RELATIONSHIP BETWEEN COLLEGE MAJOR CHOICE AND LABOR MARKET OUTCOMES IN TURKEY

by

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Abstract

This study aims to investigate how major specific quota and labor market outcomes are associated with the college major choice of students, reflected by average rankings. We use a large scale nationwide data from Student Selection and Placement Centre (OSYM) which contains information on all the students in Turkey who are placed into an undergraduate program and data from Household Labor Force Statistics conducted by Turkish Statistical Institute (TUIK). Results from both national and regional analysis show that an increase in the major specific quota, real wage and employment probability is associated with an increase in the ranking of that major, which can be interpreted as an increase in demand, while an increase in major specific unemployment rate is associated with a decrease in ranking. National labor market outcomes are found to be more effective than the regional labor market outcomes on the major choice of the students. We find that students respond relatively more to unemployment rate information on their major choice than wages and employment probability. Our findings also suggest that unfavorable macroeconomic conditions lead to lower rankings, while university programs in more developed regions and the majors with a high share of English Medium Instruction (EMI) display higher rankings.

Keywords: Labor Economics, Education Economics, College Major Choice

TÜRKİYE'DE ÜNİVERSİTE BÖLÜM SEÇİMLERİ VE İŞGÜCÜ PİYASASI ÇIKTILARI ARASINDAKİ İLİŞKİ

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Özet

Bu çalışma üniversite bölümlerine özgü kontenjanlar ve işgücü piyasası çıktılarının, ortalama sıralamalarca yansıtılan öğrencilerin üniversitedeki bölüm seçimlerini nasıl etkilediğini incelemeyi amaçlar. Çalışma kapsamında Türkiye'deki bir lisans programına yerleşmiş olan tüm öğrencilerin seçimleri sonucunda oluşan, Öğrenci Seçme ve Yerleştirme Merkezi (ÖSYM) kaynaklı geniş kapsamlı ve ülke genelindeki veriseti ile Türkiye İstatistik Kurumu (TÜİK) tarafından hazırlanan Hanehalkı İşgücü İstatisikleri verileri kullanılmıştır. Ülke ve bölgeler bazındaki analizler, talep artışı olarak yorumlanabilecek olan, üniversite-bölüm sıralamalarındaki artışın bölüme özgü kontenjanlar, reel gelir ve istihdam olasılığındaki artış ile ilişkili olduğunu gösterirken, üniversite bölümlerine özgü işsizlik oranının ilgili bölümlerin sıralamalarındaki düşüşle ilişkili olduğu görülmüştür. Öğrencilerin üniversite-bölüm tercihlerinde ülke genelindeki işgücü piyasası çıktılarının bölgesel işgücü piyasası çıktılarından ve bölüme özgü işsizlik oranının reel gelir ve iş bulabilme olasılığından daha etkili olduğu bulunmuştur. Olumsuz makroekonomik koşullar ile daha düşük üniversite-bölüm sıralamaları arasında bir ilişki olduğu ve daha gelişmiş bölgelerdeki üniversite programları ile eğitim görenler arasında İngilizce eğitim payının daha yüksek olduğu bölümlerin sıralamalarının daha yüksek olduğu görülmüştür.

Anahtar Kelimeler: Çalışma Ekonomisi, Eğitim Ekonomisi, Üniversite Bölüm Tercihi

To my growing family

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Contents

List of Tables

1 Introduction

College major choice, one of the most important decisions in one's life, has been examined in many studies from different perspectives. Link between the labor market outcomes and college major choice is one of these. This issue is very important especially in countries with a high share of young population, like Turkey. Approximately one million students applied for placement to a university program in 2017. Considering the number of students and their families, college major choice is an important issue for a remarkable portion of the population. Analysis of the determinants of college major choice is important not only for the students who make their choices about their future, but also for the economic and educational policy makers.

Our study contributes to the college major choice literature by providing evidence from a developing country context. This is the first study that analyzes the link between college major choice and labor market outcomes in Turkey. Unlike most of the studies in the relevant literature, we use a nationwide dataset which contains information on the choice of millions of students.

The goal of this study is to investigate to what extent the ranking of an average student placed into a major, which can be interpreted as the "demand" for that major, is associated with the quota of that major and the relevant labor market outcomes in Turkey. We use two datasets one of which comes from Student Selection and Placement Centre (OSYM) and the other comes from Turkish Statistical Institute (TUIK). The former is the annually published university placement results which reports the scores of highest and lowest ranking students who are placed into each university - major pair. Using this information, an average ranking is calculated for each major at both national and regional levels. Then, this information is matched to the labor market outcomes of corresponding broad majors created from the labor force dataset. Using this data, we first analyze the relationship between the total quota of a major in Turkey and its average ranking, using information from 1996 to 2015. Results suggest that one increase in the quota of a major is associated with about 3 persons increase in its ranking.[1] This indicates a positive relationship between the quota and demand. This is an interesting result considering that one would expect low demand to a major with lots of graduates, because of the high risk of unemployment after graduation. It is important to note, however, that we try to uncover the important association between ranking of major and various characteristics, rather than causal relationships. Indeed, above results may be driven by reverse causality, that is, quota increase may be a consequence of the rising demand

[1] A student who gets the best exam score is ranked as the 1st. Hence the expressions "an increase in the ranking" or "higher ranking" mean smaller rank values which correspond to students with higher achievement in the nationwide exams.

to some specific regions.

The second part of our analysis is about the link between average rankings and major specific labor market outcomes. We run the OLS regression of ranking on the average of the past three years' (t, $t-1$, $t-2$) labor market outcomes (real wage, employment probability and unemployment rate) using the observations across years 2009 to 2015. Results from both national and regional analysis suggest that major specific real wage and employment probability is positively and unemployment rate is negatively associated with average ranking. This is an expected result since the majors with higher returns in terms of real wages and employment probability and with lower unemployment rate are likely to be demanded more. More importantly, it shows that the information in the labor market is transmitted to the students and affect their decisions. We also find that unemployment rate has a relatively larger impact than wages and employment probability on college major choice of the students. Turkey has a high youth unemployment rate over the recent years (about 20 percent) and this result shows that these circumstances play a big role in shaping students' preferences over major choice.

Results also suggest that major choice is more strongly associated with the national labor market prospects than regional labor market prospects. This indicates that students primarily take into account labor market opportunity in the national labor market than the regional labor market in the decision process. An increase in the share of EMI (percent of total seats in a major allocated to English-medium instruction) of a major is associated with an increase in its ranking. In most of the specifications, an increase in the share of private education (percent of total seats in a major offered by private universities) and share of evening education (percent of total seats in a major offered by evening education programs) is associated with a decrease in the ranking.

We also investigate the role of the macroeconomic conditions, by controlling for annual unemployment rate in our analysis. Results show that there is a negative association between the aggregate unemployment rate in Turkey and the average rankings. This means that during inferior macroeconomic conditions, students with lower achievement decide to go to universities rather than seeking for a job.

In regional analysis, we also find a positive relationship between the development level of a region and rankings of the programs in that region. This is an important result because more successful students who get their university education in developed regions will probably form networks in these regions and contribute to these regions' economies after graduation. Policies intended to motivate more successful students to get university education in less developed regions may mainly benefit more developed regions.

2 Literature Review

Link between the college major choice and labor market outcomes, especially earnings has been a considerably studied issue in economics literature. Most of the studies that state the expected earnings as an important determinant of the college major choice find this effect to be small. There are limited number of studies that examines the effect of employment probability or unemployment rate in addition to earnings.

An early study by Berger (1988) uses 624 observations from National Longitudinal Survey of Young Men for 6 years. He suggests that the rise of the present value of the predicted future earnings stream of a major relative to other majors increases the probability of an individual's choosing that major over others. Like Berger (1988), Montmarquette et al. (2002) conducted a study in the U.S. context. They use a subsample of about 6000 students from National Longitudinal Survey of Youth cross-sectional sample in 1979. They explain a students' choice of a major with mixed multinomial logit and probit models and with a heteroscedastic extreme value model. They find that the expected earnings is essential in the choice of college major and its effect differs by gender and wage. Using data from the Canadian National Graduate Survey for 1986, 1990 and 1995, Boudarbat and Montmarquette (2009) find a significant effect of expected lifetime income on the choice of field of study among students whose parents don't have a university degree while choosing their field of study. They use mixed multinomial logit model to estimate the parameters. Their results indicate interestingly that there is no significant impact of lifetime earnings when the parent of the same gender as the student has a university education. Arcidiacono et al. (2012) use the data from a survey of 173 male undergraduate students at Duke University. They find that expected earnings and students' abilities in different majors are important determinants of choice of a college major. Wiswall and Zafar (2014) use an experimental design and a survey that undergraduate students in New York University participate in. They conclude that subjective beliefs about future major choice are positively and strongly associated with beliefs about self-earnings, ability and spouse's earnings. Also, tastes are the dominant factor in this choice despite the significant effect of earnings. Using French data from the Génération 92 and Génération 98 surveys, Beffy et al. (2012) asses the sensitivity of major choices of students to the expected earnings. Their estimations also suggest a significant but low elasticity of post-secondary major choices with respect to expected earnings. Xia (2016) uses data from United States and finds a strong correlation between the wage information a student gets from her family and her major choice. She states that students are more likely to choose a major related to a family member's occupation if that member earns a higher wage.

In addition to these studies interested in the college major choice for 4-year or more education, Baker et al. (2017) address this issue on the community college side. They use multinomial regression model and data from a survey for 376 students at two community colleges in California. This analysis involves both experimental and observational data. They show that the labor market outcomes have an impact on college major choice of community college students, although the most important determinant is the course enjoyment.

Unlike previous studies, Long et al. (2015) use realized labor market outcomes rather than the expectations, future predictions or beliefs. Our study is similar to theirs in the sense that we focus also on the role of realized labor market outcomes. They find a statistically significant relationship between changes in wages by occupation and following changes in college majors completed in the relevant fields. They use both national (U.S.) and local (Washington State) data, and conclude that students are more likely to respond localized information about earnings than national information. Their study also finds that share of degrees produced in year t are most strongly associated with earnings in year t-3, and the response is stronger for the majors with tight connections to few occupations. Unlike Long et al. (2015) we find that national level information is more important in shaping students' decisions.

