

Time-to-Degree: Students' Abilities, University Characteristics or What Else?

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The elapsed time taken to earn a degree is analyzed with data drawn from a representative sample of Italian graduates. Besides students' abilities, parental background and, labour market conditions, we include additional controls measured at the university level, namely period of establishment, location and dimension. The main goal is to investigate whether there are some colleges that are more efficient than others, once controlled for their students' characteristics. A duration model indicates that in fact the bad performances of some universities in terms of elapsed-time-to-degree are mainly due to the poorest abilities of their students, and not to other features.

Jel Classification: J24, I23

Keywords: Tertiary education system, elapsed-time-to-degree, duration models, unobserved heterogeneity.

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1. Introduction and motivation

Italian university system is concerned by two issues which represent two faces of the same problem: a large drop out rates, and an average time to bachelor's degree higher than the legal length. The university system reform introduced in 2001, according to the so called "Bologna's declaration", was explicitly aimed at reducing both the afore-mentioned issues, in order to increase competitiveness of Italian graduates as compared with the other European ones.

Nonetheless, elapsed time-to-degree is not only a specific trait of the Italian higher education system. According to Brunello and Winter-Ebmer (2003) in many other European countries such as Sweden, Denmark, France and Germany the time taken on average to earn the bachelor's degree exceeds the legal duration. Besides Garibaldi and al. (2008) collect a wide evidence showing that even in the US, notwithstanding the unlike higher education system model, time-to-degree has been rising in the last decades turning out to be a noteworthy concern for the policy makers.

Furthermore, time-to-degree can be interpreted as an indicator of the universities "internal efficiency". The delay in college completion represents in fact a waste of resources both at the individual and the collective level. Being full time university students entails a loss of wages for the entire period they are enrolled at any university. In addition, according to evidence (Brodaty, 2008), those who got a degree beyond the legal length are penalized in terms of earnings when they find a job. From the collective viewpoint instead, students who did not achieve their undergraduate studies on time represent a waste of resources if they can keep on using universities' assets (classrooms, libraries, professors' time, discounted food and books, etc.) without restrictions, so congesting universities' sites.

As a matter of fact, time-to-degree is the result of a mix of factors, such as students' characteristics, students' preferences, and university organization, too. Individual ability is certainly a relevant aspect which affects the time taken to earn a degree. Lack of abilities and of motivation reduce the probability of taking a degree on time. Nevertheless if labor market conditions are bad, individuals could rationally choose to stay longer at university as they are not encouraged at seeking a job. Finally, University characteristics such as classrooms' availability, accommodations to host non resident students, rooms devoted to study, but also exams' rules, and the level of tuition fees could affect the time spent at university.

Our goal in this paper is to convey information about the actual elapsed-time-to-degree for Italian graduates during the 2001-2004 academic years, so after the University reform. We analyse how differences in elapsed-time-to-degree vary with their personal characteristics, financial circumstances, educational background, labour market conditions, and above all characteristics of the university in which they studied.

The idea of considering also information related to university is mainly due to a widespread expansion of the Italian higher education system in the latest 90s. During this period, Italy was interested by a notable increase of universities' sites which reached its peak in 1998 when several new universities were established. The intensification of the Italian university system was also due to the opening of "detached" non-autonomous sites of universities often located in small towns and providing few (often only one) courses. The major purpose of this expansion was to reduce the traditional style universities overcrowd, thus improving the efficiency of the whole university system¹. Even if according to the law, which introduced these new universities, they do not differ *de jure* in terms of organization, structure, goals and type of degree provided, they probably *de facto* differ in terms of human and financial resources available, type of students enrolled, relations with the surrounding territory, etc. In this paper we then want to detect whether differences in study time between universities are mainly due to their specific characteristics or primarily to the level of abilities of their students, which are different over them. We classify, hence, Italian Universities according to two criteria: their date of foundation and their size. In particular, regarding the period of establishment, we distinguish among three types of Universities: those founded up to 1960, those founded from 1960 till 1989 and, finally, those founded after 1990. The first group includes the "oldest" Italian Universities, some of which were established even in the Middle Age. The second group includes those Universities which were founded after the higher education system reform occurred in 1969 which opened the access to tertiary education to all high school graduates. Finally, the third group contains the most recent Universities founded in response of the 1991 law aimed at "decongesting" some old and crowded Universities. With regard to the second classification criterion, we define as "small" Universities with less than 20.000 students enrolled and as "large" Universities with more than 20.000 students enrolled.

¹Often new universities sites were established under local policy maker pressures to boost the economy of such areas.

