2012 the number of universities shot up 113%- from 80 to 171 (Mizikaci, 2006; EHEA, 2012). This has certainly helped Turkey catch up to the high demand, but placement is still low- 52% of those taking the entrance exam in 2010 were placed into a program, and only 40% of those into degree programs (the other 60% were placed in associate programs or distance education) (OSYM, 2011). Investments in

[1]The ninth development plan was written in 2006 by the State Planning Organization, which then became the Ministry of Development in June 2011. To simplify the discussion of past, present and future work of the administration, throughout this paper I refer to them as the Ministry of Development (MoD). The MoD now lists the Ninth Development Plan and other SPO documents as their publications.

[2]The Bologna Process is a voluntary collective agreement among 47 participating countries in the European Community to "make European Higher Education more compatible and comparable, more competitive and more attractive for Europeans and for students and scholars from other countries" (European Commission, 2012). It aims to increase mobility across European universities by standardizing course credits and degree levels, as well as encouraging quality assurance.

new universities and expanding current programs will need to continue in order for Turkey to meet its goals of a more highly educated workforce.

However, it is not clear that rapid expansion is equally fruitful for all. While overall income inequality has dropped in Turkey since the 1980s (OECD, 2011), there is more inequality among the most highly educated. The labor force surveys used in this study show a wide wage distribution for male college graduates, with a group concentrated well below the mean. Recently Tansel and Bircan (2012) found that male college graduates' dispersion across the wage distribution increased more between 1994 and 2002 than any other education level.

Income inequality can have many negative impacts on society. According to the Organization for Economic Cooperation and Development (OECD), it stifles class mobility, hurts overall economic performance and generates political instability (OECD, 2011). The same report identifies technological change as one cause of rising inequality, and prescribes investing in human capital as a solution. There is "nothing inevitable" about growing inequality, and "policy choices, regulations and institutions... can impact income distribution directly," the report emphasizes. Education is correlated with improved welfare, linked not just to economic growth, but also improved health, decreased crime, and higher civic engagement (see for example Oreopoulos (2007); Lochner (2004); Dee (2004) respectively). Educated workers have been shown to have "knowledge spillovers," improving productivity of their less-educated coworkers (Moretti, 2004). Expanding education, particularly higher education, should promote equity and also increase economic growth.

But Turkey's interesting trend of inequality among the highly skilled suggests that purely expanding higher education does not automatically promote equity. One explanation could be wide wage variances depending on discipline studied. While the wage returns to education have long been studied to measure the impacts of human capital on productivity, a more recent literature has identified significant differences based on field of study. In the UK, the question arose whether students should pay uniform fees if the disciplines have differing returns. Many find that arts and humanities graduates enjoy little if any premium over their secondary school graduate counterparts, while science and social science have high returns (Walker and Zhu, 2001; Chevalier et al., 2002; Blundell et al., 2000).

In Turkey, the government recently abolished student contributions (Gunes, 2012), abandoning the Ninth Development Plan's goal to increase tuition (Ministry of Development, 2006). It is unlikely that the government will be able to afford to continue the rate of rapid expansion without increasing revenue, so if fees are re-introduced the same argument should be made that students' contributions

vary based on the returns they will gain. More importantly, however, the variation of disciplines could explain the inequality among graduates, and help inform future university investments. In fact, the MoD's plan to increase employment outlines a major component as "increasing the sensitivity of education to labor market demand" (p. 121). In other words, they aim to increase the qualified workforce by strengthening the interaction between education programs and demand in the labor market. In that case, knowing the returns of specific disciplines is extremely valuable for decision makers.

The MoD also promotes tactful higher education investment in disciplines to increase welfare. Because expanding access to education and health care are main goals of their development strategy, increasing the number of seats available for those university programs is a necessary tactic. Understanding the current position of these majors in the labor market would lend evidence to their decisions. Thus far, no evidence exists of the returns to university and labor market status variations by disciplines in Turkey. Fortunately, the most recent labor force surveys (LFS) added a question for university graduates about which field they studied.

Using recent surveys from 2002-2010, I show here that inequality is increasing among male college graduates. While the 2002 wage distribution is smooth and concentrated around the mean, in 2010 there is a concentration at the lower end. One possible demographic explanation, that older graduates are being pushed to the bottom as the influx of new graduates arrives, is clearly not the answer. The middle age group actually gained the most over the period.

But educational differences are crucial. I find that the share of college graduates employed in management and professional skill-level positions has fallen 14%, while lower-level sales and clerical jobs have risen. And this distribution of leadership varies across disciplines. In 2009 and 2010, nearly 60% of services majors are employed in sales and clerical jobs, while 15% of engineers are laborers, and 84% and 85% of health and education graduates are managers, respectively. This information shows clearly that graduates from different disciplines face unequal labor market prospects.

Using an earnings production function to estimate the returns to disciplines confirms that this is also true for wages. I find a wide variation among male college grads. While the average OLS return to a college degree is 32% higher than high school, there is significant heterogeneity between the fields. Health majors have the highest returns, at almost 40% higher than an arts major, while education and arts are at the bottom. Correcting for selection bias and comparing the returns to entrance exam scores provide robustness. There are significantly different premiums

for the fields of study.

These findings should inform Turkish policymakers as how to best use investments in higher education disciplines to improve welfare, growth, and potentially decrease the inequality emerging among college graduates. I recommend they re-institute fees, focusing on high fees for high-return subjects like health. This revenue would effectively expand the number of health programs while maintaining quality, as well as help subsidize lower-return disciplines like education. Programs in the arts and science, math and computing should be evaluated to improve their relation to the labor market.

This paper is organized as follows. The next chapter gives an overview of the Turkish higher education system. Chapter 3 reviews the relevant literature on returns to education. Chapter 4 outlines the data and provides descriptive statistics. Chapter 5 explains the methodology used, chapter 6 reviews the results and the final section provides concluding remarks.

Chapter 2

Turkish Higher Education

The current Turkish higher education laws originate from the 1981 "Law on Higher Education (No.2547)," which outlined the structure of the system (Mizikaci, 2006)[1]. All higher education institutions are tied to the Higher Education Council (YÖK) and a centralized entrance examination system is used. The law also established student contributions for public universities and permitted private, non-profit "foundation" universities.

Before announcing future student fees would be abolished, YÖK posted what the public university student contributions for the 2012-2013 academic year would have been in August 2012 (YOK, 2012). Excluding medicine and distance education programs, the fees varied from 294 to 494 Turkish Lira ($163.48 to $274.7 USD, (Exchange-Rates.org, 2012)) per term depending on the subject studied, constituting between 7% and 15% of the program's total cost. Medicine faculties had the highest fees at 591 TL ($328.54), but this is only 3.8% of the very high cost of the program. On the other had, distance education fees were not abolished, and those students will pay 71 TL ($39), or 35% of the very low-cost programs. These fees were determined yearly by YÖK. Private universities set their own fees, and are significantly higher. For example, all Sabancı University undergraduate programs charge 33,000 TL ($18,350) per year (Sabanci University, 2012). There is a centralized student loan system for public universities, and many private universities offer scholarships for those students unable to pay their contributions. [2]

The admissions process is administered centrally by the Student Selection and

[1]I only touch here briefly on the parts of the higher education system relevant to this paper. For a comprehensive history and overview of the entire system, see Mizikaci 2006. She presents a very detailed account.