As explained above, most of the studies are conducted for the developed country cases. To the best of our knowledge, there are only two studies which examine the effect of labor market outcomes on the college major choice by providing evidence from a developing country. Hastings et al. (2016) use surveys and administrative data of Chilean students to explore how earnings and cost beliefs are related to degree (defined at institution-major level) choice. One of their findings is that Chilean students who state the labor market outcomes as important factors for their degree choice are less likely to overestimate earnings of past graduates, and they tend to choose the programs with higher earnings. Hastings et al. (2015) examine the effect of earnings and costs information on degree (at institution-major level) choice of Chilean students. They first ask students about their college enrollment plans and beliefs about earnings and costs. Then they give information about earnings and costs of the past students at their preferred degree to a random sample, and track their degree enrollments. They find that this treatment causes low-SES students to enroll in degrees with higher net earnings.

There are limited number of studies on college major choice in Turkey. Caner and Okten (2010) examine this issue in a risk and return framework. Using a random sample from individual level university entrance exam (OSS) data for 2002, they find that parental income and self-employment status are important determinants of choosing a riskier major over a less risky one. Another study that investigates

college major choice in Turkish context is conducted by Yazici and Yazici (2010) who conduct a survey of 449 undergraduate students from 3 universities. They state that interest in the subject, guaranteed employment, expected earnings, university entrance exam score and prestigious career are ranked as the most important factors by students in their choice of college major.

Our study contributes to the college major choice literature by providing evidence from a developing country context. Unlike most of the previous studies, our data is a large-scale, nationwide dataset which includes information on college major choice of all students in the country who get the right for an undergraduate education through a nationwide exam. In addition, this is one of the few studies that investigate the link between realized labor market outcomes and college major choice in a developing country context. Also, this is the first study which examines the effect of labor market outcomes (earnings, employment probability and unemployment rate) on college major choice in Turkey.

Although students' abilities, tastes or course enjoyment are found to be important determinants of college major choice in the previous literature (Arcidiacono et al. (2012), Wiswall and Zafar (2014), Baker et al. (2017)), we only analyze the effect of pecuniary outcomes rather than non-pecuniary outcomes on the choice of students. Unlike some other contexts, such as the North American context, in Turkish university entrance system students choose the college and major simultaneously, before taking any courses at the university. Therefore, students make their decisions much less exposed to non-pecuniary aspects of majors unless they make a detailed research about the course content or characteristics of jobs they may get after graduation. For this reason, we focus on the labor market outcomes which can be considered as the most readily available information for students before going to university. This study is one of the few studies analyzing the college major choice in this type of a context.

3 University Entrance System and College Major Choice in Turkey

Since 1974, Student Selection and Placement Centre (OSYM) has been responsible for the placement of students to the universities. Nationwide examination has been playing a central role in student placement in a context where demand for university education far exceeds the number of available seats of the universities. In this system, OSYM collects preferences of the students and makes the placements according to the examination scores and preferences in a centralized setting. Until 1981, students had to take Student Selection and Placement Exam (OSYS) as the

qualifying exam. Between 1981 and 1999, University Entrance Exam consisted of two steps. The first step was Student Selection Exam (OSS), and the second step was Student Placement Exam (OYS), which were held in April and June, respectively. In 1999, two steps were combined and called OSS (Student Selection Exam). Then, there was a change in the content of the one-stage exam in 2006. In 2010, the two-stage exam was introduced again and was implemented until 2017. The first stage is called Higher Education Entrance Exam (YGS), while the second stage is Undergraduate Placement Exam (LYS). These two exams are held in April and June of each year, respectively. Every student who wants to pursue higher education has to take YGS. Students who get a YGS score higher than a certain threshold have the right to take LYS. LYS scores are required from students who wants to be placed in an undergraduate program in Turkey. LYS consists of 5 different sessions. Students choose which sessions to take according to their intended college major (OSYM Tarihsel Gelisme, n.d.)

OSYM ranks students within the score types according to a score constructed as a combination of the score from the centralized exams and the high school GPA of students. Each student also submits a university and major preference list. According to their rankings and preferences, qualifying students are placed into university-major pairs up to the prespecified quotas and get the right to register. Some students may not be able to register to a program because their rankings are not sufficient for the programs listed in the preference list. In 2017, for instance, 83 % of students who submitted a preference list were placed into an undergraduate program, associate degree program or open education program.

Changes implemented since 1990's has resulted in variation in score types and score intervals across years. Table 1 summarizes the exams and relevant score types over the years, and Table 2 shows how we group these score types into broad categories. What has remained unchanged since 1990's is that OSYM ranks students within the score types, collects students' preferences on university-major pairs, and places them into university-major pairs, by taking quotas into consideration. For this reason, we use information on students' rankings in our analysis, instead of their scores which are not comparable across years due to the changes in the system.

Unlike the U.S. context, students in Turkey have to make their preferences on university and major simultaneously through the preference list submitted to OSYM, before starting their university education. Those who want to switch to another major should apply for a switch and satisfy the conditions required by the relevant institution and/or Council of Higher Education (YOK) (Yatay Gecis Yontemleri, n.d.). Due to strict regulations, switching to another major is not very common in Turkey. Alternatively, students may decide to drop out and retake University Entrance Exam.

Table 1: Exams and Score Types

Time	Exam	Possible Score Types
1981 – 1998	OSS – OYS	D, F, M, S, TS, TM
1999 – 2005	OSS	EA, SOZ, SAY, DIL
2006 – 2010	OSS	EA-1, EA-2, SOZ-1, SOZ-2, SAY-1, SAY-2, DIL
2010 – 2017	YGS – LYS	YGS-1, YGS-2, YGS-3, YGS-4, YGS-5, YGS-6, MF-1, MF-2, MF-3, MF-4, TM-1, TM-2, TM-3, TS-1, TS-2, DIL-1, DIL-2, DIL-3

Table 2: Score Types

Broad Score Type	Score Types Included
MSc (Mathematics & Science)	F, M, SAY, SAY-1, SAY-2, YGS-1, YGS-2, MF-1, MF-2, MF-3, MF-4
EW&V (Equally Weighted & Verbal)	S, TS, TM, EA, SOZ, EA-1, EA-2, SOZ-1, SOZ-2, YGS-3, YGS-4, YGS-5, YGS-6, TM-1, TM-2, TM-3, TS-1, TS-2
FL (Foreign Languages)	D, DIL, DIL-1, DIL-2, DIL-3

Since students make their major choice before the university education, unless they make a detailed search, they do not have as much time or exposure to become informed about content of majors as U.S. students do. As a result, students try to get as much information as possible about the labor market prospects of majors before they submit their preference list to OSYM.

4 Data

4.1 OSYM Data

OSYM annually publishes the scores of two students with the top and bottom rankings who are placed and have the right to register into each university - undergraduate major (referred to as "major" hereinafter) pair. We pool this information between 1996 and 2015, and obtain a university-major level panel data.

In addition to above information on all universities in Turkey, data includes the scores of some universities abroad which admit students based on their OSS rankings. Fraction of the quota for such undergraduate programs is below 2 percent in most of the years included. Moreover, only about half of these seats abroad are

filled by students. We choose to exclude these programs and restrict our sample to the universities in Turkey and Turkish Republic of Northern Cyprus (TRNC) in the regressions of quota on rankings and to the universities in Turkey in the regressions of labor market outcomes on rankings. The reason of this restriction is that students who prefer studying abroad may have different goals and expectations from those who study in Turkey in terms of labor market conditions and outcomes. They may be primarily considering to find a job abroad, as a result labor market conditions in Turkey may be much less relevant.

Distance-education and open-education undergraduate programs are also excluded from the sample, because students who prefer these programs are likely to already have a job.[2]

We further restrict our sample to the university-major pairs in which at least one student is placed in the relevant year. Those with no placement do not yield any choice information, hence these rare cases are excluded from our sample.

After the restrictions mentioned above, our entire sample consists of about 100,000 observations of university-major pairs over the years between 1996 and 2015. 48 percent of them admit students with the "EW&V" score type, while 46 percent of those admit them with the "MSc" score type. The lowest share belongs to programs that admit students with the "FL" score type. We do not have a balanced panel, either because some universities and/or some majors have been closed or new ones have been opened over the years.

We calculate the mean of the scores (published as the combination of exam score and weighted average of high school GPA) of students with top and bottom ranking for each university-major pair and call this "average score". By using the cumulative distribution of the scores within the score types (published annually by OSYM), we match these average scores to the corresponding rankings (using the closest integer ranking for that average score).[3]

[2]Two universities, Sabanci University and TED University are also excluded from our analysis because of their different entrance system where students do not specify the major they want to register when making their preferences. Students who wants to register in these institutions make their choices for a faculty, for example, engineering faculty. They do not specify which specific engineering major they choose in the first place. Hence, there is no information on choice at major level in these institutions. Some other universities also apply this policy for some years and major categories. However, share of the quota of these university-program pairs within the total quota of the university is below 20% over years except Ardahan University where the share is 45%. Thus, they are not excluded in order not to lose information on major choices in most of the years and majors. Instead, such programs are grouped under "other" category of relevant score type and/or faculty. (See Appendix Table 9)

[3]A complication in this matching process is that the cumulative distributions are published for the scores which are the combination of the exam scores and the weighted average of high school GPA (AOBP) of the students. However, the main placement data from which we calculate the average score includes the scores with the extra points. A student may get extra points on top of the points implied by the combination of exam score and AOBP. For example, students with the highest GPA in their own high school or students who graduated from Teacher High Schools and

One might also consider using the cutoff rankings, i.e. the rankings which belong to the students with the bottom score, instead of the average score. Students with the top score may have different incentives to prefer that university-major pair such as the distance to her hometown or some idealistic behavior. Unlike the bottom scores, the top scores may be outliers in the distribution of the scores within a university-major group. We therefore run our regressions with the cutoff rankings as well, and the results are very similar. (Results are available upon request)

We construct three dummy variables that are either university or university-major specific. Private dummy equals 1 if the university is a private university, 0 otherwise. In some university-major programs in Turkey the language of instruction is English. EMI (English-medium instruction) dummy equals 1 if the language of instruction is English in the related university-major pair.[4] Some universities offer the equivalent of some major programs called evening education which provides lessons in the evenings or weekends with a higher tuition fee. Evening education dummy equals 1 if the university-major pair is evening education.

After assigning a ranking to each university-major pair, we calculate a national average ranking for each major group in each year. This average ranking is a weighted average of the rankings of university-major pairs within a major group, where the weights are the quotas. We also calculate regional average rankings in NUTS1 and NUTS2 levels, in a similar way to the national ranking calculation.[5] Regional average ranking presents the average ranking of each university-major pair in each region and year.

