Università Politecnica delle Marche
Dipartimento di Scienze Economiche e Sociali

Enrolment Decision and University Choice of Italian Secondary School Graduates.

Stefano Staffolani Claudia Pigini

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Abstract

This paper examines the enrolment decision and the university choice of Italian secondary school graduates. We extend previous analyses by means of a theoretical model where student's choices depend on both universities attributes and individual characteristics. Empirical evidence of theoretical predictions is provided by the estimation of a conditional logit model mainly using the Italian Institute of Statistics (ISTAT) survey of secondary school graduates in 2004. Results show that geographical distance, tuition fees and university quality play a major role in higher education choices. In addition, Italian students seem to self-sort by their own ability across different levels of university standards: high ability students tend to seek a higher quality. The sorting process is strongly influenced by parents characteristics and previous fields of study.

JEL Class.: I21, I23, J24, C25

Keywords: Human capital, university choice, enrolment decision, conditional logit

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1 Introduction

The last decade has seen a growing interest in understanding the behaviour of high school graduates when facing the decision of whether to participate in higher education and, if so, where to enrol. In the Italian case, critical issues for policy evaluations are the and the low rate of participation in higher education[1] and low mobility of secondary school leavers who, therefore, may not enrol into the institution better matching their ability and preferences.

Recently, some contributions have investigated the determinants of university choices in Italy with considerable attention to geographical accessibility of the higher education system and to possible financial constraints to university choices. Agasisti and Dal Bianco (2007) first explored the determinants of students mobility finding distance to be one of its major deterrent. Their gravity model also suggests that when a student moves, enrols in a university located in an area with good socio-economic conditions rather than choosing on the basis of that university's characteristics. The findings in Ordine and Lupi (2009) show that mobility is constrained by family income. Italian students tend to remain in their own region despite the fact that the Italian university system supplies different standards which may allow a more efficient ability sorting across institutions. The theoretical model of Cesi and Paolini (2011) confirms both previous results: geographical distance is a strong deterrent to university participation and choice. In addition, secondary school graduates will choose the closest university regardless of the

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[1] Only 20.2% of Italians between 25 and 34 graduates compared to the 37.1% of the OECD average (OECD, 2011)

quality of the university-student matching based on institution quality and student's ability.

While only a few contributions have investigated students' mobility as related to university choice in the Italian case, the choice of whether and where to attend university has been extensively analysed in other case studies. The focus of these empirical works is on the role of costs, including transportation and tuition fees, university standards as well as individual characteristics. In particular, geographical distance from institutions and the financial constraints have been found to be the major deterrent to the choice of the institution better matching the student's ability and preferences. While costs also discourage enrolments, evidence suggests that the high school background is a prevailing factor in deciding whether to attend university. Long (2004) first examines both the decision of enrolling and into which college for the US from 1972 to 1992. Tuition and distance to the institutions negatively affect the decision of which college to attend while college quality has an important role in attracting students who decide to enrol. In turn, the negative effect of price and distance on the likelihood of enrolling attenuates over the years, while college quality does not seem to play a role in this case. In the particular case of intrastate migration in Georgia, Alm and Winters (2009) confirm the key role of distance in the choice of where to study. In the case of Canada, Frenette (2004) and (2006) finds that a greater distance increases the likelihood of attending local colleges and students who live too far to even commute tend not to participate. Drewes and Michael (2006) focus more on universities price and quality. Price has the expected negative influence on the choice of which university to attend, but this tendency attenuates for very high costs as they may be associated by students with the supply of better services. University quality and requirements for admission have an opposite impact on students with low and high abilities, that is students are efficiently sorted across institutions: those who require low standards for admission attract less talented students, while students with high ability are more attracted to high rankings. The contributions of Sá, Florax, and Rietveld (2004) and Verboven and Kelchtermans (2010) examine the cases of Netherlands and Flanders respectively. The former stresses the role of geographical proximity in the enrolment probability along with the students ability and school background. A similar result is also presented in Spiess and Wrohlich (2010) for Germany. Verboven and Kelchtermans (2010) analyse not only if and where to study, but also which subject to study. They find that travel costs are a major determinant of the choice of where and what to study, a result that can be found also in Denzler and Wolter (2011) for the case of Switzerland. However, distance seems not to affect the decision of going to university. This same result is found in Gibbons and Vignoles (2012): in UK geographical distance has a negative role in the choice of the institution which gets stronger for students coming from lower socio-economic groups. However there is only a weak link between geographical inaccessibility of the higher education system and the decision to continue with tertiary education.

This paper examines the enrolment decision and the choice of which university to attend of Italian secondary school graduates addressing the role of institution quality, cost and geographical distance including the socio-economic conditions of the area the university is located in. We first extend previous analyses proposing a theoretical model that attempts to describe the student's choice in terms of both universities attributes and individual characteristics such as the student's own ability for studying and financial endowments. Grunding the empirical model on the results of the theoretical one, in the second part of the paper, we estimate a conditional logit model for enrolment and university choice of Italian secondary school leavers. This approach was first proposed by Manski and Wise (1983) and followed in recent analyses by Long (2004) and Gibbons and Vignoles (2012) [2].

We use the Italian Institute of Statistics (ISTAT) survey of secondary school graduates in 2004 interviewed in 2007 linked with data on institutions characteristics from the Italian Ministry of Education, University and Research (MIUR). We add the information on the socio-economic condition of Italian provinces in 2003 using the indicators published by the magazine *Il Sole 24 Ore* and the 2003 popular university ranking of *Censis-Repubblica.* Key to this paper, is the available information of the student's geographical locations, which allows to compute the distance between the student's location and all available alternatives. Such level of detail makes this a unique dataset that has never been used to investigate the factors influencing the decision to participate in higher education and institution choice of Italian secondary school leavers.

The reminder of the paper is organised as follows: section 2 briefly describes the organisation of the Italian higher education system; section 3 presents the theoretical model for the participation decision and institution choice; section 4 first reviews the conditional logit model, then describes data and variables and section 5 contains the estimation results. Finally, section 6 concludes.

[2]Drewes and Michael (2006) and Verboven and Kelchtermans (2010) use some variations of the conditional logit model: the rank-ordered conditional logit an the nested logit model respectively.

2 The Italian higher education system

In this section, we briefly lay out the principal characteristics of the Italian university system in order to help the reader understand the line of reasoning behind some particular modelling choices.

The structure of Italian university degrees and qualifications is based on the system resulting from the so-called “Bologna Process”: conferences and meetings at the European level (Paris (1998), Bologna (1999), Prague (2001), Berlin (2003) and Bergen (2005)) with the aim of developing an integrated European Higher Education Area (EHEA).

After leaving secondary school with a *diploma* (Italian upper secondary school leaving qualification diploma), an Italian student can choose to attend three years of undergraduate studies, at the and of which she obtains the *laurea* (first level degree). Once the undergraduate level is completed, the student may enrol into either a first level master course or attend a two year cycle of graduate studies leading, the latter, to the *laurea magistrale* (second level degree). At the third level, the Italian system offers various specialisation courses and Ph.D. programs which are only marginally different from those supplied in other countries.

Secondary school leavers are only required to possess a *diploma* to enter the first level cycle of studies: no application needs to be sent to the institution nor entry tests have to be passed by the student. In principle, any number of students may enrol in each institution [3]. This feature is key to our paper: it allows us to include the option of not attending a university course in the set of the possible choices faced by the secondary school leaver. If the non-enrolment outcome is observed, it means that the student actually decided not to enter the higher level of education and the possibility that she had been rejected by the chosen institution can be excluded.