[2]There are also currently 6 military academies that have a different admissions process and fee structure.

Placement System (ÖSYM). Seniors in high school, high school graduates from past years and current students wishing to switch universities or programs take an entrance exam in the spring, then rank up to 24 preferred universities and programs. An automated computer system places students based on this score, weighted for high school performance and subjects studied, into a program. Each program's seats (quota) are filled based on the highest-ranked students who listed it as a preference. Students whose scores are not high enough for any of the programs on their list are not placed (Caner and Okten, 2010).[3]

The university entrance exam is comprised of sections for mathematics, Turkish, sciences, and social sciences, and a weighting system is used to create three scores.[4] One is weighted more heavily by answers to quantitative sections, one weighted heavily on the verbal scores, and one that is equally weighted between the two. The area where university programs get to express their preferences is the type of score they require for admission. In a university the math program may require the quantitative score while the history program in the same school might specify the verbal score.

At first, the limited criteria and choice involved in the process makes the Turkish system seem incomparable to other countries. However, the choice framework isn't very different. For example, in the American system, students choose their preferred programs to apply to, within a realistic expectation based on their ability. Information is published regarding minimum test scores and grade point averages expected for universities, and knowing their compatibility, students apply based on that information. In the same way, each year ÖSYM publishes the minimum scores from the previous year for every program so that students can judge their compatibility. The main difference is that universities in Turkey can't express much of a choice preference, which shouldn't influence the individual returns.

Currently, there is a huge demand for tertiary education that is not being met by the number of seats available. In 2011, 52% of nearly 1.8 million test takers were placed into programs. The placement rate is up compared to previous years, from 33% in 2005, but is still low. And of these students who are placed, about 40% were admitted to degree programs, 34% into associate degrees, and 26% into distance education programs(OSYM, 2011). Turkey's push to increase access to higher

[3]The exception to the process is for vocational high school graduates entering vocational higher education programs in the same field. They are admitted without an exam score.

[4]There is also a foreign language section is only used by specific programs like foreign literature.

education by expanding the number of universities and quotas within programs is effectively increasing enrollment, but still falling short of demand.

Table 2.1: Percent of graduates in university fields in 1999 and 2009

	1999	2009
Agriculture	6	6
Education	17	15
Engineering, Manufacturing and Construction	21	13
Health and Welfare	8	6
Arts and Humanities	9	7
Social Science, Business and Law	26	41
Science, Math, Computing	9	8
Services	4	5

Data shows that there have been significant changes in the fields that students are graduating from. Table 2.1 (UNESCO, 2012) shows that over a decade the percentage of total graduates in health and education fell. It may be that the plan to increase these programs by the MoD doesn't register here, since this data is only two years into their strategy, or they are not being effective. On the other hand, social science, business and law (SBL) gained 15% over that time period. Because nearly all programs in Turkey are filled to capacity, this shows that the number of SBL programs and quotas expanded most. Whether or not this is in line with the goal to increase sensitivity to the labor market will be examined with the LFS data.

One last note is that length of study varies as well. Medicine, pharmacy, dentistry and veterinary degrees are 5-6 year programs, most other disciplines require 4 years of study (240 ECTS credits) (EHEA, 2012). Schools whose language of instruction is not Turkish usually require a year of preparatory language courses, extending the study to 5 years for those students (Mizikaci, 2006). Also, associate degrees are two years, and in the past many high schools were 3 years. Therefore, not all university graduates will have the same number of years of education.

Chapter 3

Literature Review

The development of human capital theory is usually attributed to Becker (1962), and early contributors Ben-Porath (1967) and Mincer (1975) for helping expand it into an earnings production function. The model posits that individuals invest in improvements to their productivity (e.g. education) in the present in order to gain a higher return in the future (wages). Mincer's earnings production function separates schooling from other human capital investments like labor market experience, thus providing a method for estimating the impact of education on an individual's earnings and productivity (1975):

$$y_i = \alpha + \beta S_i + \delta X_i + \gamma X_i^2 + \epsilon \tag{3.1}$$

where y equals log wages, S is the years of schooling, and X is labor market experience. The standard Mincerian wage equation and human capital theory have been used to produce a wealth of literature on the estimations of returns to schooling. Mincer's early work used census data to calculate the average increase in wages due to an extra year of schooling- he calculated 10% (1975). Since then hundreds of studies have illustrated the premium that educational attainment provides workers (see Psacharopoulos and Patrinos (2004)), but the specifications and data produce sometimes dramatically different results (Card, 1999).

An important piece of the literature on returns to education is empirical problems associated with measuring schooling as an exogenous decision. Critics of human capital theory point to the signaling model (Spence, 1973), claiming that education does not contribute to productivity and produce skills but rather people with high ability obtain more education so they can provide employers a signal of their productivity. Indeed, decisions to attend school are not random, and there are a number of factors that will bias results.[1] Early on in the returns to schooling literature Griliches

[1]Another topic of literature to note is the signalling effect of a degree, or "sheep-

(1977) explored the implications of the ability bias and the difficulties measuring it, as his analyses using IQ and other test scores are highly varied. But he also briefly explores the downward bias the estimations may exhibit due to measurement error and peoples' optimization decisions. Indeed, more recently Dearden et al. (2002), compared results from a longitudinal study that accounted for ability and corrected for measurement error, and found that they were quite close to basic ordinary least squares (OLS) results that did not correct for these errors. They conclude that the upward and downward biases cancel each other out, and in the end simple regression may produce accurate causal estimations.

David Card's comprehensive survey (1999) of recent empirical studies and their challenges also finds that OLS may be a reliable technique after all. Many studies using instrumental variables from institutional changes like compulsory schooling laws or proximity to universities have estimated returns 20-30% higher than simple OLS (Angrist and Krueger, 1991; Card, 1995b; Staiger and Stock, 1997; Harmon and Walker, 1995), implying perhaps that the downward biases like measurement error are strong, or the individuals most affected by the reforms are those who have a higher marginal return. Card compares four studies (Card, 1995a, 1999; Conneely and Uusitalo, 1997; Ashenfelter and Zimmerman, 1997) that use parent education as a family background control and then as an instrument to correct for ability bias. The studies each show a 5-10% decrease in the return estimate when family background is used as a control, and about a 15% increase in returns when used as an IV. Thus Card concludes that the biases in a simple OLS estimator are also present in those accounting for family background, and the impact that family education has on earnings actually biases the IV estimate further upwards. Bratti et al. (2008) uses propensity score matching methods to account for biases and also shows little difference between OLS and the corrected estimates. These studies don't point to

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skin effects," that has been studied by comparing the return to years of schooling between those who complete their degree versus those who don't. The literature is mixed. Some studies dismiss the notion, like Layard and Psacharopoulos (1974) who found that a credential does not give an advantage over the same number years of schooling with no credential. More recent studies that benefit from more specific data tend to show there is a significant boost in returns, such as Jaeger and Page (1996) and Ferrer and Riddell (2002). It is an interesting part of the literature on signalling, but does not directly refute human capital theory as those who achieve degrees may be gaining more human capital through more thorough coursework. My paper focuses on comparing those with degrees, as I don't have data available on years of schooling.

one clear consensus, but each do lend credibility to OLS estimates, provided caution is used when illustrating causality.