The paper is organized as follows. Paragraph 2 presents a brief review of the relevant literature. Paragraph 3 describes the structure of the data set and paragraph 4 provides some descriptive statistics. Paragraph 5 describes the empirical strategy used to identify the determinants of the time-to-degree. Paragraph 6 presents the results of the analysis. Finally paragraph 7 concludes.

2. Literature review

Over the recent years the elapsed-time-to-degree has become a subject which has aroused a lot of interest, especially among researchers. Although this issue is a growing concern especially in the Italian tertiary education system, because as study time expands, near-term costs of the degree rise and future expected benefits fall, empirical evidence on this subject is not widespread.

An extensive work that covers also this aspect has been presented by Checchi et al. (2000). Using administrative data on students enrolled in some public departments and in a private one, they attempt to analyse both college choices and subsequent students' performance, taking into account the effects of parental background on these aspects as well. Their major findings are that progression toward a degree is positively related to educational records, in other words they show that academic aptitude is an important factor that affects the likelihood of completion along with parental background – higher educated parents increase the chances of getting a degree.

An *ordered probit* approach has been employed by Boeri, Laureti and Naylor (2005) to assess the effects of students' abilities prior to their college enrolment and family income on the progression toward the degree, using data of two Italian universities (i.e. Cagliari and Viterbo). They find that, in general, having attended a general high school increases the probability of completion in comparison with other students who have obtained a different high school diploma. Bratti, Broccolini and Staffolani (2006), instead, using a sample of students who graduated in the Economics Faculty of Marche Polytechnic University and applying a propensity score technique, investigate the effect of the new university reform on students' behaviour and their performance. They highlight that this policy intervention has led to a reduction of drop-out rates, whereas the fact of spending additional years to get a degree regarding the legal length does not seem to have benefited from this new organisation of degree programmes.

Garibaldi et al. (2006) instead using administrative data of Bocconi University – a private university of Economics located in Milan - evaluate the effect of tuition fees on the time spent at university before obtaining a degree. Their most important result is that an increase in tuition fees level during the last academic year decreases the probability of expanding time-to-degree.

The issue of elapsed-time-to-degree has been analysed by Brunello and Winter-Ebmer (2003) using data drawn from a survey which was conducted at European level. These authors highlight that excess time to graduation is significantly higher in countries where the share of public expenditure for tertiary education on total expenditure is greater, besides they notice that students take longer to graduate in countries with a high rate of unemployment and stricter employment protection. As a consequence, the fact that entry into the labour market is not easy may discourage individuals from completing in time their studies. The paper of Messer and Wolter (2007) supports the last result mentioned above, as they find that economic situation – which can be expected to influence individual consumption benefit and the costs of studying – has a significant impact on individual time-to-degree. To be more precise, a low unemployment rate and high real interest rate shorten the time-to-degree by directly increasing the cost of a university education.

Light and Strayer (2000) attempt to determine whether college quality and students' ability have causal effects on university completion. The main conclusion they draw from their findings is that ability is an important, positive determinant of college success at large. In addition, they highlight that, at the lowest quality colleges - where the relatively low academic standards should facilitate progression toward a degree - graduation is mainly hampered by the paucity of other high-ability students, financial aid, and other positive environmental factors, rather than other aspects.

Furthermore, several researchers have focused their attention also on graduate students' behaviour², as especially in the US it is common for more than half of the students who started a Ph.D. programme to leave without earning a doctorate, in addition, despite the fact that the legal length is equal to four years, only few students complete their studies within the minimum period required (Ehrenberg et al., 2005). Findings of these contributions to the elapsed time taken to earn a Ph.D are not relevant to our final goals, as we are aware of the fact that the characteristics of a student enrolled in a post-graduate course differs from those

² See Ours and Ridder (2002), Ehrenberg and Mavros (1995), Ehrenberg et al. (2005), Stock and Siegfried (2000, 2001).

associated with an individual who attends an undergraduate degree programme, but the econometric approaches adopted are extremely useful for our analysis as in many works survival analysis methods have been applied in sharp contrast with what has been done using Italian data. To sum up, in this perspective, the present paper contributes to the existing literature by producing new evidence of the Italian tertiary education system link with the elapsed-time-to-degree.

3. Data

The sample is drawn from Consorzio AlmaLaurea which collects information on graduates of 46 Italian Universities, namely 65% of the Italian graduates. In particular the sample is composed by individuals who awarded their degree in 2007, independently from the year of enrollment at university.