3 Theoretical model

Secondary schools leavers choose whether to enrol or not and, if so, which university to attend. In order to analyse the enrolment and university choice we consider an economic system with the following characteristics:

Assumption 1 *Each individual lives in a specific geographic area (district hereafter, indicated by z), where one university of a given standard* ($y_z \in$

[3] Only few faculties, such as Medicine and Surgery, accept a limited number of students chosen by means of an entry test.

$[0,1]$) *is located*[4].

By university standard, we indicate the level of commitment required to the student in terms of studying, to complete the first level of university studies in turn of a good academic background and high professional skills. The university standard therefore influences both the probability of obtaining the degree (negatively) and the wage rate of graduates (positively).

Assumption 2 *Each individual i is naturally endowed with a given talent (t_i, with $t_i \in [0,1]$), lives in a family of a given income and has completed secondary school in a specific field of study.*

College enrolment can end either in graduation, with a stochastic endogenous probability defined p, or in drop-out:

Assumption 3 *The probability of graduation of individual i in university j, $p_{ij}(t_i, h_i^*, y_j, d_j)$, depends on the student's talent (t_i), the student's optimal effort (h_i^*, with $h_i^* \in [0,1]$), university standards (y_j) and on the dissimilarity between the fields offered by the university j and the previous fields of study ($d_j \geq 1$). The probability p_{ij} is assumed to be increasing in t_i and h_i and decreasing in y_j and d_j.*

The enrolment decision requires hypotheses on the long-life expected utility once the labour market is entered, thus the following assumptions on earnings and effort are made:

Assumption 4 *Income depends positively on universities' standards and it is higher for university graduates than for secondary school graduates. The expected effort in the labour market is the same for all workers.*

Individuals are therefore assumed to be heterogeneous for:

- the district they live in;
- their talent;
- the field of study of their secondary education;
- the financial situation of the household, that defines the consumption level during the studies ($C_{i,z,j}$, that is consumption of an individual enrolled in university j whose family lives in district z).

[4] This is just a simplifying hypothesis: in practice, and therefore in our empirical application, universities are located in a subset of districts and some of them host more than one university.

We define U the per-period utility and V the expected intertemporal utility so that $V = \frac{U}{r}$, being r the discount rate. For a secondary school graduate living in district z who may choose to enrol in one of the J universities, the expected utility can be written as (dropping the individual index i for clarity):

$$V^E_{z,j}(h) = U^S(C_{z,j}, h) + p_j(h)\frac{V^G(w_j)}{1+r} + [1 - p_j(h)]\frac{V^N(\omega)}{1+r} \quad for\, j = 1, 2...J \tag{1}$$

where the first addend on the right hand side is the per-period utility of students depending on consumption $C_{z,j}$ and effort during the studies h, which is the choice variable for the individual[5]. The second addend is the expected long-life utility of graduates (identified by the suffix G) and the third one the expected long-life utility of non-graduates (suffix N) both discounted for one period and weighted by the probability of graduation. w_j is the wage rate of graduates of the attended university of standard j and ω the one of non-graduate and we assume that the expected effort (working time) in the workplace is exogeously given and equal for skilled and unskilled.

The enrolment decision of an individual, who lives in district z, is based on the comparison between the utility achievable in the "preferred" university $V^E_{z,j^*}(h^*)$ in the optimal level of effort h^*, and the utility available by choosing not to enrol, $V^N(\omega)$.

Optimal effort during studies is obtained by maximising equation 1 with respect to h. This yields:

$$-\frac{dU^S}{dh} = \frac{dp_j}{dh}\frac{V^G(w_j) - V^N(\omega)}{1+r} \tag{2}$$

The marginal disutility of effort during studies must equal to the difference between long-life expected utility of graduates and non-graduates, weighted by the increase in the probability of graduation with respect to the effort.

In order to compare indirect utilities associated with the set of possible choices, we assign the following functional form to the uni-periodal utility function, valid for both enrolled and not enrolled individuals:

$$U(C, h) = C - \frac{1}{2}h^2 \tag{3}$$

[5] We are assuming that studies last one period and work last an infinite number of periods

The probability of graduation (see assumption 3) is assumed to be expressed as:

$$p\left(t, h, y_j, d_j\right) = h\sqrt{\frac{t}{t + y_j d_j}} \qquad for \quad j = 1, 2...J$$

Individuals who are more talented, enrolled in universities with lower standards, following a field of study non dissimilar to their previous studies have a higher probability of graduation.

The solution of equation 2 requires some hypotheses on $V^G(w_j) - V^N(\omega)$, that is the difference between the long-life utility of graduates and the one of non-graduates. Assuming that working hours are exogenous, this difference only depends on the discrepancy between wage rates. We assume that the relationship between graduates' wage, non-graduates wages and university standard is:

$$w_j = \omega\left(1 + y_j^{\frac{1}{4}}\right)$$

where the wage rate of graduates from university j is a premium on unskilled wage (ω). The amount of the premium depends positively on the university standard, see assumption 4. Therefore:

$$V_j^G(w_j) - V^N(\omega) = w_j - \omega = \omega y_j^{\frac{1}{4}} \qquad for \quad j = 1, 2...J$$

From equation 2, we derive the optimal level of effort of an individual choosing university j:

$$h_j^* = \frac{\omega}{1+r}\sqrt{\frac{t}{t + y_j d_j}} y_j^{\frac{1}{4}} \qquad for \quad j = 1, 2...J \tag{4}$$

The probability of graduation in university j is[6]:

$$p_j^* = \frac{\omega}{1+r}\frac{t}{t + y_j d_j} y_j^{\frac{1}{4}} \qquad for \quad j = 1, 2...J \tag{5}$$

We may now substitute equation 4 in 3, 4 and 5 in 1 and define $\Gamma = \frac{1}{2}\left(\frac{\omega}{r(1+r)}\right)^2$; we obtain that the utility of enrolling into university j for an individual living in district z is given by:

$$V_{z,j}^{E^*} = C_{z,j} + \frac{V^N}{1+r} + \Gamma\frac{t}{t + y_j d_j} y_j^{\frac{1}{2}} \qquad for \quad j = 1, 2...J \tag{6}$$

Let us define $V_{z,j} = V_{z,j}^{E^*} - V^N$, as the *net* utility of enrolling into university j and:

$$\alpha_{z,j} = \frac{r}{1+r} V^N - C_{z,j} = \frac{U^N}{1+r} - C_{z,j}$$

[6] Given $t \in [0, 1]$ and $y_j \in [0, 1]$, p^* is less than unity if $\omega < 1 + r$

is the difference between the utility of working as unskilled (discounted for one period) and consumption during studies in university j. For brevity, let us call $\alpha_{z,j}$ "loss in consumption"[7]. It is simply given by expected consumption minus loss of income during study, and it depends obviously on family income and family willingness to finance study and mobility. It depends also on the chosen university: tuition fees are differentiated between universities, transportation costs and house renting costs depend on the geographical distance between the district of residence z and the one where the j university is located.

Therefore α is indexed by j, z and it is a positive function of university fees and of the distance between residence and the location of the chosen university. From equation 6 we can write the *net* expected utility of enrolling in university j as:

$$V_{z,j} = \Gamma \frac{t}{t + y_j d_j} y_j^{\frac{1}{2}} - \alpha_{z,j} \qquad for \quad j = 1, 2...J \tag{7}$$

It simply states that the expected *net* utility is given by the difference between the higher earnings due to enrolment and the cost of studying. Individuals with a *net* expect utility lower than zero $V_{z,j} < 0 \forall j$ will not enrol.