A more recent interest in the literature has been estimating not just returns to additional years of education but the heterogeneity existing between these years. In particular a number of British studies have revealed differing returns based on type of degree and subject studied.[2] Bratti et al. (2008) use British Cohort data to estimate that the average return to a higher education degree over 2+ A-levels is 15% for men. However, despite taking the same number of years, the type of degree (first, upper second, etc) varied the return widely, from 20% to 11%. Subjects of degrees also produce differing returns, from 28% for social science all the way down to 12% for arts and humanities, over 2+ A-levels. Using an earlier British cohort, Blundell et al. (2000) also find variation in returns when comparing types of higher education qualifications, from 14 to 8% over 1 A-level for men. Their estimations for different subjects studied also exhibit heterogeneity with a -17% return to a Chemistry degree to $+10\%$ for economics/accountancy/law degrees, in relation to "missing" degree information. Their results may be unreliable, though, as they are based on very small cell sizes.

Using labor force surveys from $1993-1999$, Walker and Zhu (2001) find that while the average return to a university degree over 2+ A-levels is 15% for men, subject studied significantly varies the premium. In 1999 health and economics degrees had returns of 27% and 24% respectively, while arts and humanities actually had a negative return relative to 2+ A-levels. O'Leary and Sloane (2005) similarly use LFS data, compared to 2+ A-levels, from $1994 - 2002$ and find an average 20% return for men, but show that the averages mask the significant heterogeneity of returns by subject studied. Quantitative subjects give men much higher returns compared to an arts degree- math and computing 32%, engineering 29%. Chevalier et al. (2002) summarize many of these studies and also conclude that while these studies' estimations are quite different depending on specifications, data and cohort studied, there are varying returns in England based on a graduate's discipline, namely that

[2]The British education system offers several levels of graduation from secondary and higher education. A- and O-Level exams at the secondary level determine the students' eligibility for university, and eligibility for post-graduate degrees is determined by level of honors achieved in the undergraduate degree- First, Upper Second, Lower Second, etc. Many of the British studies calculate returns relative to those with two or more A-levels, representing those who had the opportunity to attend college but did not. However, many of the varying numbers are due to specifications like comparison to one A-level.

science and social science returns are significantly higher than arts and humanities.

In Ireland, Kelly et al. (2010) also find wide variation in returns due to field of study using graduate surveys of men and women- from 36% for education down to zero for business, law and social science relative to arts and humanities. Livanos and Pouliakas (2011) estimate the average return to an academic university degree in Greece at 24% for men, but there is significant variation- 11% for humanities up to 53% for computer science (all relative to a high school graduate).

There are a few studies in Turkey on returns to education, but none that address the question of variation dependent on degree subjects. Most recently, Tansel and Bircan (2012) investigated inequality by calculating returns across the wage distribution and for different education groups. Using quantile regression, they found that the average return to an additional year of schooling for men in Turkey is 7.6%, but with variation across the wage distribution. In particular, they find that university graduates have the most widely varying returns across the wage distribution, and that the wage gap between the highest and lowest quantiles of university graduates increased 27% between 1994 and 2002. This shows significant inequality among the most highly educated, but they deferred the underlying reasons (like degree subjects) to future research.

There is also a small literature related to college major choice in Turkey, taking advantage of the centralized placement system, but not relative to the returns or actual labor conditions of the graduates. Caner and Okten (2010) observe college entrance decisions in a risk-and-return framework and conclude that being male, having a more educated father and coming from a more populated area make them more likely to choose business and engineering over education and health. They presume that careers in education and health are more secure because they are typically employed in the public sector, where there is more wage compression and less chance of being fired. Saygin (2011) assesses entrants' risk preferences based on the riskiness of being unassigned versus the return to entering a better program, and finds that men are less risk averse. However, neither study investigated the results of graduates after completing these degrees.

Thus far, no study has examined the actual labor conditions facing graduates based on their field of study in Turkey. A clear assessment of returns and unemployment risks associated with each discipline will help answer questions of investment in universities and major choices among students. The 2009-2010 Labor Force Surveys provide just such information on wages, employment and educational attainment.

Chapter 4

Data and Descriptive Statistics

4.1 Data

I use data from the Labor Force Surveys (LFS) issued by the Turkish Statistical Institute annually with information on the employed and unemployed, their educational attainment and employment characteristics (TURKSTAT, 2010). The advantage of the labor force survey is the large number of observations, allowing for more robust results when broken down into subcategories, unlike many of the previous studies whose cell sizes at the discipline level have been very small. Combining the 2009 and 2010 LFS makes for a large sample of 245,347 men between 25 and 64, and close to or over 1,000 for each college discipline. This is a significant improvement over many of the previous cohort and longitudinal studies which oftentimes only consist of 100 observations or less in each field of study. The downside of the LFS data is the lack of information about family background and ability data.

The variables this study is concerned with are those relating to employment and education. The survey asks every respondent over 15 years old whether they are employed, unemployed (seeking employment), or not participating in the labor force. For the employed, they classify their occupation according to the 1988 International Standard Classification of Occupations (ISCO88), which I use to create a variable for professional level. The ISCO88 classifies occupations based on their skill level, which is "a function of the range and complexity of the tasks involved, where the complexity of tasks has priority"(International Labour Organization, 2004). In my study, managerial/professional ("prof.") refers to those occupations requiring the highest level of skills, like those who oversee companies, departments, policy implementation and groups of organized workers. Examples include engineers, doctors, teachers, accountants and lawyers. Associate professionals ("assoc.") are the next skill level and include technicians, nurses and insurance agents. The sales/clerical

("clerk") classification includes secretaries and office clerks, cashiers and waiters, while "worker" refers to those employed in skilled or unskilled agriculture work, machine operation, manual labor and craft trades. [1]

The employed are also classified by their employment status as a wage earner (wage), employer (emp), self-employed (self) or unpaid family worker (unpaid). They are also asked their industry, firm size, weekly hours and monthly wages. I use the annual index to calculate real hourly wages for all years. I define part-time workers as those working under 35 hours per week.

Table 4.1: Fields of study classification

Broad FOET Field of Study	Abbrev.	Fields Listed on LFS
Education	Ed	Teacher training and ed. science
Arts and Humanities	Arts	Arts; Humanities
Social Sciences, Business and Law	SBL	Social and behavior science; journalism and information; business and administration; law
Science, Math and Computing	SMC	Life and physical science; mathematics and statistics; computing
Engineering, Manufacturing and Construction	Eng	Engineering and engineering trades; manufacturing and processing; architecture and building
Agriculture and Veterinary	Ag/Vet	Agriculture, forestry and fisheries; Veterinary
Health and Welfare Services	Health Services	Health; social services Personal services; transport services and environmental protection; security services

All respondents over six are asked for their highest level of education completed, and are grouped into no level completed, junior primary (fifth grade), primary (eighth grade), high school, vocational high school, and college or above.[2] In 2009 and 2010 a new classification was added for those completing vocational high school

[1] See Appendix A for the list of ISCO88 codes.