Major level aggregated data includes 93 major groups (presented in Appendix, Table 9) and 1,684 observations over 20 years, nationwide; 12,956 observations in NUTS1 level; and about 20,000 observations in NUTS2 level. National / regional average ranking, total quota of the major group, share of private education, share of EMI and share of evening education variables are included in major level panel data. [6]

choose a major in Education get extra points. For that reason, an average score we compute may include these extra points. Because of this issue, average score for a few university-major pairs exceeds the possible maximum score in the cumulative distribution. We set these average scores to the possible maximum score without extra points, and match two datasets accordingly.

[4]We don't treat departments of "English Education", "English Linguistics and Literature", "English Linguistics and Comparative Literature", "American Culture and Literature" as their language of instruction is English, because there is no choice to get an undergraduate degree in those with a Turkish language of instruction.

[5]NUTS1 classification includes 12 regions and NUTS2 classification includes more detailed 26 regions in Turkey.

[6]These three shares are obtained from the dummies mentioned above. Share of private education shows the ratio of the quota of majors across private universities to the total quota of majors within a major group. Share of EMI is the ratio of the quota of majors whose language of instruction is English to the total quota of majors within a major group. Share of evening education is the ratio of the quota of evening education majors to the total quota of majors within a major group.

4.2 TUIK Data

We use "Household Labor Force Survey (HLFS)" conducted since 1988 by Turkish Statistical Institute (TUIK) to create major specific measure of labor market outcomes. The aim of this survey is to collect information on the features of labor market in Turkey. The key question in the survey for our study is that "From which major of the school did you graduate last?", and this question has been asked since 2009. Hence, we pool the survey data between 2009 and 2015.

We restrict our sample to the 2-, 3- or 4-year university graduates (survey questions do not separately distinguish 4-year university graduates) and those with postgraduate degrees. Our restricted sample consists of 282,663 university graduates. 58% of them are male, and 42% of them are female. The mean age of the individuals in our sample is 38 with a standard deviation of 12.8. The mean is 40 for males, and 35 for females.[7]

Survey includes questions regarding the employment status of the individual and income which refers to the net cash income earned from the main job of the individual in the previous month.

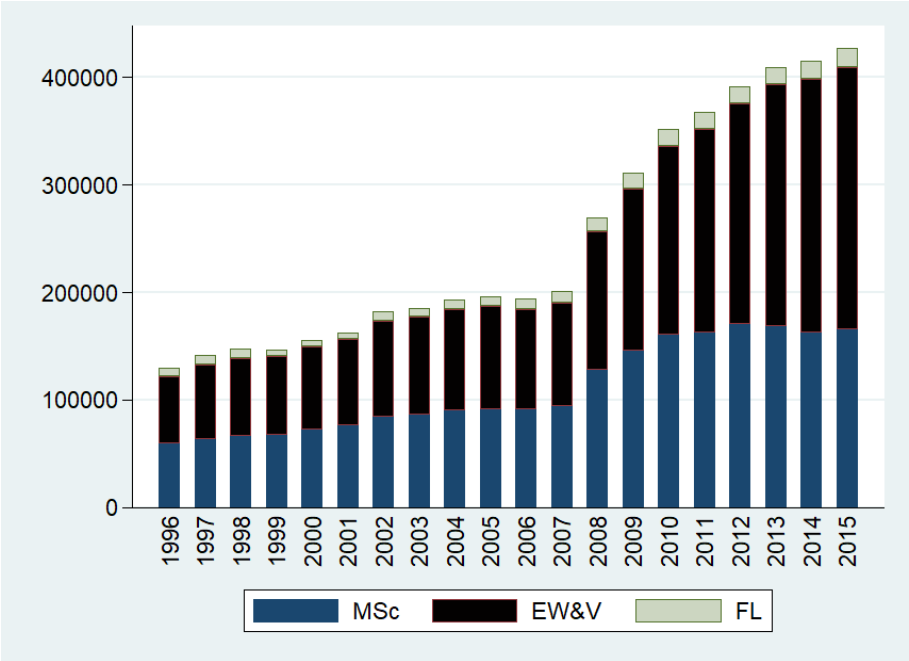
For each broad major group, we calculate the employment probability (as the ratio of number of employed individuals to the number of all individuals), unemployment rate (as the ratio of number of unemployed individuals to the number of individuals in the labor force) and average income at both the national and regional (NUTS1 and NUTS2) levels. We then transform the average wages to real average wages by using Consumer Price Index (CPI) which takes 2003 as the base year.

Major categorization in this survey is broader than that we construct from OSYM data. While we construct 93 major groups using OSYM data, there are 21 broad majors in TUIK data. Hence, we match broad majors to more detailed major groups in OSYM data. This results in 13 broad majors in the TUIK data that can be reliably matched to 47 major groups in OSYM data.[8] These 47 major groups from the OSYM data in the resulting sample constitutes 54 percent of all the university-

[7]Individuals holding a Master's or a PhD degree would state the field they study in graduate-level. It may cause, for example, an engineer to state her major as management if she gets her master's degree from management, even if she works as an engineer. We use her wage in the calculation of the average wage of management major, which creates a mismatch between the stated major and the undergraduate major. We can only identify postgraduate degree holders in the years 2014 and 2015. Ratio of the number of university graduates with more than 4-year education to the number of all university graduates is about 8% in 2014 and 2015. Since this ratio is small and many people choose postgraduate degrees in the fields that corresponds to their undergraduate major, we don't think this creates a serious problem in our analysis.

[8]In the matching process, we pay attention to make "tight" matches, aiming to minimize the risk of a mismatch. For example, the content of "Education" major is very limited. However, people who state their major as "Art" may have graduated from a wide range of majors, that may lead to significant error in the matching process. For that reason, we restrict our analysis to a smaller set of broad majors which are presented with their corresponding major group contents in Appendix, Table10.

Figure 1: Total Quota of Undergraduate Majors Over Years



major pairs and 57 percent of the total quota between the years 2009 and 2015 in our sample. 74 percent of the university-major pairs are those which admit students with the "MSc" score type such as engineering or health-related majors.

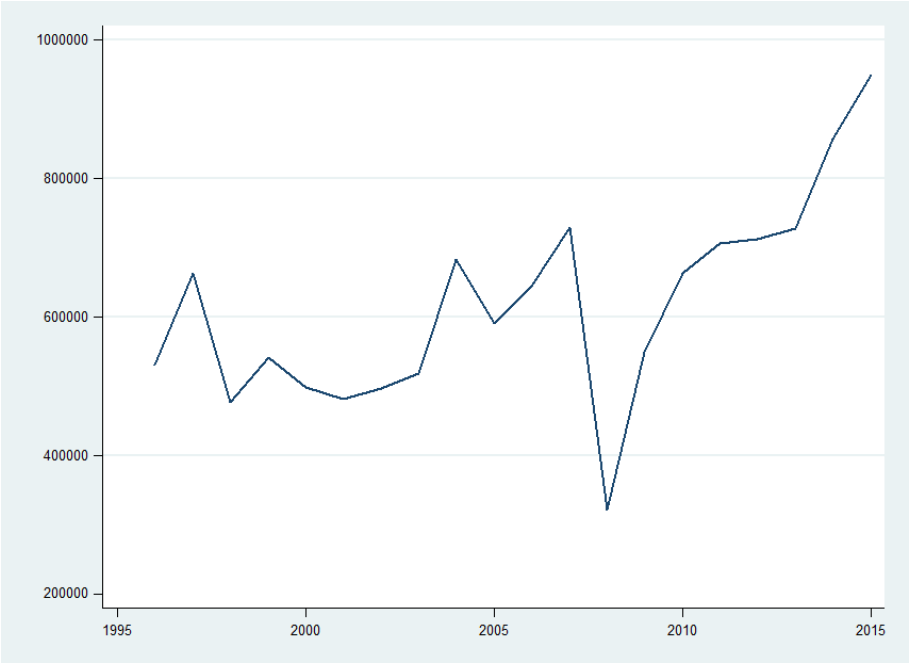
5 Model

Figure 1 shows the total quota of undergraduate degree programs in our analysis sample. Total quota of undergraduate majors increases over years, with a sharp increase in 2008. This can be considered as a response to the increasing demand to higher education over the years. Number of high school graduates (shown in Figure 2) and consequently number of students applying for the university entrance exam has also increased over time.[9] Besides the rise in the total quota, some majors' quotas change dramatically in some of the years. Figure 3 shows quota of some majors whose quota share within the relevant score type is among the largest either in 1996 or in 2015. As seen in the figure, quota of the majors are not increasing in the same rate, implying variation across majors as well as variation across years within a major.

Increasing total quota in certain majors may be a consequence of high demand to these majors. Educational policy makers may decide to increase the quota of,

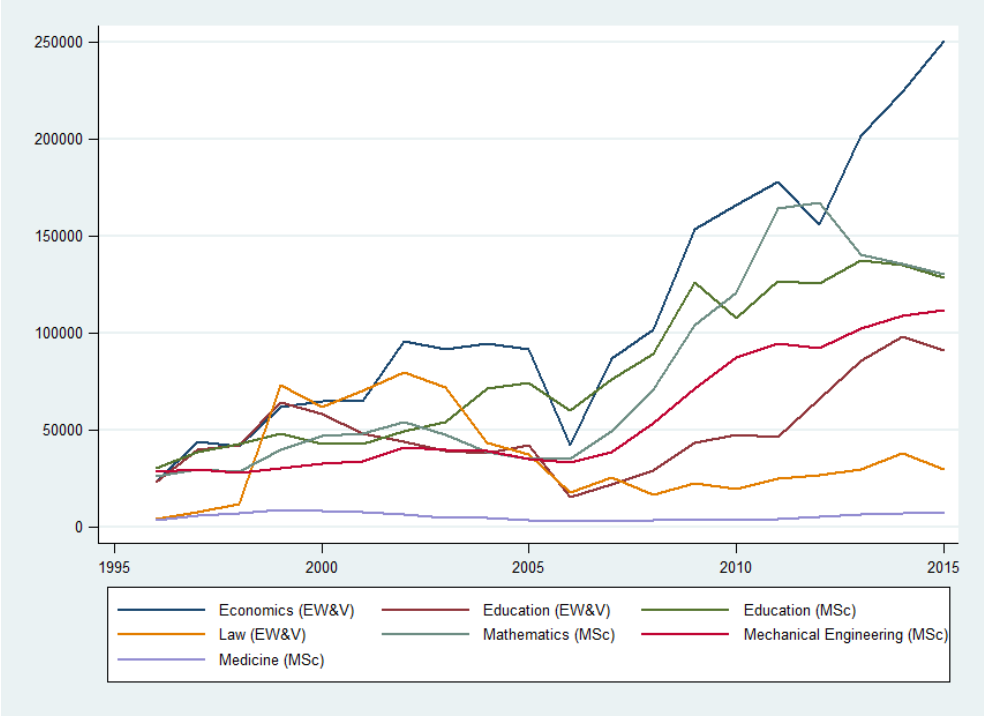
[9]The sharp decrease in 2008 in Figure 2 is due to the fact that general high schools do not graduate any students in 2008 because of the reform that increases the high school education from 3 years to 4 years for all high schools.