Equation 7 implies that the expected utility is increasing in talent, decreasing in the "loss in consumption" (so that utility is increasing in household income, decreasing in fees of the chosen university and in the distance between residence and university) and has a maximum in y_j given by $y^* = t$[8].

We can now analyse the enrolment condition:

Remark 1 *If $V_{z,j} < 0 \ \forall j$, the student does not enrol. If $V_{z,j} > 0$ for at least one j the student enrols into the university offering the standard that maximises $V_{z,j}$.*

The ratio of individuals that decide to enrol in the university k (let us call it q_k) is therefore given by:

$$P_k = prob \left[V_{z,k}(t_i, y_k, d_k, \alpha_{i,k}) > V_{z,j}(t_i, y_j, d_j \alpha_{i,j}) \right] |_{V_{z,k}(t_i, y_k, \alpha_{i,k}) > 0} \qquad \forall \quad j \neq k \tag{8}$$

[7]Individuals whose α is negative for some j are individuals who earn more studying than working as unskilled. These are individual strongly supported by the family during studies and they will surely enrol. In this case $V_{z,j} > 0$ holds.

[8]Notice that if education were completely cost-free, $\alpha_{z,j} = \alpha$ would be constant throughout universities; if standards were a continuous variable, a standard $y^* = t$ would always exist. In these cases, the individual utility for all enrolled individuals would have been: $V^* = \frac{\Gamma}{2} t^{\frac{1}{2}} - \alpha$, depending on their talent alone. More talented individuals will choose higher standards, will study longer hours (see equation 4) and will show a higher probability of obtaining the degree (see equation 5).

The probability that university k is actually chosen is decreasing in $\alpha_{z,k}$. Because of the non-linearity between expected utility and the university standard (y_k), it is not easy, in theory, to predict the effect of an increase of the university standard on the enrolment rate.

It is worthwhile to note that a change in tution fees (that are included in $\alpha_{z,j}$) or in the standard (y_j) made by one university modifies the qualitative characteristics of the enrolled students in j. This way, fees and standards influence the average effort of enrolled students (see equation 4) and the expected drop out rate (see equation 5).

4 Empirical application

4.1 Conditional logit model

According to the results of the model presented in section 3, each individual compares the expected utilities she can obtain from graduating in different universities and enrols into the one that gives the highest. In addition, one of the possible alternatives is the non-participation option, the utility of which is also compared to the other utilities when leaving secondary school. If the condition in remark 1 holds (see section 3), the student does not enrol. The econometric model that better suits such decision making process is the conditional logit model (McFadden, 1974) which was first advocated by Manski and Wise (1983) to model college choice. This approach has also been followed by Long (2004) and Gibbons and Vignoles (2012) [9].

Therefore, we assume that student i chooses between $J+1$ alternatives, of which J are Italian universities and one is the non-participation option. Whether to include this last alternative, is a critical issue in applications of conditional logit models to higher education choices. Long (2004) argues that the estimation of separate models avoids distortions in parameter estimates. Moreover, in most cases, it is not clear whether the observed choice of non enrolment is given by the student's actual decision or to the rejection of her applications. However, this misleading situation is not likely to occur when analysing the Italian higher education system (see section 2). An alternative approach would be to use a nested logit model as suggested in Verboven and Kelchtermans (2010). However, as also argued in Gibbons and Vignoles (2012), the nesting structure implies that we group *a priori* compa-

[9] More flexible tools that accommodate random utility models, such as multinomial probit or mixed logit models, are, in principle, the best choice in these cases. However, given the high number of student-university combinations in our dataset, the adoption of such models is computationally unfeasible.

rable alternatives but it is not clear how to select such sets in this context. We, therefore, jointly analyse the university choice and the non participation choice, including the latter in the set of the possible alternatives of the conditional logit model. It is quite straightforward to assign values of university characteristics in the non-enrolment alternative without making arbitrary choices[10].

The probability that individual i chooses k among $J+1$ alternatives is

$$\Pr\left(i\,\text{chooses}\,k\right) = \Pr\left(V_{ik} > V_{ij}\right) \qquad \forall \quad j \neq k, j = 1...J+1 \tag{9}$$

where $J+1$ are all J Italian universities plus the non participation alternative. In general, the utility of alternative j is given by:

$$V_{ij} = x'_{ij}\beta + q'_j\gamma + z'_h\theta + \upsilon_{ij} \qquad \text{for} \quad i = 1, \ldots, n \quad \text{and} \quad j = 1, \ldots, J+1 \tag{10}$$

In this setup, x_{ij} includes the regressors varying across alternatives and individuals, such as the distance between the location of student i and the location of university j. Instead, the set q_j contains institution characteristics as, for example, tuition fees. Finally z_h includes variables proxying the socio-economic conditions of the province where the university is located (unemployment rate, quality of life etc.) where the subscript h denotes the province, with $h = 1, \ldots, H$. As anticipated in section 3, there are universities located in the same province so that $H < J$. Assuming that the υ_{ij} are independent and identically distributed as extreme value distribution, the probability P_{ik} of i choosing k is

$$\mathrm{P}_{ik} = \frac{e^{V_{ik}}}{\sum_{j=1}^{J+1} e^{V_{ij}}} \tag{11}$$

In this kind of applications, it is useful to compute direct and cross-marginal effects or elasticities to gain insight on the impact of changes in variables q_j, such as fees and standards, key to university policy. In the conditional logit model, the marginal effect of a change in q on the probability of choosing alternative j can be computed as:

$$\psi_{ij,q_m} = \frac{\partial \widehat{P}_{ij}}{\partial q_m} = \widehat{P}_{ij}\left(\delta - \widehat{P}_{im}\right)\phi\left(q_m, \gamma_m\right) \tag{12}$$

where δ is a dummy variable that takes value one if $j = m$ and zero otherwise and $\phi\left(q_m, \gamma_m\right) = \frac{\partial V_{ij}}{\partial q_m}$. When the model specification is linear in q_m, $\phi\left(q_m, \gamma_m\right) = \gamma_m$.

[10]The assignment of such values will be discussed in detail in the next subsection.

Given the high number of students and universities in our dataset, we rely on the computation of some average quantities to compute marginal effects and elasticities. So, for instance, we compute

$$\varepsilon_{j,q_m} = \bar{\psi}_{j,q_m} \frac{q_m}{\bar{P}_j} \tag{13}$$

where $\bar{\psi}_{j,q_m} = \frac{1}{N}\sum_{i=1}^{N} \psi_{i,j,q_m}$ and $\bar{P}_j = \frac{1}{N}\sum_{i=1}^{N} \hat{P}_{ij}$.

We also consider of particular interest the effect of a change in q_j on the non-enrolment probability if such change is brought forward by all universities at the same time. We compute this elasticity as

$$\tilde{\varepsilon}_{ne,q} = \left(\sum_{j \neq ne} \bar{\psi}_{j,q_m} \right) \frac{\bar{q}}{P_{ne}} \tag{14}$$

where we write j as ne (non-enrolment) for clarity, $\bar{q} = \frac{1}{J}\sum_{j \neq ne} q_j$, $P_{ne} = 1 - \sum_{j \neq ne} \bar{P}_j$

4.2 Data description

In our analysis, we combine datasets form various sources in order to include variables on the individual and university level. We also include some socio-economic characteristics of the provinces the universities are located in. In this section we describe in detailed the variables used in the estimation of the conditional logit model. The sources used to build our variables are summarised in table 1.