[2] For this study I pool vocational high school graduates with general high school grads

and college to record which field of study those graduates majored in, identified using EUROSTAT's Field of Education and Training (FOET) classification (Andersson and Olsson, 1999). This is the variable I am primarily interested in, to investigate the differences these disciplines exhibit in returns to university. While the LFS lists 21 groups of fields of study, I group them by the broadest FOET fields, indicated by the first digit of each discipline's code. This is in line with the literature, favoring broad groups of disciplines so that each will have a larger number of observations, and the results will be more robust. Table 4.1 shows the categorization outlined by the FOET manual and also the grouping of LFS fields.

The survey also includes a number of individual characteristics like household size, region of residence, whether they have lived outside that region, and whether the individual is employed in the public sector. Unfortunately, it does not include measures of ability or family background indicators, so ability bias is an important consideration for interpretation. In order to gauge the influence of ability, I compare the regression results to the average entrance exam scores for each field of study.

I restrict the sample to full-time male wage earners between the ages of 25 and 64. While there is no doubt that the returns and labor market conditions are very interesting and important for Turkish women as well, many of the factors influencing their labor and education choices are quite different from men. Table 4.2 shows that men's and women's labor force participation (LFP) is hugely different- 76% versus 27%. Men and women are nearly incomparable in every category of labor force characteristics other than unemployment rate, when all adults are considered. Additionally, the difference between college-educated women and the rest is much more drastic than that for men. The LFP rate is 43% higher for college educated women, and the percent working as unpaid family workers is 38% lower. It is likely that those lower-educated and rural women are employed as unpaid family workers in agricultural work, while urban women would be higher educated but might have lower employment. For men, these differences are much less severe. This information indicates that men and women's education and labor conditions do require two separate analyses, and I defer the analysis of the returns for women to future research.

As for analyzing wage earners, unfortunately the data on earnings is limited to those who are classified as wage earners, not employers or the self-employed. Admittedly this may introduce bias into the results, and so I employ a Heckman two-step procedure to help correct for selection bias. I limit the age group to $25-64$ year olds to avoid the disparities arising from young people entering the labor market and older ones retiring.

Table 4.2: Male versus female labor market rates 2009 & 2010

Labor Status By Gender				
	All Men	Men: Uni	All Women	Women: Uni
LFP Rate	76.10%	84.60%	27.10%	70.60%
Unemp	10.60%	6.70%	10.80%	11.50%
PT	7.30%	4.00%	27.00%	7.90%
Employment Type[a]:				
Wage	60.00%	82.60%	43.60%	93.10%
Emp	8.00%	9.60%	1.50%	3.00%
Self	29.00%	6.60%	15.90%	2.70%
Unpaid	3.00%	1.10%	39.00%	1.20%

[a]For those adults classified as employed

4.2 Trends in Employment

Using the LFS from 2002-2010, I investigate how wages for male college graduates have evolved over time. Figure 4.1 shows that the college premium, as a percentage of log wages over high school grads, has increased significantly on average. At a low point in 2005 college graduates were earning 47% more than men with high school degrees. By 2010, that figure had risen steadily by 15%, bringing college graduates' earnings up to 62% above high school. The rapid increase in enrollment has been accompanied by an increase in wages relative to high school.

But while figure 4.1 only shows the average wages, figure 4.2 shows the entire wage distribution. The distribution shows significantly more inequality in 2010. In 2002 college graduates' wages had a smooth distribution concentrated around the mean but in 2010 there is a "hump" that has formed at the lower end. The density function has shifted upwards, indicating that mean wages are rising, but there are a number of college graduates earning much less than the average. This begs the question, who is being left behind when the average wages increase?

One explanation would be if the recent influx of college graduates had better skills, then they might push their older cohorts to the bottom of the distribution. But figure 4.3 illustrates that the middle age group of college graduates have gained the most. While 25-29 year old college graduates' premium increased about 10%, and 45-49 year olds 8% from 2005-2010, these are quite modest compared to the 35-39 year olds' 19% increase. Typically, the younger age groups should enjoy the

Figure 4.1: The wage premium in percent of college graduates over high school graduates from 2002-2010

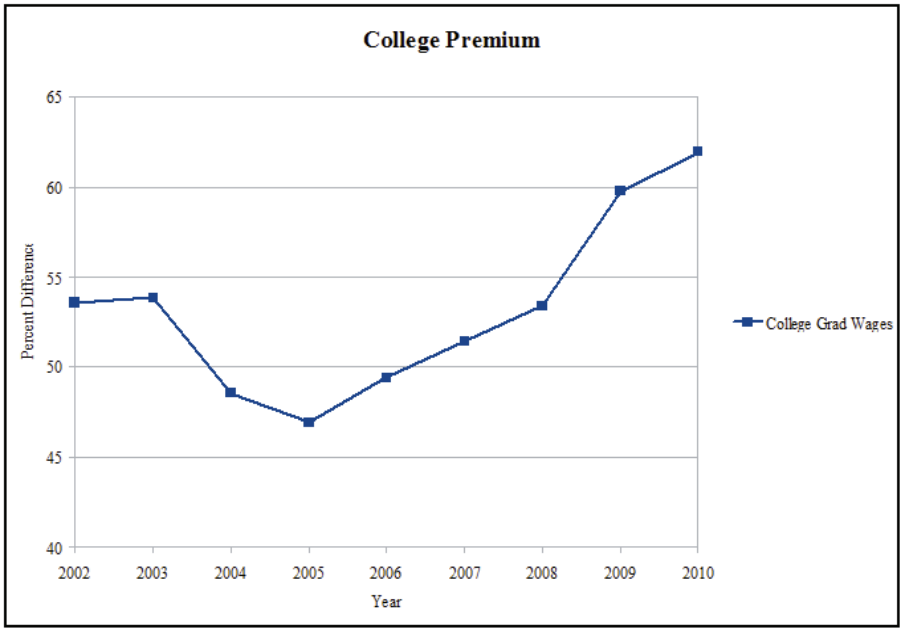


Figure 4.2: The distribution of male college graduates' real log wages in 2002 and 2010