In 2001 the Italian HES has been reformed according to the “Bologna declaration” (1999) an agreement aimed at improving the comparability and the homogeneity of the European University systems. The reform suppressed the most 4 or 5 years degree courses and introduced the so called 3+2 system from the academic year 2001. Since in Italy there is not a maximum delay to obtain a degree, amongst 2007’s graduates there are three type of individuals: those who enrolled before 2001 in an “old” type degree course and who graduated within the same regime, those enrolled before 2001 in an “old” type degree course who decided to shift to a “new” degree course and who therefore graduated in a 3 years course and those who enrolled after 2001 in a 3 years course. In order to work with homogeneous individuals we focus only on people who enrolled since 2001 in a 3-years bachelor's degree, excluding then students who earned an “old type” degree (4 or 5 years of duration), as well as those who swop from an “old” to a “new” type degree. We also exclude graduates in Medical studies which preserved the pre-2001 organization providing a single-cycle degree (laurea a ciclo unico). We finally focus our analysis on graduates from public universities, thus excluding those who awarded their degree from private ones or from universities financed and managed at a regional level³.

Concerning the dependent variable, namely the students’ time-to-degree, its construction needs some attention. AlmaLaurea data set report both the enrollment and the graduation dates

³ In Italy there are two regional universities, Università della Valle d'Aosta and Università di Bolzano, which are located in two regions with specific rules (Regioni a statuto straordinario). This status allows these regions to keep in their territory the most part of the taxes locally collected thus entailing a greater availability of financial resources.

for each individual and, as a consequence, we can calculate for each graduate the exact number of days spent at university. Nevertheless we do not use this information in the analysis. The exact day when a student graduates in Italy does not only depend on student's ability, but also on the organization of the graduation sessions provided by each university. Since there is not a rule set at a national level, each university can organize the graduation sessions autonomously, thus affecting its students' time-to-degree and introducing a bias in the dependent variable. In order to improve the comparability of the durations among different universities we have grouped graduation dates into graduation sessions, according to the academic calendar year. In each academic year the first graduation session is from the 1st May to the 31th August, the second graduation session from the 1st September to the 31th December and the third session from the 1st January to the 30th April. For each student we have then calculated the number of sessions needed to graduate starting from the 1st May of their third enrollment year, namely from the date when the student is entitled to graduate. As reported in the table 1 the medium number of sessions needed to graduate is 5 which corresponds to a medium delay higher than one year.

There is another problem affecting data when time-to-degree is considered. Almalaurea data are organized by year of graduation, despite the academic year of enrolment. This implies that in 2007 we do not observe two types of individuals: those who enrolled at university in the years 2001-2004 and who took their degree before 2007 as well as those who are not yet graduate⁴. Nevertheless, if the number of students enrolled at university and their time-to-degree distribution did not significantly change during the whole period 2001-2004, the time-to-degree observed in the 2007 graduates' cohort is not different from that which would be observed if one could follow one entire freshmen's cohort of whatever year (Siegfried and Stock, 2001). In our case both the conditions are satisfied and we can consider the observed time-to-degree distribution as representative of the distribution of the time-to-degree of students enrolled in any academic year from 2001 to 2004⁵.

⁴ Table A1 in appendix represent the structure of our data.

⁵ As showed in table A2 in appendix the number of students enrolled at university in Italy during the period 2001-2004 is rather steady, with a small increase in 2002 and 2003. The greatest jump in university enrollment in the last decades indeed occurred in 2001 with respect to 2000, with the introduction of the 3+2 reform. With regard to time-to-degree, table A3 report its distribution for the years 2004-2007 according to Almalaurea data on graduates. These four years are those in which students enrolled in 2001-2004 are entitled to earn their bachelor degree. Obviously, in 2004 all the graduates are on time because they are those students enrolled in 2001 who took their degree just after three years. In 2005 then we only observe graduates on time (those enrolled in 2002) or graduates with a delay of one year (those enrolled in 2001) in 2006 only graduates in time or with a one or two years delay and so on. The table also reports the time-to-degree distribution that had to be observed in 2005 and in 2006 we could observe the same distribution as in 2007.

4. Descriptive statistics

Descriptive statistics are reported for the whole sample and by the type of University as well (Table 2). We define six groups of universities according to their date of foundation and their size in terms of students enrolled (Table 1). Group 1 refers to small and oldest Universities (before 1960), group 2 to large and oldest Universities, group 3 to small and 1960-1989 Universities, group 4 to large and 1960-1989 Universities, group 5 to small and after 1990 Universities and, finally, group 6 to large and after 1990 Universities.

[TABLE 1 AROUND HERE]

Our final sample is composed by 67.985 observations, which are not distributed among the six Universities groups equally. Group 2, composed by large and oldest Universities, are more than a half of the sample (64%), group 4, composed by large and 1960-1989 Universities, are the 11.2%. The other four groups are all composed by less than 10% of the sample. These differences depend both on the number of Universities included in each group and on the number of students enrolled in each of them.