At the individual level, we use the survey on studying and working experiences of secondary school graduates (Indagine sui percorsi di studio e lavoro dei diplomati) issued by the Italian Institute of Statistics (ISTAT). The

Table 1: Source of variables used in the conditional logit model

ISTAT	MIUR	CENSIS	SOLE 24 ORE
Sec. sc. grades	Fees	Ranking	Rent
Sec. sc. provenance	Private		Population
Mother's education	Exp. Grants		Quality of life
Highest hous. job			
Distance			
Proximity			
Unemployment*			

* ISTAT indagine sulle forze di lavoro

students are interviewed three years after obtaining their secondary school *diploma*. We use the 2007 survey where 25880 students, who obtained the title in 2004, were interviewed. The dataset contains information on the students' personal and household characteristics and on their educational background. We observe, in particular, the enrolment decision and, for the enrolled individuals, which university the student has enrolled into. In our analysis, we chose not to consider universities attended by less that 20 individuals in the sample. Excluding observations with missing data on the variables of interest, we end up with a sample of 25326 secondary school leavers and 79 universities.

One key information contained in these data is the student's province of residence during the attendance of secondary school. Therefore, for each individual, we are able to compute the distance between the student's province of residence and the province of each Italian university, measured in 100Km. Model specifications also include square and cube of distance. This variable takes value zero for universities located in the same province of the student's residence during secondary school studies and for the non-enrolment option.

Other variables of interest at the individual level are type of secondary school attended, secondary school final grade, mother's education and the household highest job position. Table 2 shows the sample composition for the variables used in our analysis along with gender. It emerges that the participation in higher education is strongly differentiated according to all the characteristics presented in the table. The 94% of students coming from *Liceo* decides to attend university while this percentage is much lower for students coming from vocational schools (30%). The secondary school final grade also plays a major role, by rising the probability of enrolment from 36 to 84%. The educational level of the mother is also particularly important in the enrolling decision.

In order to estimate the conditional logit model, we need to re-organise the data such that the observational unit is the combination student-university. We, therefore, end up with a dataset of 2026080 observations. For the purpose of the analysis, we link the ISTAT dataset with other information on universities coming from various sources.

As we want to investigate the effect of university quality on students' choices, we use the popular Italian university ranking of *Censis-Repubblica* of 2003 to proxy the university standard y_j of the theoretical model (see section 3). Table 3 shows some descriptive statistics of the ranking for the whole sample (expressed in hundreds) and table 8 in appendix show the points obtained by each of the 79 universities in Italy in 2003. For secondary school leavers who decided not to enrol, we assign the ranking value of 6.4: this choice is motived by thinking of university quality as some measure of returns to education. Since in 2003 the average wage premium of a university degree over a secondary school title was about 30% (OECD, 2003), we set a ranking values that stands in the same proportion. The model specification includes also ranking square and cube to account for the possibility that the effect of university standards on students' choices may not be increasing monotone [11].

Information on tuition fees and scholarships granted by universities in 2003 are publicly available on the website Italian Ministry of Education, University and Research (MIUR). Table 3 also contains contains some descriptive statistics on the fees charged and the amount scholarship granted in hundreds of euros. Both these values are set to zero for the not-enrolment choice. Table 8 in appendix shows these statistics disaggregated by university. Our model specification includes also the square of tuition fees and, instead of grants, the expected scholarship: this variable is computed by multiplying the amount of grants times the ratio of students who obtained the scholarship over the number of students enrolled in each university in 2003. From these data, we also extract a control variable which takes value 1 if the university is private and 0 if public. The majority of Italian universities is public (66 of the 79 considered in our study) and their financing comes only partly form tuition fees. These fees are relatively low compared to those charged by universities only privately financed.

Variables related to the socio-economic characteristics of the provinces the universities are located in are also included. In particular, we use some of the indicators yearly provided by one of the Italian top magazines *Il Sole 24 Ore*: quality of life and the average rent payed in each area for a 100 square meters (in hundreds of euros) in 2003. Rent is set to zero if the university is located in the province where the student has completed secondary school and for the non-enrolling option. From the ISTAT Labor Force Survey (indagine sulle forze di lavoro) of 2003, we use the unemployment rate and the population of the university province (see table 3 and table 8 in appendix).

[11] A possibility also advocated in Drewes and Michael (2006)

Table 2: Individual and household characteristics

	Enrolled		Not enrolled		Total	
	No.	%	No.	%	No.	%
Gender						
Males	6041	52	5552	48	11593	100
Females	8868	65	4865	35	13733	100
Secondary school type						
Vocational sch.	2190	30	5080	70	7270	100
Technical sch.	4263	54	3595	46	7858	100
Liceo	5106	94	302	6	5408	100
Pedagogical sch.	2472	85	452	15	2924	100
Artistic sch.	878	47	988	53	1866	100
Secondary school grade						
Minimum	833	34	1652	66	2485	100
Medium-Low	5818	49	6078	51	11896	100
Medium-high	5999	71	2406	29	8405	100
Maximum	2259	89	281	11	2540	100
Household highest job position						
Chief executive officer	2901	74	1039	26	3940	100
Executive	1734	82	383	18	2117	100
Self-employed	2074	53	1846	47	3920	100
White collar	2971	68	1420	32	4391	100
Blue collar	5116	48	5566	52	10682	100
Not employed	113	41	163	59	276	100
Mother's education						
Primary school	1193	38	1915	62	3108	100
Lower sec. school	4993	48	5327	52	10320	100
Upper sec. school	6850	70	2919	30	9769	100
University degree	1873	88	256	12	2129	100
Total	14909	59	10417	41	25326	100

Source: ISTAT, survey on studying and working experiences of secondary school leavers (graduated in 2004, interviewed in 2007)

Table 3: Descriptive statistics for Italian provinces and universities

	Ranking	Fees	Grants	Rent	Quality	Unempl.	Pop.
mean	8.8	10	0 .14	12	4.3	0.081	0.86
s.dev.	.62	10	0.058	5.5	.5	0.051	1.1
min	6.8	3.2	0 .029	4.7	3.4	0.027	0.013
max	10	59	0.26	30	5.1	0.2	4.2

Rent, fees and grants are in 100 euros. Population is in millions of people. Values set for the non-enrolment option are excluded.

We also include the *Proximity* variable, that is a dummy aimed to inversely catch the dissimilarity parameter d_j of the theoretical model. For each individual, it is built considering the correspondence between the field of secondary studies and the disciplinary fields offered by each university. If *Proximity* is equal to one, there is a good correspondence between previous studies and offered fields.

5 Estimation results

The estimation results of the conditional logit model using the whole sample of secondary school leavers are presented in table 4. Along with university characteristics, we want to include information about the student's secondary school and household. However, to achieve identification in the conditional logit model, all regressors used in the estimation must vary at least across alternatives. Covariates such as student's school or family background are, instead, alternative invariant. We, therefore, run separate estimates for groups of individuals with different school and family characteristics using the categories presented in section 4.2 for descriptive statistics. [12]. The results of the conditional logit models estimated on sub-samples of students are displayed in in tables 9–12 in the appendix.