Figure 2: Number of High School Graduates Over Years*



*Sources: Turk Yuksekogretiminin Bugunku Durumu, YOK (2005) & National Education Statistics 2016/'17, MEB (2017)

Figure 3: Quota of Some Majors Over Years



for example, industrial engineering because of the rising demand of students to that major. On the other hand, increasing a specific major's quota may result in less demand to it because of a possible future excess labor supply in the relevant job market. As a consequence, students with better rankings may not prefer these majors to avoid low labor market prospects.

In order to analyze the direction and extent of the relationship between quota and rankings, we estimate the parameters in the following model:

$$R_{m,t} = \alpha_0 + \alpha_1 * Q_{m,t} + \alpha_2 * ST_m + \alpha_3 * Share_{m,t} + \alpha_4 * U_t + \alpha_5 * Y_t + \epsilon_{m,t} \quad (1)$$

$R_{m,t}$ is the ranking and $Q_{m,t}$ is the quota of the major m in year t. ST_m is a dummy variable that captures score type of major m, which control for the differences between students choosing majors from different score types. $Share_{m,t}$ is the vector of share of EMI, share of private education, and share of evening education variables for major m in year t. U_t is the unemployment rate in Turkey in year t, which captures the macroeconomic conditions that may affect the students' choices. Y_t is the set of year dummies which control for year fixed effects.

The second part of our analysis focuses on the relationship between the major specific labor market outcomes and the rankings. Equation 2 tests the hypotheses that average ranking of the majors are affected by the associated labor market outcomes in national level. We estimate the parameters in equation 2, by using classical OLS regression.

$$R_{m,t} = \beta_0 + \beta_1 * L_{bm,t} + \beta_2 * ST_m + \beta_3 * Q_{m,t} + \beta_4 * Share_{m,t} + \beta_5 * U_t + \beta_6 * Y_t + u_{m,t} \quad (2)$$

$L_{bm,t}$ is the mean of the labor market outcome (wage, employment probability, or unemployment rate) in years t, $t-1$ and $t-2$ for broad major bm. Rest of the variables are the same as explained above.

We further make our analysis using the aggregated data at regional level. We investigate the relationship between the major specific regional labor market outcomes and average rankings of majors in the universities located in the relevant region. Since some students may be attending universities at a place other than their usual area of residence, our assumption in the regional-level specifications is that students consider the labor market outcomes at the region where their intended university is located, instead of the outcomes at their area of residence. This is not an unrealistic assumption since students tend to get a job where they get the university education, and consequently form network. We utilize two different region classifications. NUTS1 classification includes 12 regions and NUTS2 classification includes more detailed 26 regions in Turkey. The relevant specifications are given

by equations 3 and 4. Equations 3 and 4 also include development indices D_{n_1} and D_{n_2} which are the weighted averages of development indices of cities within regions n_1 and n_2, respectively; where the weights are populations of these cities.[10] Including development index variable helps us to investigate whether the major specific average rankings of universities differ systematically by the development level. Such a difference may be caused due to more qualified instructors' working at the universities in more developed regions, or students' wish to form networks in these regions.

$$R_{m,t,n_1} = \theta_0 + \theta_1 * L_{bm,t,n_1} + \theta_2 * ST_m + \theta_3 * Q_{m,t,n_1} + \theta_4 * Share_{m,t,n_1} + \theta_5 * U_t + \theta_6 * Y_t + \theta_7 * D_{n_1} + \epsilon_{m,t,n_1} \quad (3)$$

$$R_{m,t,n_2} = \gamma_0 + \gamma_1 * L_{bm,t,n_2} + \gamma_2 * ST_m + \gamma_3 * Q_{m,t,n_2} + \gamma_4 * Share_{m,t,n_2} + \gamma_5 * U_t + \gamma_6 * Y_t + \gamma_7 * D_{n_2} + \epsilon_{m,t,n_2} \quad (4)$$

L_{bm,t,n_1} in equation 3 is the mean of labor market outcomes in years t, $t-1$ and $t-2$ for broad major bm, in region n_1 (in NUTS1 level). L_{bm,t,n_2} in equation 4 is the mean of labor market outcomes in years t, $t-1$ and $t-2$ for broad major bm, in region n_2 (in NUTS2 level). Similarly, other variables with subscript n_1 or n_2 vary at the regional level, as well as major and time.

We also want to figure out that at which level (national or regional) the labor market information has more influence on the major choice of students. For this purpose, we also estimate specifications where we add national labor market outcome variable ($L_{bm,t}$) to equations 3 and 4.

6 Results

6.1 OLS Regression Results of Ranking on Quota

We run OLS regression to estimate the parameters in equation 1 and present the results in Table 3. Columns (1) to (5) show results where all score types are pooled in data. Column 1 shows that in the simple bivariate regression, the estimated coefficient of quota variable is 0.66, implying that a rise in the quota of a major is associated with 0.66 decrease in its ranking. However, when we control for other variables including the characteristics of the majors (such as the shares of EMI,

[10]Development indices are taken from a research report of Ministry of Development. (Ministry of Development, 2013) Indices and population values of each city are for 2011.

private education and evening education), score type and time dummies the sign of the coefficient estimate becomes the opposite and larger in absolute value. In the full specification (Column 5), one quota increase is associated with 3.22 increase in the ranking. It means that the rise in the quota is associated with increased the demand, which is the opposite of our expectation. This may result from reverse causality, indicating that quota increases may be a response to increasing demand for certain majors.

Column 5 also shows that an increase in the share of private and evening education is associated with a decrease in rankings. However, the effect of the share of EMI is positive. The coefficient estimate of unemployment variable captures the possible changes in the mean ranking which results from the annual macroeconomic conditions. It shows that when unemployment rate increases, rankings decrease, which can be interpreted as follows. In years with inferior macroeconomic conditions (higher unemployment rates in this case), less successful students decide to go to university instead of entering into labor market. In other words, university education is more demanded by the students with lower achievement when the unemployment rate is higher. Coefficient estimates of score types capture the differences in mean rankings across the score types. Year dummies capture year specific changes in rankings such as changes in the examination system etc.

We repeat our analysis within each score type, and present the full specification results in Table 3, Columns (6), (7) and (8). Regressions for FL score type do not include share of EMI variable, for the reason discussed in footnote 4. The negative relation between quota and ranking is also observed within each score type. The effect of quota increase of a major in FL score type is the lowest among three of the score types. Similarly, coefficients of shares and unemployment rate are smaller than those in the regressions for other score types. One quota increase is associated with 3.17 increase in the ranking for EW&V, while it is associated with 2.57 increase for MSc. EW&V majors' rankings are more sensitive to quota changes than MSc majors' rankings. When we look at the coefficients of share of EMI and share of private education in columns (7) and (8), we see that rankings of EW&V majors (like Economics, Psychology, etc.) are more sensitive to the share of private education than those of MSc majors (like Engineering or Health-related jobs); while it is the opposite for the share of EMI.

6.2 Labor Market Outcomes

6.2.1 National Analysis

Table 4 summarizes the OLS regression results from equation 2; where major specific real wage, employment probability and unemployment rate are the main

independent variables in columns (1-2), (3-4) and (5-6), respectively. In the first two columns, $L_{m,t}$ is the mean of national real average wage of major m in years t, $t-1$ and $t-2$. Results show that as the real wage of a major increases, its ranking also increases. It is an expected result, indicating that lucrative majors in terms of real wages are more demanded. This result remains the same when we control for the quota, national unemployment rate, shares, score type dummies and year dummies. Middle two columns show that, similar to the average wage, there is a positive relationship between the employment probability and the ranking of a major, i.e, majors with higher employment probability are more demanded. In the last two columns results are consistent with those in the middle columns. An increase in the unemployment rate of a major decreases its ranking, yielding less demand to it. Like in Table 3, an increase in the quota of a major is associated with an increase in its ranking in all the specifications. Although we have a smaller sample here, the magnitudes of the coefficient estimates of quota variables in the full specifications are very close to that shown in Table 3. Similarly, the coefficients of national unemployment rate, evening share and English share have the same signs as in Table 3. The only difference is the coefficient of private share which is negative in the specifications in Table 4, although it is positive in Table 3. However, the negative effect is not statistically significant in columns (2) and (4).[11]

In order to examine which labor market outcome has relatively more effect on rankings, we investigate the impact of a one standard deviation increase in each major specific labor market outcome. Corresponding effects on rankings are approximately -6800, -4500, and 8200 for real wage, employment probability, and unemployment rate respectively. This shows that unemployment rate has a relatively larger impact on the students' college major choice among the three labor market outcomes. The effects of real wage and employment probability are relatively lower.

[11] Although our results are highly statistically significant, we are aware of the cluster problem in our data. $L_{bm,t}$ variable reflects the three-year average of the relevant labor market outcome for a *broad major*, not for a *major group*. For example, we take "Engineering" as a broad major, and "Computer Engineering" as a major group. (See Appendix Table 10 for the major group - broad major matching.) We have the same labor market outcome (independent variable) within a broad major and different rankings (dependent variable) for each different major group in our data. However, some broad majors and major groups are matched one to one. So, part of our data is clustered and this may cause the standard errors to be underestimated. The closest case to ours in the literature can be considered as "unbalanced clusters" which means the clusters to be in different size, but this case is not directly applicable to our case. Although we are not able to directly address this problem, we discuss some alternative ways to handle it, as explained in detail in Appendix.