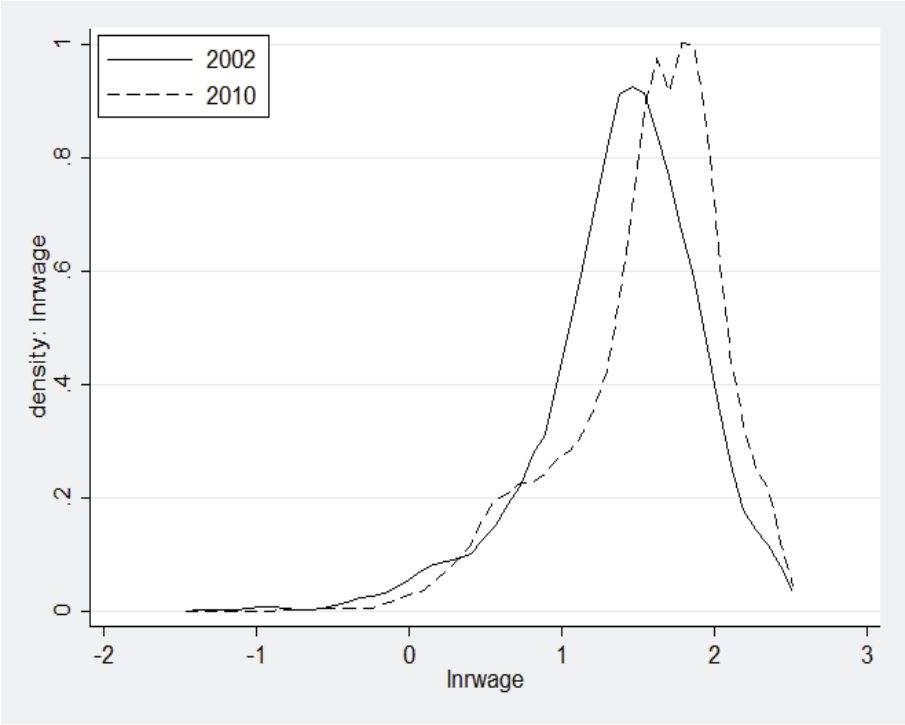
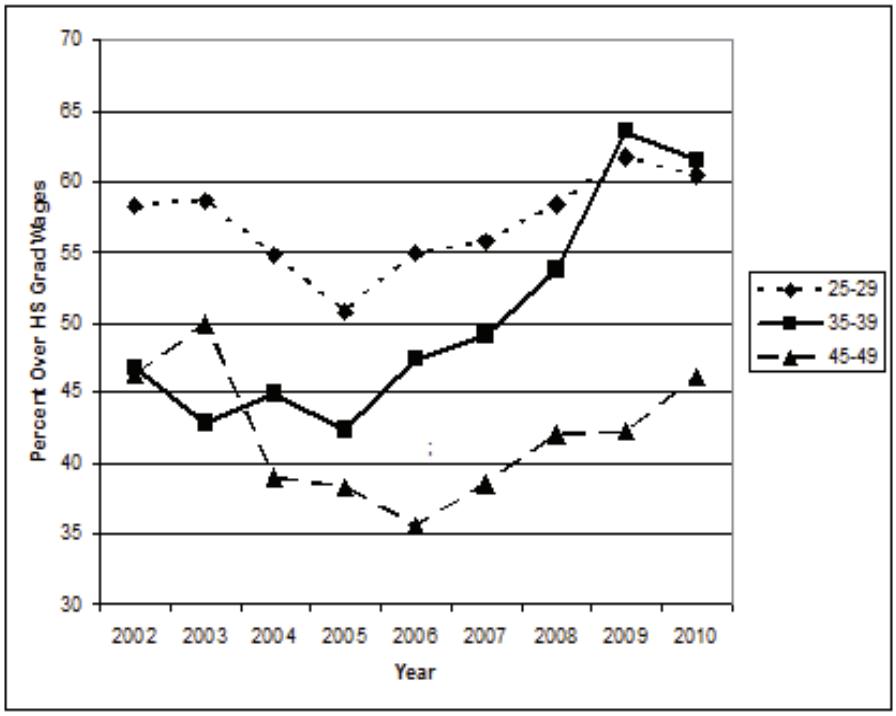


Figure 4.3: College premium over high school graduates by age group



largest premium over high school graduates, as their education will be a large factor when they have low levels of experience. As workers gain more experience, the premium provided by a college degree should fall.

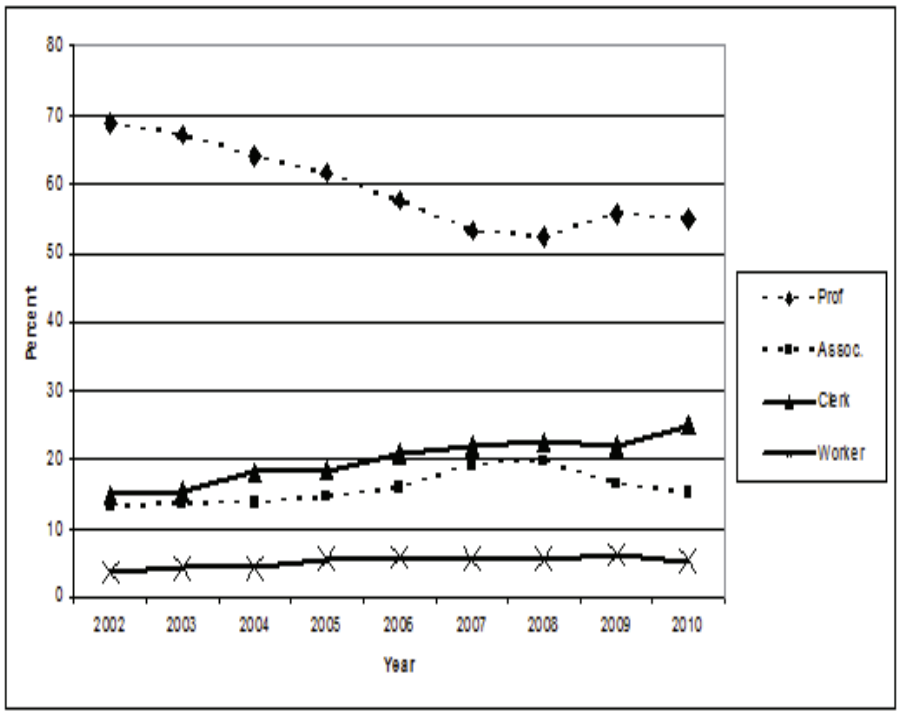
But in 2009, the middle-age workers' average premium overtook their younger counterparts. The share of the workforce made up of college graduates grew from 17.5% in 2002 to 24.7% in 2010, and with this influx of college-educated workers, the demand from the labor force increased too. So middle-aged workers got a boost relative to high school graduates, and despite experience levels, raised to a premium of the younger cohort.

Interestingly, older workers did not enjoy a large boost over the same time period, and continued to lag behind their younger counterparts. It could be that many of the labor market situations for that group of men were already determined, meaning there were not as many opportunities for promotions and pay raises. Or, it could be that they are too old to have kept up with technological changes, and therefore did not share in the benefits from the increased demand for university graduates. That being said, their premium in the labor market didn't fall, it just did not increase as much as the 35-39 year old group. This still would not account for a widening of the wage distribution.

Essentially, this says that age cannot account for the wide wage distribution

of college graduates. But another factor that may explain heterogeneity is the dispersion of workers across different professional levels. Figure 4.4 shows that over the time period the share of college graduates employed as professionals decreased by 14%, while the share of sales/clerical workers increased 10%. As these professional levels signify skills and have different average wages, this increase in lower-professional workers could be a part of the wage disparities among college graduates.

Figure 4.4: Share of college graduates in the workforce by professional level from 2002-2010



At first glance, this information would support an argument for overeducation. It appears that with the increase in college graduates and changes in the labor market, a group of graduates are taking lower-skilled positions. If these sales and clerical positions don't require a college degree and their skills are not being utilized, then these employees would be overeducated. Investigating those dynamics is beyond the scope this study, though, so I would defer that topic for future research.

The returns for these different professional levels are of interest, however, as well as their dispersion across disciplines. If majors from different fields are systematically concentrated at different levels then that could help explain the heterogeneity.