The model presented in table 4 predicts a cubic relationship between distance and choice of university. This result can reasonably describe the behaviour of Italian secondary school leavers: it may be conjectured that a student is more likely to enrol in a university close to home. The probability of enrolling in a university located in other provinces decreases in the cost and time of commuting; however, for those universities located too far to

[12]Another way to include individual characteristics in the estimation is to interact all individual variables with university characteristics. This strategy, however, leads to estimation results hard to interpret given the complexity of the specification.

even commute, the decreasing effect on the choice probability attenuates. This is probably due to moving and renting costs being somewhat constant: it makes sense that transportation and renting costs may not be extremely different for various distances once the student has decided to move in order to attend university. A part from marginal differences, distance seems to play the same role in university choice for students with different individual characteristics (see tables 9–12).

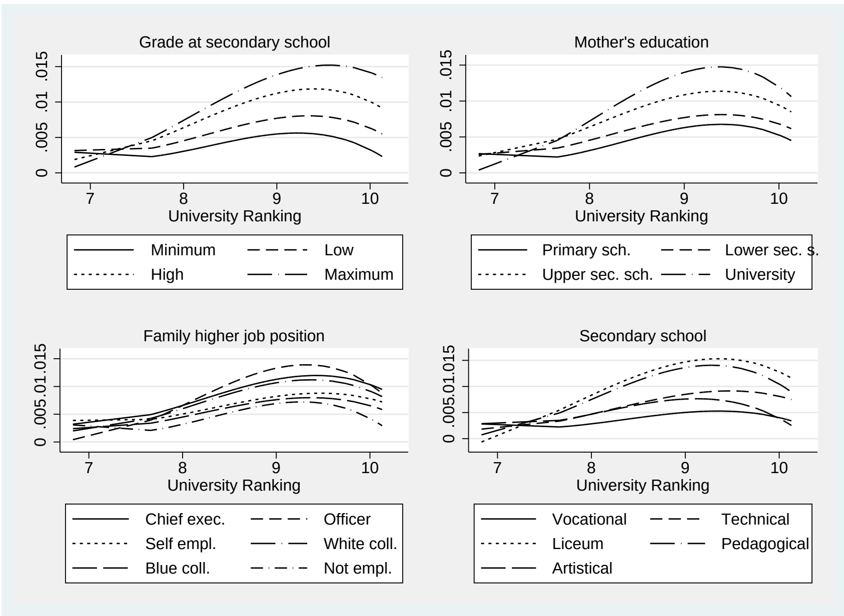
In line with the results of Agasisti and Dal Bianco (2007), table 4 shows that the socio-economic condition of the university province plays a key role in the choice of which institution to attend. Clearly, the price of house renting is a deterrent to choosing a place to move to. In addition, the expected signs of the quality of urban life and unemployment rate suggest that the search of better opportunities may hide behind the university choice. The coefficients of expected grants, of the dummy variable for private universities and of proximity all have the expected sign and do not differ substantially across sub-samples.

The relationship between ranking and university choice is confirmed to be highly non-linear in Table 4: as predicted by the theoretical model, it exists an optimal level of the university standard y_j^* that does not necessarily corresponds to the maximum ranking available. To give an idea of merely qualitative differences in the sub-samples, we present in Figure 1 the cubic interpolation of fitted probabilities from models 9–12 on university ranking. The shapes in figure 1 show that, when choosing an institution to attend, students are sorted by their ability across university standards. Students with the lowest secondary school grade, coming from vocational and technical schools and with less educated mothers are more likely to choose universities with the lowest standard. Also, as predicted by the theoretical model, the ranking level that maximises utility of students with low grades is lower than the levels maximising utility for more talented students. From the top left panel of Figure 1 ,it clearly emerges that the enrolment probability increases in the secondary school grade. This latter result is also valid for increasing levels of mother's education and for students coming from vocational schools. The family highest job position seems to play a minor role in differentiating the university choice on the basis of standards.

The expected negative effect of tuition fees on university choice is confirmed by the estimates in table 4. However, the positive sign of the quadratic term suggests that this effect attenuates for high level of taxes as they probably are perceived as a signal that better services are provided by the institution [13]. Table 9 shows that students with high secondary school grades

[13]This is a result also found in Drewes and Michael (2006)

Figure 1: Cubic interpolation of fitted probabilities on university ranking



Cubic interpolation of fitted probabilities of models 9 – 12 is displayed only for enrolled students.

Table 4: Estimation results: conditional logit model

	coefficients	st. err.	C.I.(95%)	
Choice				
Distance	-2.710***	0.03	-2.76	-2.66
Distance Sq.	0.355***	0.01	0.34	0.37
Distance Cube	-0.015***	0.00	-0.02	-0.01
House Renting Price	-0.013***	0.00	-0.02	-0.01
Quality of Life	0.329***	0.04	0.25	0.41
Unempl. rate	-6.417***	0.48	-7.37	-5.47
Population	0.402***	0.01	0.38	0.43
Private	-1.095***	0.05	-1.20	-0.99
Ranking	-97.650***	2.28	-102.11	-93.19
Ranking Sq.	11.631***	0.28	11.09	12.17
Ranking Cube	-0.456***	0.01	-0.48	-0.43
Fees	-0.060***	0.01	-0.07	-0.05
Fees Sq.	0.001***	0.00	0.00	0.00
Exp. Grants	0.016***	0.00	0.01	0.02
Proximity	1.625***	0.06	1.51	1.74
Observations	2026080			
R^2	0.579			
Log-lik	-46712.9			
LR test : $\chi^2_{(15)}$	128532.6	p-value=0.000		

* $p-value < 0.10$, ** $p-value < 0.05$, *** $p-value < 0.01$

are less sensitive to tuition fees. This is also true for students with mother's level of education higher than primary school and for students whose parent is chief-executive, executive and blue collar. However, this last group shows higher decreasing linear effects than the others. Tuition fees are not significant for students coming from pedagogical or artistic secondary school.

As introduced in section 4.1, we compute elasticities to gain some insight on the effects of variations in key policy variables for academic institutions on university choice and enrolment decision. Table 5 displays direct elasticities of the probability of enrolment to university ranking and tuition fees, computed following equation 13.

By increasing the ranking of 1% and holding all other universities their ranking constant, the average university raises enrolments by 4.3% (see table 5). More talented students (those with high grades), students coming from less educated family and from technical secondary schools are more sensitive to increases in rankings. The elasticity of the enrolment probability faced by a university to changes in its own fees is, on average, -0.33. Marked differences emerge for students coming from Liceo, highly talented, whose mother own a university degree and from families with a chief executive officer. For all of them, fees seem not to be (or less) relevant in the choice of which university to attend.

Table 6 shows the cross-elasticities of the non-enrolment probability to variations of ranking and fees: the first two columns display the elasticities to the changes in ranking and fees in all Italian universities at the same time (see equation 14); the last two columns show elasticities computed as in equation 13, that is only one university (an *average* universities) modifies its ranking and the amount of tuition fees charged. For the whole sample, the total elasticities are -2.83 to ranking and 0.298 to fees. This means that, for instance, if all the universities increased their fees of 100 euros, the enrolment rate would reduce of about 3%. Gaining positions in the ranking attracts, from non-enrolled students, individuals with high grades, coming from more educated families and where the highest profession is executive or white collar. Higher fees will reduce the enrolment rate mainly for students of technical secondary school, living in blue collars and less educated families.

The last two columns of Table 6 also suggest that the effects of changes in ranking and fees on the probability of choosing a certain university (see Table 5) are only partly related to the non-enrolment decision: the elasticity of the non-enrolment probability to changes in the average ranking is only 0.34. Therefore, the stronger effect displayed in Table 5 (elasticity to ranking of 4.3) mainly depends on the university ability, once has gained a higher *appeal*, to attract secondary school leavers that would have chosen other institutions. The same feature appears for fees: the non-enrolment choice shows a lower elasticity in absolute value (-0.0026). Therefore, students react to an increase in the tax rate of the average university mostly by moving to other, less expensive, universities.