Table 3: OLS Regressions of Ranking on Quota

	All Score Types Pooled					ST: FL	ST: EW&V	ST: MSc
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quota	0.66*	-1.58***	-1.84***	-2.15***	-3.22***	-0.26*	-3.17***	-2.57***
	(0.39)	(0.42)	(0.42)	(0.42)	(0.38)	(0.14)	(0.54)	(0.57)
Share of EMI		-276.93**	-106.96	-133.53	-887.26***		-610.31**	-1070.03***
		(111.34)	(102.29)	(98.68)	(120.80)	-	(209.91)	(158.74)
Share of Private Education		1539.05***	1358.67***	1226.19***	1098.80***	89.16***	1713.53***	348.12**
		(115.13)	(108.95)	(103.51)	(99.73)	(10.09)	(161.50)	(114.11)
Share of Evening Education		2172.49***	1899.74***	1721.10***	1202.16***	174.06***	1215.82***	1173.65***
		(166.55)	(166.10)	(162.16)	(149.06)	(42.02)	(308.52)	(167.27)
National Unemployment Rate				10096.25***	35278.03***	2983.84***	43782.39***	33083.31***
				(892.87)	(2416.96)	(439.47)	(4804.26)	(2332.76)
Score Type Dummies	No	No	Yes	Yes	Yes	No	No	No
Year Dummies	No	No	No	No	Yes	Yes	Yes	Yes
Num. of Obs.	1684	1684	1684	1684	1684	105	675	904
R^2	0.00	0.21	0.27	0.32	0.46	0.81	0.47	0.44

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 1996 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of the compliance with the dependent variable in terms of scale.) Dependent variable is National Average Ranking ($R_{m,t}$) in all the specifications. Columns (1) to (5) show the OLS regression results where all score types are pooled in data. Columns (6), (7) and (8) show the OLS regression results within the score types FL, EW&V and MSc; respectively. Constant terms are not presented.

6.2.2 Regional Analysis

We repeat our analysis using the data where the labor market outcome variables, ranking, quota, and share variables are defined at regional, instead of national level. The regions are defined by the NUTS1 and NUTS2 regional classifications, and the results are presented in Table 5 and Table 6, respectively. Table 5 shows that the effect of regional real wage on the rankings (columns 1 and 2) is in the same direction as the effect in national level analysis, though it is smaller. Similarly, the effects of employment probability (columns 3 and 4) and unemployment rate (columns 5 and 6) are in the same direction albeit smaller in absolute value, with those in the national level. Table 6 that adopts a more detailed regional definition (NUTS2) yields similar results although estimated effects are smaller than the corresponding coefficient estimates found in the regressions that utilize NUTS1 level variation.

Coefficient estimates of quota variable in two of the regional analyses have the same sign as, but they are considerably larger in absolute value than the one in the national analysis. Coefficient estimates of unemployment rate and share variables are statistically significant and have the same sign as in the national analysis, except unemployment rate which is insignificant in column 4 of Tables 5 and 6.

We also control for the development index variables (D_{n_1} and D_{n_2}) in the regional level regressions. Coefficient estimates indicate a positive association between development levels and rankings in all of the regional level specifications, implying that the rankings of the universities in the more developed regions are higher.

In sum, the positive effects of wage and employment probability variables, and the negative effect of the unemployment rate variable remain the same in national and regional level analysis. However, NUTS1 level regional analysis yields coefficient estimates smaller in absolute value than those of national level analysis. Similarly, coefficients in the NUTS2 level analysis are smaller in absolute value than those in the NUTS1 level analysis. As the labor market information becomes more region-specific, students seem to respond to the information less while choosing majors. These results suggest that the national level labor market outcomes may be more influential on the rankings. In order to test this hypothesis, we further run two regressions. In the first regression national ($L_{bm,t}$) and NUTS1 regional (L_{bm,t,n_1}) level major specific labor market outcomes are the main independent variables. In the second one national ($L_{bm,t}$) and NUTS2 regional (L_{bm,t,n_2}) level major specific labor market outcomes are the main independent variables. Average rankings calculated at NUTS1 and NUTS2 regional levels (R_{m,t,n_1} and R_{m,t,n_2}) are the dependent variables in the first and second regressions, respectively. Results are presented in Tables 7 and 8. In both regressions, results show that national level labor market information has a larger effect than regional level labor market information on rank-

Table 4: OLS Regressions of Ranking on Labor Market Outcomes (National Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-182.72***	-192.37***	-2459.25**	-4127.03***	8725.25***	8250.48***
	(22.07)	(25.04)	(740.54)	(704.85)	(1416.67)	(1617.28)
Quota		-3.21***		-3.87***		-2.27**
		(0.89)		(0.87)		(0.86)
National		54066.49**		46545.21*		41493.38*
Unemployment Rate		(23719.90)		(24381.81)		(23739.84)
Share of		-1776.53***		-1098.41**		-1483.77***
EMI		(363.40)		(342.89)		(366.30)
Share of		-34.64		-357.44		-433.54*
Private Education		(238.00)		(249.27)		(241.79)
Share of		940.76**		1409.23***		866.49**
Evening Education		(323.73)		(304.96)		(305.17)
Score Type	No	Yes	No	Yes	No	Yes
Dummies						
Year	No	Yes	No	Yes	No	Yes
Dummies						
Num. of Obs.	230	230	230	230	230	230
R^2	0.15	0.46	0.06	0.45	0.21	0.48

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is National Average Ranking ($R_{m,t}$) in all the specifications. First and second columns show the OLS regression results where the main independent variable $L_{bm,t}$ stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 5: OLS Regressions of Ranking on Labor Market Outcomes (NUTS1 Regional Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-138.19***	-139.54***	-1799.63***	-2829.41***	6474.91***	5813.20***
	(6.85)	(8.22)	(209.28)	(200.68)	(464.81)	(481.35)
Quota		-15.35***		-22.76***		-14.30***
		(2.40)		(2.62)		(2.37)
National Unemployment Rate		24627.07**		16542.33*		20643.34**
		(9916.66)		(9916.49)		(9869.89)
Development Index		-525.81		-8335.05***		-6674.02***
		(996.24)		(934.87)		(942.54)
Share of EMI		-514.87***		-441.81***		-600.85***
		(77.31)		(79.02)		(82.25)
Share of Private Education		531.35***		398.50***		336.48***
		(71.33)		(75.46)		(77.21)
Share of Evening Education		175.01**		527.49***		313.89***
		(85.92)		(80.10)		(82.24)
Score Type Dummies	No	Yes	No	Yes	No	Yes
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	2110	2110	2110	2110	2110	2110
R^2	0.16	0.29	0.04	0.28	0.15	0.30

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS1) Average Ranking (R_{m,t,n_1}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_1} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 6: OLS Regressions of Ranking on Labor Market Outcomes (NUTS2 Regional Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-125.00***	-117.92***	-1195.29***	-2042.98***	4561.27***	4203.29***
	(4.95)	(5.95)	(137.89)	(133.48)	(349.42)	(349.60)
Quota		-18.84***		-26.52***		-19.91***
		(3.35)		(3.72)		(3.20)
National Unemployment Rate		21943.96**		12214.21		15343.81*
		(7891.45)		(7990.09)		(7952.53)
Development Index		-2836.22**		-9365.66***		-7674.99***
		(897.11)		(875.02)		(869.19)
Share of EMI		-422.00***		-404.98***		-529.25***
		(50.74)		(53.59)		(55.35)
Share of Private Education		511.44***		444.77***		399.80***
		(58.50)		(63.59)		(62.48)
Share of Evening Education		236.87***		562.26***		427.74***
		(63.21)		(58.80)		(59.78)
Score Type Dummies	No	Yes	No	Yes	No	Yes
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	3584	3584	3610	3610	3599	3599
R^2	0.13	0.25	0.02	0.23	0.10	0.25

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS2) Average Ranking (R_{m,t,n_2}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_2} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

ings of majors. This implies that students respond more to national labor market outcomes than regional labor market outcomes while choosing their college majors.[12]

As explained before, most of the observations in our data are the majors that admit students with MSc score type. We repeat our analysis in both national and regional levels for these majors. Results are shown in Tables 16 to 20 in appendix. Most of the results are very similar to our main results.[13]

[12]We have also run regressions where both wage and unemployment rate variables are included as main explanatory variables in order to compare their effects. However, including one additional labor market outcome vanishes the significance of other's effect. This is not surprising since the correlation between these variables are high leading to a multicollinearity problem.

[13]Most of the variation in our analysis comes from major level. We have also repeated our analysis including major dummies and major-year interactions to the regressions. As expected, we lose the significance of the estimated coefficients of main interest since most of the identifying variation vanishes.

Table 7: OLS Regressions of Ranking on Labor Market Outcomes (NUTS1 Regional and National Level)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO (regional)	-138.19***	-92.23***	-6.59	-1799.63***	-1090.79***	-1054.22***	6474.91***	1945.41**	1027.48*
	(6.85)	(8.55)	(11.42)	(209.28)	(280.08)	(251.57)	(464.81)	(623.16)	(615.66)
LMO (national)		-99.77***	-224.54***		-1293.19***	-3713.42***		7948.45***	9127.59***
		(11.64)	(14.55)		(389.85)	(357.44)		(795.17)	(796.58)
Quota			-14.50***			-22.11***			-4.98**
			(2.60)			(2.65)			(2.19)
National Unemployment Rate			35008.49***			27306.22**			27793.27**
			(9281.38)			(9816.81)			(9439.19)
Development Index			-9362.67***			-7701.13***			-9474.84***
			(1117.37)			(924.45)			(873.89)
Share of EMI			-660.58***			-426.23***			-606.95***
			(81.55)			(79.41)			(83.23)
Share of Private Education			494.09***			417.59***			269.45***
			(71.75)			(72.89)			(75.92)
Share of Evening Education			68.27			582.71***			115.66
			(81.08)			(78.88)			(78.57)
Score Type Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Year Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Num. of Obs.	2110	2110	2110	2110	2110	2110	2110	2110	2110
R^2	0.16	0.18	0.37	0.04	0.05	0.32	0.15	0.22	0.38

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS1) Average Ranking (R_{m,t,n_1}) in all the specifications. First three columns show the OLS regression results where the main independent variables are Average Real Wage in national and regional level. In columns (4) to (6), the main independent variables are Employment Probability in national and regional level. In last three columns, the main independent variables are Unemployment Rate in national and regional level, respectively. Constant terms are not presented.