4.3 2009-2010 Characteristics

To more closely examine the impacts of university disciplines on wages and labor market status, I pool the LFS from 2009 and 2010 for 245,347 observations of men between the ages 25 and 64. As I stated before, a question was asked to all college grads about what field they studied. Together, the two years have 35,670 male college graduates, which is a sufficient number to provide robust results even when broken down by discipline. Table 4.3 shows some key information related to the

Table 4.3: Employment status by discipline studied

	Empl	Unemp	Not LF	PT	Wage	Emp	Self	Unpaid
All Men	74%	9%	17%	6%	64%	8%	25%	3%
College Graduates:								
Ed.	76%	5%	19%	19%	90%	3%	6%	1%
Arts	83%	6%	11%	11%	88%	6%	5%	2%
SBL	82%	7%	11%	2%	80%	12%	7%	1%
SMC	80%	8%	12%	9%	86%	8%	5%	1%
Eng	83%	7%	9%	2%	78%	14%	6%	1%
Ag/Vet	83%	6%	11%	2%	78%	12%	8%	2%
Health	94%	2%	5%	2%	82%	13%	4%	0%
Services	81%	4%	14%	1%	92%	4%	4%	0%

labor market for college graduates and their disciplines. For the most part, a college degree provides an advantage over the average in terms of full time employment and labor force participation. One notable exception is education, whose labor force participation is much lower, and part time work much higher, than the average. There are a couple of explanations for this. First, I define part-time workers as those who responded that they usually work fewer than 35 hours per week. Teachers are likely to report working fewer hours, mistakenly reporting their hours teaching in the classroom (typically about 20 hours). However, teaching is a full-time job when class preparation, grading and meetings are included. So this is most likely due to measurement error.

As for labor force participation, teaching position start-dates are typically restricted to the cycle of the academic year. So a graduate may need to wait for their placement from the ministry to begin, meaning they are not actively seeking a job. This technically classifies them as out of the labor force, but is a unique "gray area" for educators. Another explanation could be that the placement system for teachers

encourages some graduates to drop out of the labor force. In Turkey the Ministry of Education makes hiring decisions for public schools centrally, potentially moving teachers to a different region. If graduates are not willing to relocate or do not like their placement, they may drop out of the labor force.

Also, arts and SMC majors have higher part time rates than average, although not nearly as high as education. Again, this could be due to the specification. If their hours are flexible, or some of their work is done from home, then it would follow that many people would incorrectly answer the question.

The most interesting difference between majors are their employment status. College graduates are more likely to be wage earning employees than the average, and every discipline has much fewer self-employed. But majors from SBL, Engineering, Health, and Ag/Vet are much more likely to be employers, indicating the entrepreneurial opportunities of these disciplines. This could bias the results, as we don't observe income from employers, and it is possible that those who run their own business do so because they are either higher or lower ability than wage earners, so I will likely need to correct for selection bias.

For wage analysis, I further restrict the sample to just full-time wage earners. As figure 4.4 showed, one possible factor contributing to inequality among college graduates is the decreased share of graduates working at the managerial/professional level, and an increase in lower levels. If the spread varies by major, this could be a good indicator for how well programs are sensitive to the labor market.

Table 4.4: The share of college graduate wage earners by professional level

	Prof.	Assoc.	Clerk	Worker
Ed.	85.5%	6.1%	6.5%	1.9%
Arts	72.7%	13.3%	10.5%	3.5%
SBL	42.3%	17.6%	36.2%	3.9%
SMC	73.1%	12.1%	12.1%	2.7%
Eng	47.1%	24.4%	13.4%	15.1%
Ag/Vet	57.1%	23.1%	15.7%	4.0%
Health	83.9%	13.8%	1.5%	0.9%
Services	30.5%	7.9%	59.1%	2.6%

Table 4.4 shows that different fields have different rewards in the labor market as far as leadership. Amazingly, over 15% of college graduates with engineering degrees are working as laborers. This could be because there is an oversupply of engineers in the country, so many graduates have to take low-skilled low-wage jobs.

Services and SBL graduates also have a low percentage working in management and professional jobs, with a higher concentration in sales and clerical positions- nearly 60% for services grads. On the other hand, health and education majors have the highest shares of managerial/professional positions.

The differences by discipline show that the field of study can vary job opportunities available, or that some fields are over-supplied, or that the degrees themselves have a lower or higher premium in the market. Whatever the reason is, this is evidence that discipline studied does impact labor market success, and could account for inequality among graduates.

Table 4.5: Log real wages of full time wage earning college graduates

Discipline	Mean	SD	Min	Max
Ed.	1.61	0.38	-0.53	3.33
Arts	1.53	0.43	-0.48	3.33
SBL	1.57	0.60	-1.22	4.57
SMC	1.58	0.59	-2.5	3.84
Eng.	1.50	0.64	-0.83	3.96
Ag/Vet	1.58	0.52	-0.58	3.25
Health	2.12	0.63	0.14	6.55
Services	1.62	0.47	-0.57	3.44
Total	1.59	0.58	-2.50	6.55

With the differing labor market conditions by field of study in 2009-2010, it is no surprise that there are differences in average wages earned as well. Table 4.5 shows some interesting patterns, particularly for engineering graduates. Engineers are earning the lowest wages, almost 10% less than the average, and have the highest standard deviation. Health majors, who have the highest labor force participation and a high level employed at a professional level, have the highest wages. Services majors have high wages, despite overwhelmingly being employed in sales/clerical positions. But these raw wages don't tell a full story. Only the returns to each discipline will exhibit the true impact.

Chapter 5

Methodology

5.1 Ordinary Least Squares Regression

I estimate the returns using ordinary least squares regression (OLS) of a Mincerian earnings function:

$$LnW_i = \beta S_i + \alpha X_i + \epsilon \tag{5.1}$$

Where W_i is the hourly wage of individual i, S_i is educational attainment, X_i is a vector of personal characteristics that also influence earnings such as region, marital status and tenure at the current job, and ϵ_i is an error term. I am interested in β, the earnings premium for education level S.

Next, I use a similar specification to estimate the differing returns for university fields of study. Restricting the sample to only college graduates, and assigning a dummy variable for each field of study, I can compare the returns for each subject relative to an arts and humanities degree. This is in line with most of the literature (e.g. O'Leary and Sloane).

$$LnW_{ij} = \beta S_{ij} + \alpha X_{ij} + \epsilon_i \tag{5.2}$$

Where j represents field of study for individual i, with the same vector of characteristics X.

5.2 Heckman Two-Step Model

I'm likely to obtain biased estimates, however, due to sample selection. The data set only provides earnings information for those working as wage earners. As I showed in section 4.3, majors like engineering and health have a significant number of graduates classified as employers. If people are not randomly distributed as employers and wage earners then there will be a selection bias. In other words, if

the unobservable characteristics like ability influence both wages and likelihood to be an employer, the sample is non-random.

Ability may be positively or negatively correlated with with employment type. The highest ability graduates could be the ones founding their own businesses because they are more entrepreneurial, in which case their wages would be higher than the average, and our estimates will be downward biased. On the other hand, it may be the lower ability graduates who choose to run their own companies because they aren't satisfied with their prospects as wage earners. In that case, employers' wages will be lower than the average and our estimates will be upward-biased.

To correct for this selection bias, I employ a Heckman two-step procedure. As shown in Wooldridge (2003), I add a specific selection equation:

$$s = 1[\gamma z + v \geq 0] \tag{5.3}$$

where $s = 1$ if we observe a man's wages, and zero otherwise. z is a set of exogenous characteristics, the coefficient γ represents the likelihood of being a wage earner, and v is unobservable characteristics.