Direct elasticities can be computed for each of the 79 university used in our sample. Nevertheless, we prefer to shows the average direct elasticity for sub-groups of universities, as shown in table 7. The probability of enrolling in universities located in the Islands, in small universities, in private university and in highly ranked universities[14] reacts less than the average to an increase in the ranking. The first two results probably depend on the higher difficulties encountered by students living in the Islands or in small towns (where small university are more frequently located) to move away from their area.

[14] Those with a ranking higher than the average rank

The latter two can depend on some sort of “decreasing return to scale” in the relationship between the enrolment probability and the ranking (private university are usually highly ranked). The elasticities of the enrolment probability to fees does not change substantially across the groups we consider in table 7, ranging from -2.6 for private universities to -0.37 for “medium” universities.

In order to take a closer look to the determinants of the enrolment choice alone, we also estimate a binary logit model considering only individual characteristics. The results are displayed in Table 13 in the appendix. Individual characteristics and the family socio-economic condition are statistically significant in explaining the enrolling decision. Moreover, coefficients suggest that a similar pattern with the university choice and enrolling decision analysed for sub-samples with the conditional logit model in table 6.

Table 5: Direct elasticities of the probability of enrolment to university ranking and fees, by individual characteristics

	Ranking	Fees		Ranking	Fees
Whole sample	4.3	-.33			
			Primary school	5.6	-.58
Vocational sch	4.4	-.79	Lower sec school	4.5	-.56
Technical sch	5.2	-.54	Upper sec school	3.9	-.26
Liceo	3.6	.22	University degree	3.9	.13
Pedagogical sch	4.4	-.23			
Artistic sch	2.6	-.51	Chief ex off	3.0	.15
			Executive	5.0	-.16
Grade 60	3.3	-.57	Self-empl	4.4	-.45
Grade 61-80	3.9	-.42	White coll	4.9	-.48
Grade 81-99	4.4	-.24	Blue coll	4.5	-.62
Grade 100	5.1	-.02	Not empl	4.9	-.38

Table 6: Cross-elasticities of the non-enrollemnt probability to ranking and fees, by individual characteristics

	Ranking	Fees	Ranking	Fees
	All		*Average*	
all sample	-2.83	.298	-.034	.0026
Vocational sch	-1.74	.236	-.021	.0022
Technical sch	-2.83	.459	-.034	.0039
Liceo	-3.14	-.197	-.035	-.0023
Pedagogical sch	-4.65	.208	-.054	.0021
Artistic sch	-1.96	.095	-.023	.0012
Grade 60	-1.75	.16	-.021	.0016
Grade 61-80	-2.24	.226	-.027	.0022
Grade 81-99	-3.34	.313	-.039	.0026
Grade 100	-4.3	.227	-.05	.0011
Primary sch	-2.54	.231	-.031	.0020
Lower sec sch	-2.44	.4	-.029	.0035
Upper sec sch	-2.95	.26	-.035	.0024
University degree	-3.72	.046	-.042	-.0010
Chief ex off	-2.32	-.044	-.026	-.0012
Executive	-4.44	.315	-.051	.0024
Self-empl	-2.54	.246	-.031	.0024
White coll	-3.59	.335	-.043	.0033
Blue coll	-2.43	.401	-.029	.0034
Not empl	-2.92	-.125	-.036	-.0005

For the sub-samples, elasticities are computed using the fitted probabilities of models 9–12

Table 7: Direct elasticities of the probability of enrolment to university ranking and fees, by univestity groups

	Ranking	Fees
North-West	4.3	-.32
North-East	3	-.4
Center	4.4	-.36
South	5.7	-.27
Islands	.71	-.33
Small Uni	1.4	-.25
Medium Uni	6.4	-.37
Large Uni	5.1	-.33
Very Large Uni	4.4	-.35
Public Uni	4.7	-.34
Private Uni	2.7	-.26
Low ranked Uni	7.6	-.32
High ranked Uni	1.6	-.33

6 Final remarks

This paper analyses the enrolment decision and the university choice of Italian secondary school leavers. The determinants of this decision-making process are of great interest in Italy, where both participation and graduation rates are lower that the OECD average and recent reforms have deeply modified the university system.

We add to the existing literature presenting a theoretical model for the higher education choices of Italian secondary school leavers where we compute the indirect utility of choosing a certain university as well as the one of not participating in higher education. For each set of individual characteristics, the model shows that the optimal choice depends on the geographical distance between the student's home and the institutions, on university standards and on the charged tuition fees.

Grounding the empirical analysis on the theoretical model results, we trust that the best empirical strategy is to estimate a conditional logit model. The microdata used in our application had never been employed for this purpose and have a unique level of detail.

The results of the conditional logit model estimation confirm the prediction of the theoretical model and mirror closely findings related to other countries. The geographical distance plays a major role students choice between universities: students prefer to enrol in universities close to home, implying that they may settle for choices that do no fit at best their ability and preferences. Other than university attributes, we show that a key role in university choice is played by the socio-economic conditions of the institution geographical location, suggesting that the process of choosing a university may hide the search for better opportunities.

It is worthwhile to focus the post-estimation analysis on two key variables: university standards (approximated by the university ranking) and the tuition fees. Both seem to strongly influence the enrolment decision and are the main instruments in the hand of the university management for policy tuning. Results suggest that Italian students self-sort by their own ability across different levels of standards: low talented students appear to prefer low-quality universities or not to enrol at all, while high ability students tend to seek universities with higher standards. The sorting process is strongly influenced also by parents characteristics and by the secondary school field of study. High standards increase the probability of enrolment, with an elasticity of 2.8 (to a change in the ranking of all Italian universities). This elasticity is higher for students with a strong secondary school background, coming from more educated and wealthier families. These groups of students are probably more appealing to the university's management because of their lower probability of dropping out.

Tuition fees exhibit the expected negative effect on the probability of enrolment with an average elasticity (to a change in fees of all Italian universities) of 0.3. This elasticity differ across individual characteristics (for instance, it is negative for students coming from Liceo).

This empirical model lends itself to a number of useful analyses. We may compute, for instance, direct elasticities for each institution and cross-elasticities for every pair of Italian universities. In this paper, for brevity, we only compute direct elasticities for groups of universities. Results shows that small, private, highly ranked university and universities located in the Islands display a lower elasticity to standards: these are universities that could be less interested in the standards (the relative ranking) than others, at least in terms of enrolment rate.

For each university, a reduction in fees and a rise in standards increase the enrolment rate. Especially the former, changes the composition of enrolled students attracting talents. Of course, both these measures are costly, both will bias the drop-out rate and the their results depend on the reactions of other universities. The higher educational system (and the government that finances it) should be interested in the "quality" of enrolled students, of graduates and the drop-out rate. Both depend on the geographical distribution of university, on tuition fees and on the standard of university.

Further developments of the paper must firstly take into account the drop-out decision, that influences students' decision, university policy and the whole economy payoff. Then, in order to decide if some optimal university policy exists, it must include some utility function of the university's management and of the government.