Table 8: OLS Regressions of Ranking on Labor Market Outcomes (NUTS2 Regional and National Level)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO (regional)	-125.00*** (4.95)	-74.50*** (6.20)	-9.33 (7.50)	-1195.29*** (137.89)	-251.23 (171.48)	-479.86** (151.31)	4561.27*** (349.42)	474.17 (405.23)	195.68 (389.48)
LMO (national)		-117.81*** (9.00)	-223.75*** (9.59)		-2166.30*** (274.48)	-4291.01*** (248.76)		10000.23*** (608.17)	10897.88*** (602.93)
Quota			-15.61*** (3.67)			-25.38*** (3.79)			-1.45 (2.57)
National Unemployment Rate			34541.59*** (7354.48)			24793.46** (7728.93)			25060.95*** (7345.41)
Development Index			-9621.01*** (918.63)			-8435.68*** (853.70)			-11569.31*** (805.94)
Share of EMI			-587.99*** (52.92)			-375.12*** (53.20)			-540.10*** (53.76)
Share of Private Education			500.27*** (56.53)			453.59*** (60.90)			275.82*** (60.96)
Share of Evening Education			133.19** (59.38)			600.18*** (56.74)			133.01** (57.30)
Score Type Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Year Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Num. of Obs.	3584	3584	3584	3610	3610	3610	3599	3599	3599
R^2	0.13	0.16	0.34	0.02	0.04	0.29	0.10	0.23	0.38

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Score Type Dummies include a dummy variable for each score type (FL, EW&V and MSc) and year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS2) Average Ranking (R_{m,t,n_2}) in all the specifications. First three columns show the OLS regression results where the main independent variables are Average Real Wage in national and regional level. In columns (4) to (6), the main independent variables are Employment Probability in national and regional level. In last three columns, the main independent variables are Unemployment Rate in national and regional level, respectively. Constant terms are not presented.

7 Conclusion

In this study we analyze how choice of a major is affected by major specific quotas and labor market outcomes within the Turkish context, using a dataset that includes university placement information and major specific labor market outcomes between 2009 and 2015. We find a statistically significant and positive association between the demand of a major - reflected by higher rankings - and major specific quota increase, real wage and employment probability. Increase in major specific unemployment rate is associated with a lower demand and the magnitude of this is found to be the largest among three of the labor market outcomes. Unlike other studies in the literature, our dataset includes major-level information and we interpret major specific rankings as demand for a major. For this reason, we cannot provide a direct comparison of the magnitudes we estimate to those found in the previous studies.

Increase in the rankings with the rise in quota looks like an unexpected result. However, it may be driven by reverse causality, and makes more sense to interpret increasing quota levels as a response to the increasing demand for certain majors.

Our study shows that the information in the labor market is transmitted to the students and affect their decision process. Results about labor market outcomes show that students respond to pecuniary outcomes while choosing a major. Majors with high salaries and high employment rates are more demanded. Another important finding of this study is that students give relatively more importance to unemployment rate than wages when shaping their major decisions. In a country with a high youth unemployment rate like Turkey, this result is not surprising. Students may want to avoid the risk of being unemployed and demand the majors with lower unemployment rates more. This result is consistent with the findings by Yazici and Yazici (2010) who report that Turkish students rank guaranteed employment and expected earnings as two of the five most important factors in their choice of college major.

Our findings also suggests that students care more about national labor market prospects than regional ones where their intended university is located. It may be interpreted as students do not restrict themselves to the labor market where they will get university education when choosing their major. They may consider searching for a job in any region. This result is in contrast to the one found by Long et al. (2015) who state that students are more likely to respond localized wage information than national wage information in United States.

Another finding of this study is that as regional development level increases, rankings of university programs in that region also increase. It is not surprising that more successful students do not choose to get a university education in less

developed regions. Although our results indicate that students care more about national labor market prospects than regional ones while choosing their universities, after graduation they may decide to enter into labor market in the regions where they get university education. This may cause the development level difference between regions to remain. Policies intended to attract more successful students to less developed regions may be implemented in order to decrease the gap between the regions.

Our results show that as macroeconomic conditions get worse (as national unemployment rate increases), students with lower achievement become more likely to seek university education. In a better macroeconomic environment, they may prefer to go into labor market after high-school graduation. One might think that this wouldn't be the case in an environment where total quota of all the majors in the country remains the same over years. However, in almost every year some seats are not filled by students. Students with lower achievement would be placed to these majors in the years with inferior macroeconomic conditions if the total quota were to remain constant over years.

An increase in the share of EMI of a major is associated with an increase in its ranking. Students may have a preference towards majors that offer English Medium Instruction. This is also an expected result, since English is an important skill in the labor market and getting university education in English (or graduating from a major with a high share of EMI) may increase the chance of getting a good job.

In conclusion, this study shows that labor market information is likely to be an important determinant for the high school graduates and affect their decisions. While this study cannot identify causal relationships, our results show potentially important determinants of major choice for future causal analysis in this field.

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Appendices

Table 9: Major groups

Broad Score Type	**Major Groups** (MSc: Mathematics & Science, EW&V: Equally Weighted & Verbal, FL: Foreign Languages)
MSc	Actuary (MSc)
	Aeronautical & Aircraft & Aerospace Engineering (MSc)
	Agricultural Engineering (MSc)
	Agriculture & Animal Production & Soil and Plant (MSc)
	Aircraft Airframe Engine Maintenance & Aviation & Aircraft Electric Electronic (MSc)
	Aquacultural & Fishery Technology Engineering (MSc)
	Aquacultural Resources & Fishery and Food Technology (MSc)
	Architecture & Interior Architecture & Urban Design and Landscape Architecture & Urban and Regional Planning (MSc)
	Astronomy & Space Sciences (MSc)
	Automotive Engineering (MSc)
	Bioenformatics & Genetics & Biotechnology & Molecular Biology (MSc)
	Bioengineering (MSc)
	Biology (MSc)
	Chemical & Fiber & Polymer Engineering (MSc)
	Chemistry (MSc)
	Civil Engineering (MSc)
	Computer & Information Technologies & Software Engineering (MSc)
	Computer Science and Technology & Informatics & Digital Game Design (MSc)
	Dentistry (MSc)
	Education (MSc)
	Electrical and Electronic & Communication Engineering (MSc)
	Engineering - other (MSc)
	Environmental Engineering (MSc)
	Food Engineering (MSc)
	Forestry and Woodworking Engineering (MSc)

Broad Score Type	Major Groups
	Geological & Geophysical Engineering (MSc)
	Geomatic Engineering (MSc)
	Health Related Majors (MSc)
	Industrial Design (MSc)
	Industrial Engineering (MSc)
	Manufacturing Engineering (MSc)
	Maritime Transportation and Management & Marine Engineering (MSc)
	Material & Metallurgical & Nanotechnology Engineering (MSc)
	Mathematics (MSc)
	Mathematics Engineering (MSc)
	Mechanical Engineering (MSc)
	Mechatronics & Control & Automatization Engineering (MSc)
	Medicine (MSc)
	Mining & Mineral Processing Engineering (MSc)
	Nuclear Energy & Power Systems & Energy and Material Engineering (MSc)
	Nursing Care (MSc)
	Other (MSc)
	Pharmacy (MSc)
	Physics & Optics and Acoustics Engineering (MSc)
	Physics (MSc)
	Pilotage (MSc)
	Statistics (MSc)
	Textile Engineering (MSc)
	Veterinary Medicine (MSc)
EW&V	Anthropology (EW&V)
	Archaeology and Art History (EW&V)
	Architecture & Interior Architecture & Urban Design and Landscape Architecture & Urban and Regional Planning (EW&V)
	Art History and Management (EW&V)

Broad Score Type	Major Groups
	Banking & Accounting & Finance (EW&V)
	Capital Markets & Real Estate Management (EW&V)
	Child Development (EW&V)
	Civil Aviation Management (EW&V)
	Economics (EW&V)
	Education (EW&V)
	Entrepreneurship (EW&V)
	Gastronomy and Culinary Arts (EW&V)
	Geography (EW&V)
	Graphic Design (EW&V)
	Health Management (EW&V)
	History (EW&V)
	Insurance & Actuary & Risk Management (EW&V)
	International Management & Trade & Logistics (EW&V)
	Language - Culture - Literature (EW&V)
	Law (EW&V)
	Management (EW&V)
	Maritime Management (EW&V)
	Media & Visual Arts & Communucation Design (EW&V)
	Other (EW&V)
	Philosophy (EW&V)
	Political Science & Public Administration & International Relations (EW&V)
	Psychological Counseling and Guidance (EW&V)
	Psychology (EW&V)
	Public Finance (EW&V)
	Public Relations & Marketing & Promotion & Advertising (EW&V)
	Social Service (EW&V)
	Sociology (EW&V)
	Sports Management (EW&V)

Broad Score Type	Major Groups
	Technology & Information & Document Management - Management Information Systems (EW&V)
	Textile & Fashion & Jewelry Design & Handicrafts (EW&V)
	Theology & Religion (EW&V)
	Tourism & Hotel Management & Accommodation (EW&V)
FL	Banking & Accounting & Finance (FL)
	Education (FL)
	Language - Culture - Literature (FL)
	Linguistics (FL)
	Other (FL)
	Tour Guiding (FL)
	Translation and Interpreting (FL)

Table 10: Broad Majors

Broad Majors	Major Groups
Education	Education (EW&V)
	Education (FL)
	Education (MSc)
Mathematics and Statistics	Mathematics (MSc)
	Statistics (MSc)
Computer	Computer Science and Technology & Informatics & Digital Game Design (MSc)
Engineering	Aeronautical & Aircraft & Aerospace Engineering (MSc)
	Agricultural Engineering (MSc)
	Aquacultural & Fishery Technology Engineering (MSc)
	Automotive Engineering (MSc)
	Bioengineering (MSc)