Concerning our dependent variable, the average number of sessions varies from a minimum of 4.26 in the group 1 to a maximum of 5.6 for the group 6. In general we observe that students enrolled in the “oldest” Universities have shorten study time than those enrolled in the more recent Universities. With regard to the size, on average students enrolled in large Universities spend more time to earn their degree. The aim of this paper is to establish if these differences in terms of time-to-degree depend on different students’ characteristics and abilities or also on the University characteristics and their organization.

As regards previous educational experiences, we have information on the type of high school diploma achieved and final mark. Both these indicators greatly differ among the six groups. Students enrolled at large Universities are characterized by a higher percentage of general high school diploma (*licei*), whereas students studying in small Universities have on average more technical of professional diploma. In particular in group 5 only 41% of the graduates got a general high school diploma as compared with an overall average of 58%. Also concerning the high school leaving grades, differences are remarkable. Graduates from large Universities are characterized by higher final marks as compared with graduates from small Universities. According to these two indicators, graduates differ in terms of ability among the

six groups of Universities identified. In particular those from large Universities show better level of knowledge than those from small Universities and, among them, those from newly established Universities have even worst abilities.

[TABLE 2 AROUND HERE]

Looking at the parental background, which is crucial for offspring educational outcomes, graduates from large oldest and newly established Universities (group 1 and 6) have on average more educated parents. This evidence can be easily explained by considering that large universities are generally located in metropolitan area where the educational level is, on average, higher. Once again graduates from small and newly established Universities represent the most disadvantaged group.

So far we have focused on the characteristics of the students before their enrolment at University. In our analysis however we will focus also on their choices and experiences at University. The information on the geographical area where the students used to live during University is not so interesting *per se* since it obviously depends on where the University is located. Nevertheless we will include this information in the estimates as a proxy for the labour market conditions of the area where the student lives. More interesting is the information on students' mobility. On average more than 50% of the students used to live in the same province of the University, 27.1% moved to another province of the same region and only 21.1% to another region. In addition, students of newly established Universities are on average less mobile. This can be viewed as a signal of the fact that potentially these Universities have been established where the demand of higher education was high. Regarding working experiences, about 70% of the graduates had a part time job when studying, with no remarkable differences among the six groups. As regards living conditions, only about 40% of the graduates used to live outside parents' house in a rented flat or in an accommodation provided by the ISU (Institute for the Right to Study).

Finally concerning departments we distinguish among fourteen different study fields. The most part of the individuals graduated in Economics/Statistics (16.6%) and in Political Science/Sociology (16.2%). The lower percentages are in Scientific fields.

5. Empirical strategy

We want to estimate the impact of university and students' characteristics on time-to-degree by controlling for a number of other confounding factors. In particular, given the discrete nature of our time variable (sessions needed to graduate) and of the corresponding event of

interest (graduation may occur at any particular year), we use a duration model with a discrete hazard setting based on a complementary logistic model (*cloglog*): for each graduation session, the dependent variable takes value 0 when individuals are still enrolled at University and 1 when they graduate (Jenkins, 2004). In our data for each individual we observe a complete duration spell as the sample is composed by only graduates. Moreover, the use of a model with a proportional hazard allows to transform the coefficients of this analysis into hazard ratios, which makes easier the interpretations of results⁶. For any given covariate, the hazard ratio is:

$$HR = \frac{\chi(x = a)}{\chi(x = a - 1)} = \exp(\beta_x)$$

where χ is the continuous time hazard rate. This is the relative risk associated with a one unit change in the value of the corresponding explanatory variable, holding everything else constant.

Obviously it is questionable whether all students with the same set of observed covariates face the same expected hazard of graduation. Due to the unobservable factors, there might be some students who are “intrinsicly” more or less likely to graduate in any session. Ignoring unobserved heterogeneity may then produce a bias in the results.

As a consequence, we also present results obtained controlling for unobserved heterogeneity issues. Denoting with ν the unobserved component shifting schooling duration (where ν is independent from the covariates X and time t), according to Jenkins (2004) it can be integrated out from the survivor function once a specific functional form for ν is specified. This is convenient as it allows writing the unconditional survivor function in terms of this distribution. For the discrete time models, a popular choice is the Gamma distribution, which nests other familiar functional forms such as the normal one.

6. Main Results

In this section, we use the statistical framework discussed in the previous paragraph to investigate the determinants of the probability to graduate in any session. In particular we aim at verifying to what extent students’ characteristics affect the time necessary to take the degree and whether college characteristics do matter as well.

⁶ Indeed, under the “proportional hazard” assumption, the duration profile of the hazard is only function of the time variable and, therefore, it is the same for all the individuals, where this profile is shifted upwards or downwards by the explanatory variables.