A simplified version of Equation (5.2) can be expressed:

$$y = \beta x + u, E(u|x = 0) \tag{5.4}$$

Again, β represents the return.The correlation between u and v is what causes the selection problem.

Assuming that z in Equation (5.3) and u in Equation (5.4) are not correlated, and u and v have normal distributions, I can estimate the so-called "truncation point" of s, i.e. whether or not someone is included in the sample. Therefore, I can estimate the returns using the non-random sample by:

$$E(y|z, s = 1) = \beta x + \rho\lambda(\gamma z) \tag{5.5}$$

where ρ is the correlation between u and v, and $\lambda(\gamma z)$ is the inverse mills ratio. Including these in the regression corrects for the observability of y (wages).

To estimate γ for each i I can use a probit model of s_i on z_i using the entire sample:

$$P(s = 1|z) = \Phi(\gamma z) \tag{5.6}$$

And then include it in the regression for the two-step Heckman model.

In my case, $s_i = 1$ when wages are observed. "Employers" will be those workers who are most likely or able to take risky employment moves like starting their own business. I expect that those whose wife is employed or who have lived abroad will be more willing and/or able to found their own business, regardless of whether they

are higher or lower ability than average. So z includes all the control variables used in regression, and additionally dummy variables for having an employed spouse and previously lived abroad.

Estimating the probit model on all $s_i = 1$, I can obtain the inverse Mills ratio (λ), and then run the regression of y_i on x_i, λ for all the wage earners. This will give me unbiased estimates of the returns to different disciplines.[1]

[1]I am interested in using the coefficients given by the Heckman procedure because they represent returns to the entire population of employed men. If I was interested in the selection-corrected returns for those selected into the wage earner sample, I would need to employ an additional step to get the correct coefficients. The formula is $\beta_k - \alpha_k \rho \sigma_u \delta$ where β is the coefficient on variable k from the output, α the coefficient from the selection equation, ρ the correlation between error terms, σ is the error term of outcome, and δ is a function of the inverse mills ratio.

Chapter 6

Results

Table 6.1 shows the ordinary least squares estimates for educational attainment level. I have included controls for personal characteristics, such as being married, region of residence, being young (under 35) or old (40-50), household head. Controls also include firm size, tenure at current firm and tenure squared. Coefficients for controls are in Appendix B, but their coefficients are the direction and magnitude typical of earnings production function estimations.

Table 6.1: Attainment level returns

Ed. Level	**Coefficient**	**(Std. Err.)**
Jr. Primary [a b]	0.135***	(0.010)
Primary	0.224***	(0.011)
High School	0.361***	(0.011)
College	0.823***	(0.011)
N	90894	
R^2	0.579	

[a] "No Degree" group omitted

[b] For this and all subsequent tables, significance levels are indicated: 10% level:*, 5% level: **, 1% level:***

The estimates in table 6.1 show the returns to each level of education relative to those with no completed education. The gains increase with each level, by 9% from junior primary to primary, an additional 14% for high school graduates, and a large leap of over 45% for those with college degrees. This means that even after controlling for a variety of characteristics, a college degree does have a significantly large wage premium. This also confirms that not every level of schooling has equal

returns. Even comparing a three-year high school program to a five-year college degree, the average return per year would be still be double for university education.

This estimation does not include professional level controls, however. So it is expected that a large part of the high return will be due to college graduates' ability to obtain higher level positions. Table 6.2 shows the OLS results when professional level is included as a control, along with the other personal and employment controls from table 6.1.

Table 6.2: Attainment level returns with professional level controls

Variable[a]	**Coefficient**	**(Std. Err.)**
Jr. Primary[b]	0.129***	(0.010)
Primary	0.210***	(0.010)
High School	0.319***	(0.010)
College	0.639***	(0.011)
Assoc.[c]	-0.157***	(0.006)
Clerk	-0.329***	(0.005)
Worker	-0.322***	(0.005)
N	90894	
R^2	0.601	

[a]Also contains the same controls as Table 6.1, not shown

[b]Returns compared to omitted group "no degree"

[c]Returns compared to omitted group "management/professional"

The return to a university degree falls by 20%, a sizeable drop, especially compared to the other attainment levels. No other coefficient falls by more than .04. So one important part of the pay gap can be attributed to college graduates gaining higher-level positions, but even holding professional status constant they still gain a huge premium. The coefficients on the professional level dummies show that every education attainment level gains a large advantage for holding a professional position, while sales/clerical and worker level positions fall far below. College graduates with the same skill-level duties earn 32% over high school graduates, which is no small advantage.

This is a high return relative to the studies referenced in chapter 3, most of which estimated the average man's return to a UK university degree over high school around 15% or 20%. The average return in Greece was estimated at 24% above high school graduates. So men in Turkey have on average a high reward for

a college degree. But the broad wage distribution suggests that the variation may also be higher than these other countries, and the returns to different disciplines may be an important indicator.

As I showed earlier, the wages and labor market conditions for graduates of different majors can be widely varying, and as I expected, the returns do differ. Table 6.3 lists the coefficients for the return to each field of study category, relative to an arts degree.

Table 6.3: Estimates of returns to disciplines

Discipline[a]	**Coefficient**	**(Std. Err.)**
Ed	-0.003	(0.015)
SBL	0.158***	(0.013)
SMC	0.085***	(0.017)
Eng	0.143***	(0.014)
Ag/Vet	.111***	(.019)
Health	0.395***	(0.018)
Services	0.142***	(0.017)
N	20153	
R^2	0.417	

[a]All other controls from table 6.2 included. Returns are in comparison to an Arts and Humanities degree.

Indeed, restricting the sample to college graduates, and breaking down their education by discipline studied, indicates quite significant variation in the returns depending on a graduate's field. Health majors enjoy an almost 40% markup over arts and humanities majors, 16% for social science, business and law, 14% for both engineering and services, 8.5% for science, math and computing, and 11% for agriculture/veterinary. Education has no significant return over arts, largely because I have controlled for both working in the public sector and professional level- the two advantages that typically award high wages to education majors. So while the college premium over high school graduates is quite large, those in SMC, arts, education and ag/vet are certainly falling below their counterparts in the other disciplines.

Next, I attempt to correct for the selection bias associated with the OLS results. By using a Heckman two-step procedure, I can use observable characteristics indicating riskiness to estimate a probit for the selection of employed college graduates into being wage earners. I use a dummy variable equalling one if his wife is employed,

indicating a second income in the house to ensure against risk. I also use a dummy variable equalling one for men who have lived outside the country, indicating a risk taken previously. I also include the other personal and firm characteristic controls used in the previous regressions, except for tenure and tenure squared. These variables are excluded because they are not a factor in selection, and when included they bias the selection equation.

Table 6.4: Heckman estimation results

Variable	**Coefficient**	**(Std. Err.)**
Regression Estimations[a]		
Ed	-.011	(0.014)
SBL	0.137***	(0.013)
SMC	0.069***	(0.017)
Eng	0.123***	(0.0154)
Ag/Vet	0.088***	(0.019)
Health	0.404***	(0.018)
Services	0.128***	(0.017)
Selection Equation		
Spouse Employed	0.101***	(0.029)
Lived Abroad	-0.169***	(0.044)
Mills Ratio		
lambda	-.072***	(0.022)
ρ	-.16	
N	22643	
Censored	3707	
Uncensored	18936	
Wald $\chi^2_{(32)}$	12608.88	
$prob > \chi^2$	0.00	

[a]All control variables from table 6.2 included in both selection and regression equations, except tenure and tenure squared.