Broad Majors	**Major Groups**
	Chemical & Fiber & Polymer Engineering (MSc)
	Civil Engineering (MSc)
	Computer & Information Technologies & Software Engineering (MSc)
	Electrical and Electronic & Communication Engineering (MSc)
	Engineering - other (MSc)
	Environmental Engineering (MSc)
	Food Engineering (MSc)
	Forestry and Woodworking Engineering (MSc)
	Geological & Geophysical Engineering (MSc)
	Geomatic Engineering (MSc)
	Industrial Engineering (MSc)
	Manufacturing Engineering (MSc)
	Maritime Transportation and Management & Marine Engineering (MSc)
	Material & Metallurgical & Nanotechnology Engineering (MSc)
	Mathematics Engineering (MSc)
	Mechanical Engineering (MSc)
	Mechatronics & Control & Automatization Engineering (MSc)
	Mining & Mineral Processing Engineering (MSc)
	Nuclear Energy & Power Systems & Energy and Material Engineering (MSc)
	Physics & Optics and Acoustics Engineering (MSc)
	Textile Engineering (MSc)
Architecture and Construction	Architecture & Interior Architecture & Urban Design and Landscape Architecture & Urban and Regional Planning (EW&V)
	Architecture & Interior Architecture & Urban Design and Landscape Architecture & Urban and Regional Planning (MSc)
Agriculture, Forestry and Fishery	Agriculture & Animal Production & Soil and Plant (MSc)

Broad Majors	**Major Groups**
	Aquacultural Resources & Fishery and Food Technology (MSc)
Veterinary Medicine	Veterinary Medicine (MSc)
Health	Dentistry (MSc)
	Health Related Majors (MSc)
	Medicine (MSc)
	Nursing Care (MSc)
Social Services	Social Service (EW&V)
Business and Management	Management (EW&V)
Law	Law(EW&V)
Life Sciences	Bioenformatics & Genetics & Biotechnology & Molecular Biology (MSc)
	Biology (MSc)
Physics	Physics (MSc)

A Cluster Problem

A.1 Major Clusters

As noted in footnote 11, our data is partially clustered because some broad majors are matched to more than one major groups, while some of them are matched exactly to one major group. While there are various studies that address for clusters issue, to the best of our knowledge, there is no study that addresses econometric issues where there is partial clustering. Hence, we try to handle this problem by aggregating our original dataset in a different way. Our main aggregation strategy was to calculate the weighted average of rankings of each university-major pair within a major group. In this section, we calculate the weighted average of rankings of university-major pairs within *broad majors*. There are two reasons why we do not prefer this aggregation strategy in the first place. First, since there are just 13 broad majors, the number of observations in our aggregated sample would be very low. Second, we have to group some majors that belong to different score types. For example, "Education" is a broad major and it contains the following three major groups: "Education (EW&V)", "Education (FL)" and "Education (MSc)". These three major groups contain education majors from different score types and creating an average ranking for all of them raises some measurement issues since each score type is ranked separately. However, this aggregation strategy rules out the partial

cluster problem in major level, which makes it advantageous to use.

Despite the disadvantages, it is interesting to see whether estimates remain significant using this alternative aggregation strategy. We calculate the weighted average ranking $R_{bm,t}$ for broad major bm in year t, where the weights are the quotas of university-major pairs as in the main analysis. Using this alternative data, we run OLS regressions to estimate the parameters in Equation 5 below, and present the results in Table 11. Variables in Equation 5 are the same as those defined for Equation 2, in Section 5 except they are aggregated in broad majors level instead of major groups.

$$R_{bm,t} = \beta_0 + \beta_1 * L_{bm,t} + \beta_2 * Q_{bm,t} + \beta_3 * Share_{bm,t} + \beta_4 * U_t + \beta_5 * Y_t + u_{bm,t} \quad (5)$$

In Table 11, the parameters of interest are statistically significant. They are of the same sign, but of smaller magnitude than those in Table 4. While most variables have the expected sign and are statistically significant, only the National Unemployment Rate variable is not statistically significant. EMI variable has the opposite sign compared to that in Table 4.

We also repeat our analysis at regional NUTS1 and NUTS2 levels with this aggregation strategy. Tables 12 and 13 summarize the results, respectively. As in the national level analysis, parameters of interest are smaller than those in Tables 5 and 6 but remain mostly statistically significant. They are statistically significant and in expected sign. National Unemployment Rate variable is insignificant in both NUTS1 and NUTS2 levels. Remaining results are mostly in line with those in Tables 5 and 6.

A.2 Region Clusters

Although the alternative aggregation strategy we implement solves the partial clustering problem at major level in our data, there are also region clusters that may yield a problem. Error term may be correlated within clusters, leading standard errors to be underestimated. Since there are 26 and 12 regions in NUTS2 and NUTS1 classifications respectively, the number of clusters is small. In order to obtain accurate inference about the statistical significance of estimated parameters, we use "pairs bootstrapping" (clusterbs: a user-written Stata command) that deals with the few clusters problem. Since this strategy does not allow categorical variables, we treat "year" as a continuous variable. Tables 14 and 15 summarize the results for NUTS1 and NUTS2 levels, respectively.

Table 14 is divided into three panels with one labor market outcome in each

Table 11: OLS Regressions of BM Ranking on Labor Market Outcomes (National Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-188.08***	-121.51***	-2952.11***	-1675.90**	7158.22***	6019.00***
	(19.28)	(24.07)	(811.72)	(707.75)	(1518.03)	(1583.59)
Quota		-1.07***		-1.11***		-0.68**
		(0.20)		(0.23)		(0.21)
National Unemployment Rate		523.25		-12615.64		-25810.26
		(39001.70)		(43216.17)		(38563.39)
Share of EMI		1634.73**		2334.42**		1568.46*
		(671.40)		(791.57)		(826.13)
Share of Private Education		-924.42**		-1340.59**		-1522.55***
		(355.05)		(473.47)		(336.81)
Share of Evening Education		1761.42**		1888.49**		1177.83*
		(522.01)		(602.05)		(587.82)
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	65	65	65	65	65	65
R^2	0.36	0.59	0.15	0.50	0.37	0.62

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is National Average Ranking ($R_{bm,t}$) in all the specifications. First and second columns show the OLS regression results where the main independent variable $L_{bm,t}$ stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

panel. Within each panel, first column (Columns 1, 4 and 7) shows the coefficient estimated from the OLS regression of ranking (R_{bm,t,n_1}) on the relevant labor market outcome (L_{bm,t,n_1}) and other control variables. The second column in each panel (Columns 2, 5 and 8) shows the p-value of the estimated coefficient from classical OLS regression with robust option. The last column in each part (Columns 3, 6 and 9) shows the p-value obtained from the pairs bootstrapping procedure. Organization of Table 15, which presents the results from the regression of ranking (R_{bm,t,n_2}) on the relevant labor market outcome (L_{bm,t,n_2}) and other control variables is the same. The parameters of interest for three of the labor market outcomes remain statistically significant after pairs bootstrapping procedure in both NUTS1 and NUTS2 regional level regressions. Coefficient estimate of quota variable remains statistically significant in NUTS1 level regressions. However, in NUTS2 level regressions, it becomes insignificant in the pairs bootstrapping procedures. National Unemployment Rate variable also remains significant in all specifications.

In Table 14, p-values of Development Index variable is larger in the last columns (3, 6 and 9) than those in the second columns (2, 5 and 8) in each panel. It is insignificant in the first panel where the main independent variable is wage; but significant in the other parts where the main independent variables are employment

Table 12: OLS Regressions of BM Ranking on Labor Market Outcomes (Regional NUTS1 Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-145.71***	-104.15***	-2218.76***	-1540.30***	5690.62***	4170.62***
	(10.35)	(11.77)	(290.71)	(307.58)	(657.20)	(702.81)
Quota		-8.44***		-9.05***		-7.52***
		(1.21)		(1.25)		(1.10)
National Unemployment Rate		12408.34		2063.56		918.59
		(18423.60)		(18567.25)		(18324.22)
Development Index		-1523.92		-4980.02**		-3040.82*
		(1747.98)		(1779.53)		(1695.67)
Share of EMI		189.43		486.39**		115.51
		(188.12)		(227.18)		(208.77)
Share of Private Education		318.99**		7.65		12.64
		(160.54)		(195.66)		(182.35)
Share of Evening Education		1398.98***		1547.88***		1323.62***
		(192.01)		(188.71)		(193.12)
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	677	677	677	677	677	677
R^2	0.19	0.31	0.09	0.27	0.20	0.33

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional Average Ranking (R_{bm,t,n_1}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_1} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 13: OLS Regressions of BM Ranking on Labor Market Outcomes (Regional NUTS2 Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-139.07***	-94.46***	-1359.70***	-1016.56***	3955.33***	2973.95***
	(7.95)	(9.61)	(184.78)	(189.25)	(461.03)	(465.10)
Quota		-11.21***		-11.84***		-10.37***
		(2.39)		(2.37)		(2.12)
National Unemployment Rate		13694.45		-706.84		-3478.92
		(14394.13)		(14674.12)		(14378.32)
Development Index		-4698.21**		-7711.50***		-6771.72***
		(1574.87)		(1634.95)		(1561.27)
Share of EMI		146.37		379.76**		92.37
		(132.91)		(142.37)		(143.85)
Share of Private Education		329.16**		70.26		138.49
		(143.79)		(151.27)		(149.35)
Share of Evening Education		1222.82***		1350.58***		1210.40***
		(142.52)		(139.40)		(139.81)
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	1227	1227	1251	1251	1242	1242
R^2	0.15	0.26	0.04	0.22	0.13	0.26

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional Average Ranking (R_{bm,t,n_2}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_2} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 14: OLS Regressions of BM Ranking on Labor Market Outcomes (NUTS1 clusters)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO	-104.13	0.00	0.00	-1538.55	0.00	0.00	4140.70	0.00	0.00
Quota	-8.44	0.00	0.03	-9.05	0.00	0.01	-7.53	0.00	0.02
Nat. Unemp. Rate	23615.75	0.01	0.01	20613.69	0.02	0.01	16664.18	0.05	0.01
Dev. Index	-1533.15	0.38	0.73	-4993.96	0.01	0.22	-3062.58	0.07	0.42
S. of EMI	192.24	0.31	0.57	492.94	0.03	0.10	128.03	0.54	0.67
S. of Private Ed.	316.64	0.05	0.61	4.14	0.98	0.99	7.96	0.97	0.99
S. of Evening Ed.	1391.71	0.00	0.00	1538.45	0.00	0.00	1314.50	0.00	0.00
Year	-606.65	0.82	0.72	-1450.38	0.59	0.42	-894.76	0.73	0.62
Num. of Obs.	677	677	677	677	677	677	677	677	677
Num. of Clusters			12			12			12

Notes: Table is divided into three parts with one labor market outcome in each part (Real Average Wage, Employment Probability, Unemployment Rate). Within each part, first column (Columns 1, 4 and 7) shows the coefficient estimated from the OLS regression of ranking (R_{bm,t,n_1}) on the relevant labor market outcome (L_{bm,t,n_1}) and other control variables. The second column in each part (Columns 2, 5 and 8) shows the p-value of the estimated coefficient from classical OLS regression with robust option. The last column in each part (Columns 3, 6 and 9) shows the p-value obtained from the pairs bootstrapping procedure. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Constant terms are not presented.

probability and unemployment rate. Results for Development Index variable are similar in Table 15, except that in the first panel it becomes insignificant after the pairs bootstrapping procedure, while it was already insignificant in Table 14, first panel.