Table 3 and 4 present results with and without controls for unobserved heterogeneity for several specifications. In particular specifications in column (I), (III) and (V) control for the characteristics of universities (dimension and age) separately, while specifications in columns (II), (IV) and (VI) for their interactions as well. We report both coefficients and hazard ratios. For each covariate, the latter represents the complement to one of the probability of withdrawal from the educational system⁷. Finally table 5 reports the estimated hazard ratios for the different types of University as compared with the reference category represented by type (1) Universities (small and established by 1960).

We first comment results for a standard duration model, with no treatment of unobserved heterogeneity issues (table 3). Next, we will discuss result from the model with controls for unobserved heterogeneity (table 4).

In all specifications the logarithm of the duration has a positive and statistically significant effect on students' withdrawal. This is a standard result and says that students are more likely to graduate as time elapses.

When we look at the first two specifications we only control for the University dimension and period of establishment (I) and for their interactions (II). These estimates obviously are not very informative because no students' characteristics are included. However it is interesting to compare these results with those reported in the following specifications in order to highlight if the coefficients of the University types change once controlled for students' characteristics.

[TABLE 3 AROUND HERE]

In column (I) all the estimated hazard ratios are lower than one, thus suggesting that students enrolled in large or in more recent Universities (after 1960) take more time to graduate. The results obtained adding interactions (column (II)) allow to estimate the effect of any type of University as reported in table 5. The reference category is represented by small Universities established by 1960. According to our estimates students in any University face a lower probability to graduate than those enrolled in a small and old University. This lower probability range from 19.7% for those enrolled in a type-2 University (large and pre-1960) to 32.5% for those enrolled in a type-6 University (large and post 1990).

When we control for students' characteristics, however, these differences among students' performances tail off remarkably. In particular, according to the estimates in column (IV) and

⁷For instance, if the estimated hazard ratio for a characteristic j is 0.6, then the individuals with that characteristic have a 40% lower probability of exiting the educational system than the reference group; instead, if the hazard ratio is 1.5 the individuals have a 50% higher probability of exiting from educational system.

to the effects calculated in table 5, students enrolled in small and post-1990 Universities face a lower probability to graduate in any session by only 3.6% and those in large and post-1990 Universities by 11%.

When we look at the effect of students' characteristics we observe that their ability affect their performance as expected. In particular students from technical or professional high schools and with lower leaving grade are more likely to spend more time at University on achieving their degree. Another proxy for ability is represented by the dummy indicating if students had in the past other college experiences without graduating. These students have a lower probability to graduate by 37%. Both parental background and students' abilities affect the analysed outcome: the more parents are educated the less students stay at University. Surprisingly, we do not find any statistically significant effect associated to gender. According to our estimates women have the same probability than male of graduating in each session, once controlled for their ability.

A variable which strongly influence students' performance in terms of time-to-degree is represented by the macro-area of study. In particular students living in Centre regions are less likely to graduate in any session by 32% and those living in Southern regions by about 45% with respect to the reference category (Northern areas). This result is in line with the real business cycle explanation finds in previous studies (Brunello and Winter-Ebmer, 2003; Messer and Wolter, 2007) which highlights that students' performances at University are strongly affected by labour market conditions. If there are good job opportunities students experiment higher cost opportunities in staying at University so, as a consequence, they are encouraged to achieve their degree on time.

With regard to students experiences at College we find that working part-time has a negative effect on time-to-degree by 22%. Subtracting time to the study increases the resources available to students but it increases the time needed to graduate, thus nullifying the positive effect on students' economic condition. Students receiving scholarships from their University graduate fast by 17% but this obviously depends on the fact that such grants are often merit-based.

Finally, when we look at the college field we observe that students in Scientific fields, Engineering, Law, Liberal Arts and Language experience a lower probability to graduate in any session. For some field (Scientific or Engineering) this is likely due to a greater difficulty associated with such studies, while for the remaining it is probably the effect of less job opportunities.

As already mentioned, table 4 shows estimates allowing for unobserved heterogeneity. First, we notice that, based on a likelihood ratio tests for the three samples, the hypothesis of gamma-distributed unobserved heterogeneity is not rejected by the data, and, therefore, that these estimates are the preferred ones. Interestingly, once we control for selectivity issues on time-to-degree, differences among students performance in any University type as compared with those of the reference category (small and oldest) slightly increase with respect to the estimates of column IV, thus suggesting that there are some.

[TABLE 4 AROUND HERE]

The only University type for which the difference with the reference group remains low is represented by small and post-1990 Universities.

7. Concluding remarks

This paper investigates the determinants of time taken to earn a bachelor degree in Italy. By this analysis we evaluate whether such duration, which often goes beyond the legal length, depends only on the abilities and the motivations of students or if labour market conditions and colleges characteristics matter as well. As far as we know, the current paper is the first attempt to analyze time-to-degree on a sample representative of the Italian university system, trying to control also for the University characteristics.