Table 6.4 confirms that there is indeed non-random selection in the data. Lambda is highly statistically significant, meaning there is a correlation between the error terms in the selection and estimation equation. Furthermore, because

lambda is negative, we know that the correlation is negative, meaning those who are more likely to be wage earners are also more likely to earn less. This supports the argument that those who are employers have higher ability or motivation, and thus will have higher wages.

The coefficients on disciplines show that the impact of selection bias is quite modest. As far as the ordering of returns, the only change is that engineering is now slightly lower than services (by .5%), whereas in the OLS estimates, engineering had a slightly higher (.1%) return. Other than that, the variation between the disciplines remains about the same. This means that while yes, there is non-random selection of workers into wage earning or employer positions, it does not have a very important influence on their wage returns. Even the coefficients themselves change very little, with health gaining another 1% return relative to an arts degree, while the other disciplines' advantage over arts fell slightly (by no more than 2.3%).

Another interesting aspect are the selection coefficients themselves. The coefficient on living abroad is negative and highly significant, meaning that indeed those who had taken the risk of living outside the country were less likely to be wage earners, and more likely to run their own business. However spouse's employment is positive and significant. So those men whose wives have jobs are actually more likely to be wage earners, therefore less likely to take a risk. This could be because those who do run their own businesses earn more money, and so their wives don't need to work. In this case, the story may be different if we could observe whether his wife was employed at the time he made the decision to start his own business.

Table 6.5: Average university entrance exam raw scores in 2005

	Equal Weight		Quantitative		Verbal	
	Mean	Rank	Mean	Rank	Mean	Rank
Ed	224	4	203	5	228	3
Arts	210	6	167	8	244	1
SBL	195	8	167	7	211	6
SMC	227	3	238	3	203	7
Eng	239	2	252	2	214	5
Ag/Vet	209	7	223	4	183	8
Health	246	1	255	1	227	4
Services	221	5	186	6	236	2

One problem with these results is that they don't correct for the effect that

ability has on earnings. It could be that the different returns are only capturing ability- i.e. health majors earn so much because they have very high ability and are more productive. If that were the case, then I would expect that college entrance exam scores, a very clear measure of ability and the only factor in college acceptance, to be ordered the same as the returns are.

However, table 6.5 shows that this is not true. While the data set does not include measures of ability or the individual exam scores, data from the ÖSYM shows the average scores (not weighted for high school performance) for each university program. Here I have compiled them into the eight broad FOET classifications. Comparing the scores is admittedly a bit complicated, because there are three types of weights. Quantitative scores are likely to be used in quantitative-heavy subjects like math and science, verbal scores will be required for majors in arts and humanities, and some programs will use the equal-weight score. Table 6.5 shows the average scores for all three and the respective ranking for that subject.

One thing that is clear, however, is that the returns to different degrees do not correspond to the ability level required for admission. Particularly SBL has a very low rank in all three weighted scores, coming in last in the equal weight. But the return to an SBL degree is the second-highest, at 13.7% above arts. Also, this coincides with an increase in the number of SBL programs and quotas, as seen in table 2.1. It could be that while SBL majors do not have high ability, there is a very high demand for them in labor market. This is probably due to a combination of the effectiveness of SBL education and Turkish industries. Either way, it is clear that SBL degrees have a high premium without requiring high ability.

It is also interesting that arts majors have the highest scores in the verbal weighted exams, given that their returns are absolutely the lowest. And SMC students have the third-highest ability according to the quantitative and equal weight tests, yet their returns are only higher than education and arts majors, with a premium of 6.9%. These discrepancies suggest that the skills and abilities of students in these majors are not applicable in the labor market, and perhaps the curriculum needs to change to improve job-readiness upon graduation.

This could be evidence that students are not well-informed about the labor market prospects for different degrees. For example, engineers have very high equal weight and quantitative scores, falling only slightly below health majors. This implies that a lot of the highest ability students are choosing to enter engineering. But engineering has much lower returns than health, slightly lower returns than SBL, and about the same returns as services majors. Plus, engineering majors have more graduates employed in low-skilled jobs than any other discipline, with 15% of them

as workers. If high-ability students are choosing engineering because they believe that the best job opportunities and salaries are awarded to engineers, then they are mistaken. Their high ability may be better rewarded with an SBL degree.

The fact that returns and exam scores have such large disparities indicates that degrees are not merely a signal for different levels of ability. Unfortunately I cannot include any measures of ability in my regression estimations, but being able to compare the scores lends robustness to my OLS estimators that there are heterogenous returns to different degrees. Also, the Heckman procedure lends robustness in that the effects of sample selection bias are fairly weak and do not significantly alter the results. The results provide evidence that varied returns to disciplines may be causing inequality among the highly skilled.

Chapter 7

Conclusions

There are some main conclusions that can be drawn from these results, and each of them has important policy implications.

First, it is clear that there is wage inequality among male college graduates that has arisen recently. The increasing wage premium experienced by the college educated is not evenly distributed, and the varied returns to field of study provide strong evidence that it is educational differences themselves that can account for it. As the OECD stated, inequality is harmful to the economy and welfare, and policy can directly affect the wage distribution. In this case, policymakers should take note that simply increasing the number of higher education institutes and quotas will not automatically improve welfare and increase growth. Education policy should target investments that will promote equity, and truly accomplish the goals of increasing education's sensitivity to the labor market. Equally, making sure that the disciplines whose graduates contribute significantly to societal welfare are adequate should be a priority. Targeted and smart investment is key.

One such consideration regards health majors. The MoD development plan states that increasing the number of seats in university health programs is a priority, and a significant part of the plan to improve access to healthcare in the country. However, medicine is a high-cost program, and even if student contributions were still in place, they would make up only 3% of the costs. My regression results show that health majors have extremely high returns relative to all other disciplines, so I recommend instituting comparatively high fees for medicine majors. As Turkey already has a loan system in place for university students unable to make their contributions, medicine majors will be able to finance their education and then repay them with their particularly high future earnings. This will allow YÖK to expand medicine programs without compromising quality due to a lack of resources.

Raising fees on disciplines with high returns would also free up more resources for

disciplines like education. Like health, the MoD has named increasing the number of seats in education degree programs a priority to expand access to education. However, education majors do not enjoy the large wage returns that health majors do, so increasing fees would put an undue burden on those students and may discourage people from entering the field. Instead, revenue from students in health could be used to subsidize education programs and still accomplish the goal of improving access to education.

Also, the MoD outlined a goal of improving education's sensitivity to the labor market to produce more qualified entrants. The returns to different disciplines are an important indicator of success in the labor market. Those with social science, business and law, engineering, and services majors are enjoying significantly higher returns than arts and humanities, and science, math and computing majors. Policymakers should consider the differences between these programs and the types of employment they lead to to understand what kinds of human capital are vital in the labor market.

Finally, these results contribute to an increasing literature that shows there is heterogeneity in returns to education. Simply calculating the additional return to a year of schooling is not very useful for policymakers. To make good investments, they need to understand that different forms of human capital have different returns. In line with evidence from the UK and other industrialized countries, these results show that discipline studied is a key element of the return to a university degree.

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