Coefficient estimate of share of EMI and Private Education variables are generally insignificant after pairs bootstrapping procedure in both regional levels. Share of Evening Education, however, remains significant in all specifications.

Table 15: OLS Regressions of BM Ranking on Labor Market Outcomes (NUTS2 clusters)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO	-94.50	0.00	0.00	-1015.56	0.00	0.00	2956.81	0.00	0.01
Quota	-11.21	0.00	0.40	-11.83	0.00	0.38	-10.37	0.00	0.34
Nat. Unemp. Rate	27729.83	0.00	0.00	25001.29	0.00	0.00	19922.79	0.00	0.00
Dev. Index	-4703.18	0.00	0.22	-7721.49	0.00	0.04	-6786.88	0.00	0.05
S. of EMI	147.16	0.27	0.62	384.70	0.01	0.16	99.90	0.49	0.75
S. of Private Ed.	328.47	0.02	0.52	66.50	0.66	0.88	135.31	0.37	0.75
S. of Evening Ed.	1217.93	0.00	0.00	1342.93	0.00	0.00	1202.51	0.00	0.00
Year	-1152.57	0.60	0.42	-2423.73	0.27	0.06	-2026.19	0.34	0.12
Num. of Obs.	1227	1227	1227	1251	1251	1251	1242	1242	1242
Num. of Clusters			26			26			26

Notes: Table is divided into three parts with one labor market outcome in each part (Real Average Wage, Employment Probability, Unemployment Rate). Within each part, first column (Columns 1, 4 and 7) shows the coefficient estimated from the OLS regression of ranking (R_{bm,t,n_2}) on the relevant labor market outcome (L_{bm,t,n_2}) and other control variables. The second column in each part (Columns 2, 5 and 8) shows the p-value of the estimated coefficient from classical OLS regression with robust option. The last column in each part (Columns 3, 6 and 9) shows the p-value obtained from the pairs bootstrapping procedure. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Constant terms are not presented.

Table 16: OLS Regressions of Ranking on Labor Market Outcomes - MSc (National Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-225.26***	-244.32***	-5702.18***	-5310.32***	9778.05***	11373.70***
	(28.39)	(30.33)	(796.73)	(579.28)	(1173.55)	(1176.83)
Quota		-3.45***		-5.37***		-2.03**
		(0.91)		(0.82)		(0.84)
National		55318.65**		49527.05**		50596.05**
Unemployment Rate		(22924.63)		(22179.36)		(21565.05)
Share of		-2375.67***		-1808.34***		-2150.32***
EMI		(375.83)		(338.21)		(357.73)
Share of		-193.85		-320.01		-729.87**
Private Education		(255.96)		(240.51)		(252.80)
Share of		628.78*		1237.81***		629.93**
Evening Education		(325.63)		(281.75)		(287.24)
Year	No	Yes	No	Yes	No	Yes
Dummies						
Num. of Obs.	200	200	200	200	200	
R^2	0.18	0.54	0.21	0.58	0.22	0.60

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is National Average Ranking ($R_{m,t}$) in all the specifications. First and second columns show the OLS regression results where the main independent variable $L_{bm,t}$ stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 17: OLS Regressions of Ranking on Labor Market Outcomes - MSc (Regional NUTS1 Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-140.71***	-126.66***	-2842.57***	-2957.70***	5949.07***	5398.59***
	(7.46)	(9.45)	(193.53)	(188.43)	(374.86)	(406.98)
Quota		-26.02***		-35.91***		-24.69***
		(2.98)		(3.03)		(3.02)
National Unemployment Rate		15284.98		9474.77		13263.29
		(10017.86)		(9925.01)		(9922.97)
Development Index		-1080.33		-8695.93***		-7160.04***
		(1067.08)		(938.37)		(939.96)
Share of EMI		-545.17***		-481.54***		-613.83***
		(81.47)		(80.19)		(83.37)
Share of Private Education		408.23***		294.61***		211.25**
		(78.89)		(78.00)		(81.23)
Share of Evening Education		-38.45		290.55***		122.57
		(83.10)		(76.14)		(78.93)
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	1833	1833	1833	1833	1833	1833
R^2	0.18	0.26	0.10	0.27	0.14	0.27

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional Average Ranking (R_{m,t,n_1}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_1} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 18: OLS Regressions of Ranking on Labor Market Outcomes - MSc (Regional NUTS2 Level)

	LMO: Wage		LMO: Employment Probability		LMO: Unemployment Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
LMO	-123.70***	-112.92***	-1949.01***	-2151.25***	3979.79***	3821.07***
	(5.17)	(6.33)	(135.86)	(135.10)	(274.24)	(281.90)
Quota		-26.40***		-41.20***		-31.11***
		(4.05)		(4.55)		(4.17)
National Unemployment Rate		9468.28		1523.00		4584.03
		(8084.53)		(8122.72)		(8126.65)
Development Index		-2594.64**		-8910.75***		-7341.79***
		(924.51)		(884.63)		(883.39)
Share of EMI		-457.66***		-453.88***		-545.24***
		(51.45)		(52.82)		(54.04)
Share of Private Education		403.53***		362.18***		280.65***
		(60.55)		(61.17)		(62.29)
Share of Evening Education		-23.90		321.14***		231.38***
		(61.76)		(56.74)		(58.31)
Year Dummies	No	Yes	No	Yes	No	Yes
Num. of Obs.	3099	3099	3112	3112	3105	3105
R^2	0.15	0.20	0.06	0.19	0.09	0.19

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional Average Ranking (R_{m,t,n_2}) in all the specifications. First and second columns show the OLS regression results where the main independent variable L_{bm,t,n_2} stands for Average Real Wage; third and fourth show those for Employment Probability; fifth and sixth show those for Unemployment Rate. Constant terms are not presented.

Table 19: OLS Regressions of Ranking on Labor Market Outcomes - MSc (NUTS1 Regional and National Level)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO (regional)	-140.71***	-92.95***	8.52	-2842.57***	-619.76**	-844.06***	5949.07***	1328.63**	532.17
	(7.46)	(8.83)	(12.24)	(193.53)	(243.17)	(232.73)	(374.86)	(512.16)	(492.01)
LMO (national)		-124.77***	-265.47***		-4562.72***	-4327.38***		8474.95***	9833.89***
		(12.64)	(16.27)		(352.31)	(322.45)		(681.84)	(695.21)
Quota			-17.36***			-35.93***			-11.97***
			(3.00)			(3.08)			(2.91)
National Unemployment Rate			32508.23***			23870.47**			26002.06**
			(9296.56)			(9556.99)			(9315.43)
Development Index			-11048.14***			-7673.73***			-9550.21***
			(1174.18)			(918.45)			(871.52)
Share of EMI			-675.39***			-472.75***			-641.50***
			(85.44)			(82.98)			(86.73)
Share of Private Education			269.67***			305.55***			100.1
			(78.12)			(75.58)			(79.72)
Share of Evening Education			-158.27**			375.30***			-39.48
			(79.83)			(73.46)			(76.47)
Year Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Num. of Obs.	1833	1833	1833	1833	1833	1833	1833	1833	
R^2	0.18	0.22	0.34	0.10	0.17	0.33	0.14	0.21	0.35

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS1) Average Ranking (R_{m,t,n_1}) in all the specifications. First three columns show the OLS regression results where the main independent variables are Average Real Wage in national and regional level. In columns (4) to (6), the main independent variables are Employment Probability in national and regional level. In last three columns, the main independent variables are Unemployment Rate in national and regional level, respectively. Constant terms are not presented.

Table 20: OLS Regressions of Ranking on Labor Market Outcomes - MSc (NUTS2 Regional and National Level)

	LMO: Wage			LMO: Employment Probability			LMO: Unemployment Rate		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
LMO (regional)	-123.70***	-68.44***	1.04	-1949.01***	-14.74	-307.69**	3979.79***	161.67	-56.31
	(5.17)	(6.45)	(7.94)	(135.86)	(145.30)	(141.12)	(274.24)	(305.04)	(294.63)
LMO (national)		-147.81***	-260.00***		-5233.16***	-4958.48***		9995.54***	11241.42***
		(9.79)	(10.93)		(242.05)	(227.10)		(459.16)	(456.83)
Quota			-15.45***			-40.06***			-5.59
			(3.89)			(4.57)			(3.53)
National Unemployment Rate			27511.22***			18575.46**			20166.92**
			(7411.80)			(7573.49)			(7323.14)
Development Index			-10957.48***			-7804.91***			-11370.74***
			(942.24)			(848.51)			(813.64)
Share of EMI			-588.87***			-416.93***			-553.24***
			(53.39)			(53.60)			(53.70)
Share of Private Education			256.14***			347.52***			103.01*
			(57.92)			(58.61)			(61.99)
Share of Evening Education			-129.31**			373.05***			-39.80
			(58.47)			(53.20)			(55.22)
Year Dummies	No	No	Yes	No	No	Yes	No	No	Yes
Num. of Obs.	3099	3099	3099	3112	3112	3112	3105	3105	3105
R^2	0.15	0.20	0.31	0.06	0.17	0.29	0.09	0.21	0.34

Notes: *, ** and *** denote at most 10%, 5% and 1% p-values respectively. Robust standard errors are shown in parenthesis. Year dummies include a dummy variable for each year from 2011 to 2015. Share of EMI, Share of Private Education, Share of Evening Education and Unemployment Rate variables take values between 0 and 100. (They are rescaled by multiplying by 100, for the sake of compliance with the dependent variable in terms of scale.) Dependent variable is Regional (NUTS2) Average Ranking (R_{m,t,n_2}) in all the specifications. First three columns show the OLS regression results where the main independent variables are Average Real Wage in national and regional level. In columns (4) to (6), the main independent variables are Employment Probability in national and regional level. In last three columns, the main independent variables are Unemployment Rate in national and regional level, respectively. Constant terms are not presented.