According to our results, time-to-degree is affected by individual ability, fields of study chosen, working status, labor market and living conditions. University characteristics in terms of age (tradition) and size matter as well even once controlled for students' characteristics. In particular small universities (less than 20.000 students) perform better than large universities even controlling for students' ability. Assuming that the difficulty level of the degree courses is homogeneous among universities, this result could be interpreted as the effect of better studying conditions provided by small universities in terms of class size, possibility to confront with teaching staff, better organization of the exams' sessions. Old universities attract on average better quality students than those enrolled in recently established universities. In Italy, as well as in other countries, such universities are playing the role of leading up to tertiary education students from poorest backgrounds. Finally, once controlled for students' characteristics differences among universities narrow but still remain significant, thus stressing that universities organization and, probably, their resources, can influence students' performances.

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Tables

Table 1 Universities classification by size and year of foundation

	Small-Medium <20.000 students	Large-Mega >20.000 students
By 1960	(1) Camerino, Ferrara, Modena e Reggio Emilia, Sassari, Venezia Ca' Foscari, Venezia IUAV	(2) Bari, Bologna, Cagliari, Catania, Firenze, Genova, Messina, Padova, Parma, Perugia, Roma La sapienza, Siena, Torino, Torino Politecnico, Trieste
From 1960 to 1989	(3) Cassino, Udine, Viterbo Tuscia, Basilicata, Molise, Reggio Calabria, Trento	(4) Calabria, Salento, Salerno, Verona, Chieti e Pescara
From 1990 on	(5) Catanzaro, Foggia, Piemonte Orientale, Roma IUSM	(6) Napoli II, Roma 3

Table 2 Descriptive statistics

	All	(1)	(2)	(3)	(4)	(5)	(6)
Observations	67985	5879 8.6%	43583 64.1%	4793 7%	8085 11.2%	1592 2.3%	4053 6%
Duration (in sessions)	4.97	4.26	4.91	5.13	5.37	5.17	5.50
Female	0.611	0.600	0.604	0.573	0.662	0.649	0.632
<i>High school track</i>							
General	0.580	0.505	0.610	0.470	0.511	0.411	0.697
Technical	0.289	0.375	0.264	0.396	0.334	0.420	0.174
Professional	0.023	0.026	0.021	0.029	0.028	0.031	0.017
Teaching	0.076	0.042	0.073	0.077	0.104	0.125	0.080
Other	0.032	0.052	0.032	0.029	0.022	0.013	0.032
<i>High school leaving grade</i>							
60-70	0.174	0.197	0.171	0.201	0.154	0.217	0.172
70-80	0.222	0.241	0.218	0.236	0.215	0.244	0.222
80-90	0.217	0.227	0.215	0.217	0.217	0.229	0.215
90-100	0.373	0.322	0.380	0.336	0.409	0.303	0.380
No answer	0.013	0.013	0.015	0.010	0.006	0.006	0.012
<i>Father and mother education</i>							
Father primary school	0.122	0.144	0.111	0.121	0.154	0.246	0.098
Father lower secondary	0.287	0.291	0.281	0.326	0.323	0.318	0.212
Father upper secondary	0.411	0.402	0.414	0.423	0.398	0.344	0.430
Father university degree	0.180	0.163	0.194	0.130	0.125	0.091	0.260
Mother primary school	0.126	0.140	0.111	0.125	0.175	0.251	0.118
Mother lower secondary	0.287	0.309	0.279	0.350	0.308	0.289	0.227
Mother upper secondary	0.430	0.418	0.437	0.424	0.402	0.383	0.450
Mother university degree	0.157	0.134	0.173	0.101	0.114	0.077	0.204

Table 2 Descriptive statistics (continues)