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Appendix

Table 8: Descriptive statistics of Italian provinces and universities

University	Rent	Quality	Unem.	Pop.	Ranking	Fees	Grants
Torino- Universita	1.13	.0443	.0611	2.3	8.88	.837	.864
Torino- Politecnico	1.13	.0443	.0611	2.3	10.1	.807	.697
Vercelli- Universita del Piemonte O	.616	.0458	.0447	.18	8.4	.858	.778
Novara- Sede dist. Universita del P	.77	.0446	.0612	.372	8.4	.858	.778
Alessandria- Sede dist. Universita	.747	.0419	.0516	.441	8.4	.858	.778
Aosta- Universita della Valle D'Aos	1.03	.0493	.03	.0128	7.8	.395	.345
Genova- Universita	.924	.0469	.0523	.883	8.9	.829	.791
Castellanza (Va)- Libero Istituto Un	.975	.0442	.0349	.883	8.93	4.45	.844
Varese- Universita dell'Insubria	.975	.0442	.0349	.883	8.23	.792	.689
Milano- Universita	2.11	.0506	.0464	3.16	8.43	1.01	.678
Milano- Politecnico	2.11	.0506	.0464	3.16	8.7	1.33	.613
Milano- Universita Commerciale Luig	2.11	.0506	.0464	3.16	10	5.86	.635
Milano- Universita Cattolica del Sa	2.11	.0506	.0464	3.16	9.19	2.89	.761
Brescia- Sede dist. Universita Catt	1.4	.0441	.0352	1.26	9.19	2.89	.761
Piacenza- Sede dist. Universita Cat	.829	.0457	.0336	.29	9.19	2.89	.761
Roma- Sede dist. Universita Cattoli	1.85	.0481	.0751	4.19	9.19	2.89	.761
Milano- Libera Universita di Lingue	2.11	.0506	.0464	3.16	7.66	3.46	.672
Milano- Universita Bicocca	2.11	.0506	.0464	3.16	8.25	.83	.669
Bergamo- Universita	1.53	.0471	.0363	1.1	8.88	.686	.86
Brescia- Universita	1.4	.0441	.0352	1.26	8.83	.797	.707
Pavia- Universita	.89	.0423	.0433	.548	9.28	1.11	.437
Bolzano- Libera Universita degli St	1.5	.0488	.0265	.508	8.76	.845	.826
Trento- Universita	1.08	.0504	.0319	.529	10.1	.597	.688
Verona- Universita	1.57	.0455	.0469	.92	8.55	.683	.647
Venezia- Universita Ca' Foscari	2.96	.044	.049	.863	8.75	.905	.667
Venezia- Istituto Universitario di A	2.96	.044	.049	.863	8.88	.978	.714
Padova- Universita	1.23	.0447	.0408	.934	9.28	1.08	.72
Udine- Universita	.705	.0485	.0351	.542	8.78	.75	.707
Trieste- Universita	1.28	.0496	.0478	.237	9.38	.835	.675
Parma- Universita	1.08	.0481	.0357	.0442	8.8	1.11	.632
Reggio Emilia- Sede dist. Universita	.992	.0461	.0272	.53	9.13	.92	.485
Modena- Universita di Modena e di Re	1.03	.0462	.0374	.701	9.13	.92	.485

continue next page

University	Rent	Quality	Unem.	Pop.	Ranking	Fees	Grants
Bologna- Universita	1.28	.0507	.0308	.992	8.95	.961	.756
Forli - Sede dist. Universita di Bol	.787	.05	.0418	.395	8.95	.961	.756
Rimini- Sede dist. Universita degli	1.41	.0448	.0585	.329	8.95	.961	.756
Ferrara- Universita	.87	.043	.0426	.36	8.88	.862	.482
Urbino- Universita	1.12	.0434	.0501	.367	9	.884	.456
Ancona- Universita	1.03	.0457	.0522	.481	9.73	.704	.496
Macerata- Universita	.759	.043	.0525	.325	9.4	.393	.708
Camerino (Mc)- Universita	.759	.043	.0525	.325	9.6	.596	.624
Ascoli Piceno- Sede distaccata Unive	.725	.041	.0578	.214	9.6	.596	.624
Firenze- Universita	1.44	.0499	.0497	.998	8.9	.933	.671
Pisa- Universita	1.08	.0449	.0458	.418	9.23	.811	.717
Siena- Universita	1.37	.0495	.0321	.273	10.3	.907	.82
Perugia- Universita	1.18	.0405	.0555	.672	8.63	.765	.627
Viterbo- Universita della Tuscia	.707	.0395	.0834	.32	8.85	.633	.284
Roma- Universita La Sapienza	1.85	.0481	.0751	4.19	8.93	.563	.401
Roma- Universita Tor Vergata	1.85	.0481	.0751	4.19	8.33	.5	.475
Roma- Libera Universita Maria SS.Ass	1.85	.0481	.0751	4.19	8.83	3.51	.246
Roma- Libera Universita Internaziona	1.85	.0481	.0751	4.19	9.75	4.64	.353
Roma- Universita Roma Tre	1.85	.0481	.0751	4.19	8.13	.539	.439
Cassino (Fr)- Universita	.612	.0388	.107	.498	7.9	.48	.397
Benevento- Universita del Sannio	.557	.0344	.128	.288	8.08	.391	.265
Napoli- Universita Federico II	1.19	.0383	.189	3.08	8.2	.463	.221
Napoli- Universita Parthenope (gia'	1.19	.0383	.189	3.08	8.3	.554	.288
Napoli- Istituto Universitario Orien	1.19	.0383	.189	3.08	7.75	.556	.221
Napoli- Istituto Universitario Suor	1.19	.0383	.189	3.08	8.2	.942	.331
Caserta- II Universita di Napoli	1.22	.0383	.122	.916	6.83	.867	.32
Salerno- Universita	.864	.0356	.117	1.11	8.43	.409	.281
L'Aquila- Universita	.743	.044	.0835	.031	9.05	.509	.199
Teramo- Universita	.622	.0419	.0608	.312	8.23	.545	.569
Pescara- Sede dist. Universita degl	.923	.041	.0845	.323	8.1	.605	.235
Chieti- Universita Gabriele D'Annunz	.574	.043	.0859	.397	8.1	.605	.235
Campobasso- Universita del Molise	.708	.0414	.118	.231	8.53	.691	.255
Isernia- Sede dist. Universita degl	.464	.0409	.102	.0887	8.53	.691	.255
Foggia- Universita degli Studi	.746	.0344	.193	.641	7.9	.385	.408
Bari- Universita degli Studi	1.05	.0375	.147	1.26	8.43	.464	.451
Bari- Politecnico	1.05	.0375	.147	1.26	8.43	.329	.375
Taranto- Sede dist. del Politecnico	.759	.0348	.14	.58	8.43	.329	.375
Lecce- Universita degli Studi	.683	.0351	.147	.816	8.85	.315	.247
Potenza- Universita degli Studi del	.684	.0414	.123	.384	9.5	.583	.531
Cosenza- Universita della Calabria	.573	.0364	.108	.735	9.83	.419	.375
Catanzaro- Universita Magna Grecia	.578	.0369	.131	.369	8.28	.409	.566
Reggio Calabria- Universita	.66	.0351	.192	.567	8.58	.396	.608
Palermo- Universita	.982	.0351	.203	1.25	8.85	.321	.31
Messina- Universita	.869	.0343	.161	.654	8.28	.51	.69
Catania- Universita	.74	.0354	.15	1.09	8.23	.463	.394
Sassari- Universita	.618	.0415	.136	.337	9.25	.447	.378
Cagliari- Universita	.819	.0417	.158	.0563	8.95	.33	.498

Rent, Quality of life and Unemployment rate refer to the province where the university is located.