	All	(1)	(2)	(3)	(4)	(5)	(6)
Observations	67985	5879	43583	4793	8085	1592	4053
<i>Geographical area</i>							
North West	0.136	0.000	0.196	0.000	0.000	0.433	0.000
North East	0.358	0.839	0.353	0.515	0.191	0.000	0.000
Centre	0.239	0.054	0.273	0.236	0.000	0.040	0.697
South and Islands	0.268	0.107	0.178	0.249	0.809	0.527	0.303
<i>Mobility</i>							
Study in the same province	0.518	0.433	0.491	0.573	0.553	0.644	0.740
Study in another province of the same region	0.271	0.364	0.269	0.174	0.326	0.280	0.164
Study in another region	0.211	0.203	0.240	0.253	0.121	0.075	0.096
<i>Other characteristics</i>							
Working during studies	0.681	0.717	0.692	0.666	0.605	0.631	0.693
Living in a rented flat	0.322	0.266	0.355	0.309	0.338	0.098	0.120
Grant from ISU	0.264	0.226	0.251	0.311	0.345	0.332	0.210
Accommodation from ISU	0.044	0.049	0.042	0.047	0.075	0.014	0.005
Previous university experiences	0.056	0.062	0.059	0.051	0.041	0.046	0.051
<i>Field of study</i>							
Economics-statistics	0.166	0.231	0.148	0.182	0.204	0.201	0.152
Scientific	0.038	0.034	0.037	0.046	0.047	0.026	0.021
Chemical-Pharmaceutical	0.015	0.022	0.017	0.001	0.015	0.020	0.003
Geological-Biological	0.051	0.055	0.052	0.030	0.038	0.119	0.054
Engineering	0.123	0.081	0.137	0.142	0.100	0.013	0.101
Architecture	0.050	0.149	0.044	0.058	0.009	0.000	0.070
Agricultural Sc.	0.021	0.008	0.024	0.054	0.003	0.025	0.000
Political-Sociological	0.162	0.094	0.170	0.178	0.182	0.177	0.105
Law	0.056	0.050	0.047	0.091	0.036	0.157	0.132
Humanistic	0.110	0.104	0.113	0.089	0.107	0.074	0.133
Language	0.079	0.139	0.066	0.085	0.110	0.033	0.080
Teaching	0.048	0.015	0.046	0.017	0.087	0.046	0.069
Psychology	0.064	0.000	0.083	0.008	0.043	0.000	0.078
Sport	0.017	0.018	0.015	0.018	0.017	0.109	0.000

Table 3 Probability of graduation (discrete time duration models without control for unobserved heterogeneity)

	Specifications											
	(I)			(II)			(III)			(IV)		
	coeff	Z	Hazard ratios	coeff	z	Hazard ratios	coeff	z	Hazard ratios	coeff	Z	Hazard ratios
Large univ.	-0.151	-14.35	0.859	-0.218	-16.42	0.803	-0.087	-7.69	0.916	-0.161	-11.12	0.8506
1960-1989 univ.	-0.191	-17.82	0.825	-0.3319	-15.8	0.717	-0.001	-0.11	0.998	-0.156	-7.22	0.8550
After 1990 univ.	-0.201	-13.72	0.817	-0.308	-10.63	0.734	0.041	2.63	1.042	-0.037	-1.21	0.9636
Large*1960-1990 univ				0.188	7.71	1.207				0.221	8.58	1.2473
Large*after1990 univ				0.134	4.01	1.144				0.090	2.56	1.0945
Female							-0.003	-0.4	0.996	-0.003	-0.33	0.9969
Age at enrolment							0.013	6.51	1.013	0.013	6.52	1.0132
Technical							-0.177	-17.7	0.837	-0.177	-17.66	0.8372
Professional							-0.378	-13.28	0.684	-0.37	-13.25	0.6852
Teaching							-0.234	-14.08	0.791	-0.234	-14.05	0.7913
Other high school							-0.394	-13.08	0.674	-0.397	-13.2	0.6717
70-80							0.189	14.61	1.209	0.189	14.59	1.2087
80-90							0.401	30.34	1.494	0.402	30.35	1.4949
90-100							0.781	62.24	2.184	0.782	62.32	2.1869
No answer final degree							0.492	10.33	1.636	0.499	10.46	1.647
Father low.sec.							0.029	1.98	1.029	0.031	2.13	1.0322
Father high sec.							0.047	3.11	1.048	0.054	3.3	1.051
Father univ. Degree							0.083	4.6	1.086	0.084	4.7	1.0886
Mother low. Sec.							0.071	4.8	1.073	0.073	4.92	1.0758
Mother high sec.							0.105	6.94	1.111	0.107	7.05	1.1131
Mother univ. Degree							0.122	6.67	1.130	0.124	6.76	1.1326
North East							0.081	6.06	1.084	0.063	4.56	1.0653
Centre							-0.379	-27.13	0.684	-0.378	-26.33	0.6847
South and Islands							-0.566	-38.66	0.567	-0.587	-39.32	0.5559
Study in the same region							0.058	5.78	1.060	0.057	5.62	1.0586
Study in another region							-0.024	-1.92	0.976	-0.020	-1.64	0.979
Working while studying							-0.245	-26.63	0.782	-0.247	-26.79	0.7809
Rented flat							-0.018	-1.84	0.981	-0.016	-1.67	0.9832
Grant from ISU							0.154	15.63	1.166	0.157	15.94	1.1705
Accommodation from ISU							0.081	3.99	1.085	0.076	3.72	1.079
Previous univ. exp.							-0.464	-26.33	0.628	-0.461	-26.2	0.63
Scientific							-0.196	-8.68	0.821	-0.193	-8.57	0.8239
Chemical-Pharmaceutical							0.095	2.87	1.100	0.096	2.89	1.1013