Table 9: Estimation results: conditional logit model, grades

	(1) Grade_60 b	(2) Grade_61-80 b	(3) Grade_81-99 b	(4) Grade_100 b
Choice				
Distance	-2.714***	-2.701***	-2.771***	-2.668***
Distance Sq.	0.364***	0.352***	0.362***	0.352***
Distance Cube	-0.015***	-0.015***	-0.015***	-0.015***
House Renting Price	-0.018**	-0.018***	-0.006*	-0.016***
Quality of Life	0.090	0.254***	0.378***	0.701***
Unempl. rate	-4.735**	-5.221***	-7.461***	-5.304***
Population	0.397***	0.388***	0.398***	0.419***
Private	-0.817***	-0.877***	-1.281***	-1.700***
Ranking	-128.244***	-101.130***	-89.326***	-85.093***
Ranking Sq.	15.237***	11.991***	10.730***	10.312***
Ranking Cube	-0.598***	-0.469***	-0.424***	-0.410***
Fees	-0.040	-0.047***	-0.055***	-0.040***
Fees Sq.	-0.000	0.000	0.001***	0.001***
Exp. Grants	0.024***	0.020***	0.013***	0.005
Proximity	1.529***	1.564***	1.578***	2.118***
Observations	198800	951680	672400	203200
r2_p	0.707	0.629	0.540	0.495
ll	-3185.9	-19344.4	-16954.7	-5615.8
chi2	15406.9	65568.4	39752.4	11029.1

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10: Estimation results: conditional logit model, secondary schools

	(1) Vocational_sch b	(2) Technical_sch b	(3) Liceo b	(4) Pedagogical_sch b	(5) Artistic_sch b
Choice					
Distance	-2.688***	-2.864***	-2.586***	-2.920***	-2.797***
Distance Sq.	0.345***	0.375***	0.340***	0.376***	0.388***
Distance Cube	-0.014***	-0.015***	-0.015***	-0.016***	-0.018***
House Renting Price	-0.019***	-0.009**	-0.019***	-0.011**	0.006
Quality of Life	-0.003	0.365***	0.777***	0.608***	0.849***
Unempl. rate	-8.361***	-4.902***	-6.261***	-2.470*	-2.655
Population	0.423***	0.338***	0.378***	0.403***	0.271***
Private	-0.411***	-1.031***	-2.016***	-1.277***	-0.815***
Ranking	-114.997***	-94.432***	-59.964***	-100.584***	-112.360***
Ranking Sq.	13.573***	11.276***	7.518***	12.183***	13.505***
Ranking Cube	-0.529***	-0.443***	-0.308***	-0.485***	-0.535***
Fees	-0.075***	-0.099***	0.019**	-0.025	-0.001
Fees Sq.	-0.000	0.001***	0.000	0.000	-0.001
Exp. Grants	0.018***	0.014***	0.008*	0.020***	-0.003
Proximity	1.591***	1.367***	1.168***	2.092***	1.157***
Observations	581600	628640	432640	233920	149280
r2_p	0.736	0.619	0.474	0.548	0.634
ll	-8394.9	-13122.3	-12472.9	-5795.6	-2995.8
chi2	46924.8	42623.4	22450.3	14034.8	10362.2

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11: Estimation results: conditional logit model, mother's education

	(1)	(2)	(3)	(4)
	Primary_school	Lower_sec_school	Upper_sec_school	University_degree
	b	b	b	b
Choice				
Distance	-2.859***	-2.781***	-2.675***	-2.609***
Distance Sq.	0.382***	0.365***	0.347***	0.349***
Distance Cube	-0.016***	-0.015***	-0.014***	-0.015***
House Renting Price	-0.010	-0.005	-0.014***	-0.032***
Quality of Life	0.443***	0.146**	0.421***	0.933***
Unempl. rate	-2.936*	-6.770***	-7.395***	-6.181***
Population	0.326***	0.395***	0.388***	0.430***
Private	-0.944***	-0.807***	-1.183***	-1.796***
Ranking	-120.650***	-99.078***	-86.700***	-89.805***
Ranking Sq.	14.333***	11.759***	10.383***	11.016***
Ranking Cube	-0.561***	-0.460***	-0.409***	-0.444***
Fees	-0.059***	-0.095***	-0.043***	-0.020
Fees Sq.	0.000	0.001***	0.000***	0.001***
Exp. Grants	-0.001	0.017***	0.014***	-0.004
Proximity	1.589***	1.629***	1.608***	1.684***
Observations	248640	825600	781520	170320
r2_p	0.697	0.635	0.536	0.476
ll	-4123.7	-16508.9	-19856.8	-4891.2
chi2	18991.4	57427.2	45902.4	8876.3

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 12: Estimation results: conditional logit model, household highest job position

	(1)	(2)	(3)	(4)	(5)	(6)
	Chief_ex_off	Executive	Self-empl	White_coll	Blue_coll	Not_empl
	b	b	b	b	b	b
Choice						
Distance	-2.749***	-2.530***	-2.910***	-2.728***	-2.700***	-2.731***
Distance Sq.	0.377***	0.324***	0.409***	0.354***	0.346***	0.372***
Distance Cube	-0.016***	-0.013***	-0.018***	-0.015***	-0.014***	-0.018**
House Renting Price	-0.009**	-0.031***	0.000	-0.014***	-0.014***	-0.033
Quality of Life	0.763***	0.439***	0.233**	0.428***	0.154**	0.243
Unempl. rate	-5.196***	-7.478***	-7.344***	-6.349***	-6.807***	-6.885
Population	0.323***	0.500***	0.392***	0.420***	0.402***	0.410***
Private	-1.591***	-1.501***	-0.764***	-1.037***	-0.878***	-1.026**
Ranking	-82.415***	-105.531***	-93.813***	-98.072***	-99.334***	-132.317***
Ranking Sq.	9.898***	12.830***	11.049***	11.723***	11.806***	15.883***
Ranking Cube	-0.392***	-0.513***	-0.429***	-0.461***	-0.462***	-0.628***
Fees	-0.002	-0.052***	-0.046***	-0.048***	-0.092***	0.066
Fees Sq.	0.000**	0.001***	0.000	0.000	0.001***	-0.002
Exp. Grants	0.008*	0.015**	0.015**	0.014***	0.015***	-0.032
Proximity	1.477***	1.601***	1.783***	1.721***	1.593***	1.156**
Observations	315200	169360	313600	351280	854560	22080
r2_p	0.500	0.505	0.603	0.563	0.640	0.688
ll	-8629.7	-4588.0	-6812.2	-8411.0	-16873.5	-377.4
chi2	17271.1	9377.5	20730.8	21660.9	59870.7	1664.0

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Estimation results: logit model

	coefficients
Enrolment	
Secondary school	
Ref. cat.: Vocational school	
Technical	0.966***
Liceo	3.237***
Pedagogical	2.262***
Artistic	0.380***
Gender Male	-0.154***
Household highest job position	
Ref cat.: Chief executive	
Executive	0.152*
Self-employed	-0.317***
White collar	-0.012
Blue collar	-0.402***
Not employed	-0.708***
Mother's education	
Ref. cat.: Primary school	
Lower secondary sc.	0.297***
Upper secondary sc.	0.774***
University degree	1.250***
Secondary school grade Ref cat.: minimum	
Medium-low	0.633***
Medium-high	1.565***
Maximum	2.623***
Constant	-1.901***
Obs.	25326
R^2	0.288
Log-lik	-12205.6
LR, χ^2_{16}	9897.13