Geological-Biological							-0.037	-1.85	0.963	-0.032	-1.6	0.9681
Engineering							-0.255	-16.51	0.774	-0.248	-16	0.7802
Architecture							0.001	0.05	1.000	0.006	0.32	1.0066
Agricultural Sc.							-0.088	-3.01	0.914	-0.0565	-1.9	0.9450
Political-Sociological							-0.001	-0.11	0.998	0.004	0.29	1.0042
Law							-0.342	-17.31	0.709	-0.332	-16.76	0.7172
Liberal Arts							-0.127	-7.96	0.880	-0.125	-7.8	0.8822
Language							-0.116	-6.66	0.889	-0.121	-6.9	0.8859
Teaching							0.084	3.7	1.087	0.083	3.68	1.087
Psychology							0.139	7.08	1.149	0.146	7.43	1.1580
Sport							0.187	5.82	1.206	0.194	5.99	1.2142
Lnt	0.837	131.77	2.310	0.838	131.89	2.313	0.983	148.71	2.673	0.984	148.84	2.677
LR chi2	19739			19805			29939			30014.12		

Table 4 Probability of graduation (discrete time duration models with control for unobserved heterogeneity)

	(V)			(VI)		
	Coeff	Z	Hazard ratios	coeff	Z	Hazard ratios
Large univ.	-0.1463	-8.04	0.8638	-0.262	-11.1	0.7694
1960-1989 univ.	-0.0081	-0.43	0.9919	-0.253	-7.29	0.7759
After 1990 univ.	0.0635	2.56	1.0656	-0.059	-1.21	0.9426
Large*1960-1990 univ				0.3468	8.43	1.414
Large*after1990 univ				0.1402	2.50	1.1505
Female	-0.029	-1.99	0.9706	-0.0297	-1.99	0.9706
Age at enrolment	0.032	9.44	1.0325	0.0321	9.50	1.0326
Technical	-0.3223	-18.56	0.7244	-0.3216	-18.56	0.7250
Professional	-0.6470	-13.74	0.5235	-0.6453	-13.74	0.5244
Teaching	-0.4161	-15.03	0.6595	-0.4147	-15.02	0.66054
Other high school	-0.6699	-13.54	0.511	-0.6740	-13.65	0.5096
70-80	0.3387	15.59	1.4032	0.3376	15.56	1.4016
80-90	0.7137	27.82	2.0415	0.7117	27.82	2.0374
90-100	1.3746	39.98	3.9538	1.3720	40.05	3.9434
No answer final degree	0.9211	11.69	2.5122	0.9269	11.79	2.5267
Father low.sec.	0.0446	1.89	1.0456	0.0473	2.01	1.0485
Father high sec.	0.0773	3.18	1.0804	0.0804	3.32	1.0837
Father univ. Degree	0.1420	4.91	1.1525	0.1438	4.98	1.1546
Mother low. Sec.	0.1240	5.23	1.1320	0.12679	5.36	1.1351
Mother high sec.	0.1959	8	1.216	0.19804	8.10	1.2190
Mother univ. Degree	0.2293	7.71	1.2578	0.23140	7.79	1.2603
North East	0.1585	7.3	1.1718	0.13006	5.83	1.1389
Centre	-0.682	-25.97	0.5051	-0.6794	-25.42	0.5068
South and Islands	-0.979	-32.58	0.375	-1.0103	-32.95	0.364
Study in the same region	0.1024	6.28	1.1079	0.0994	6.11	1.1045
Study in another region	-0.039	-1.94	0.9617	-0.033	-1.68	0.9667
Working while studying	-0.402	-24.61	0.6684	-0.4035	-24.71	0.6679
Rented flat	-0.018	-1.16	0.9813	-0.0178	-1.1	0.982
Grant from ISU	0.2654	16.02	1.3044	0.2700	16.29	1.3100
Accommodation from ISU	0.1191	3.65	1.1264	0.1091	3.35	1.1153
Previous univ. exp.	-0.771	-24.61	0.462	-0.7674	-24.54	0.4642
Scientific	-0.3415	-9.29	0.710	-0.3370	-9.19	0.713
Chemical-Pharmaceutical	0.1115	2.09	1.1180	0.1114	2.1	1.1179
Geological-Biological	-0.0606	-1.86	0.9417	-0.0520	-1.61	0.9493
Engineering	-0.4650	-17.45	0.6280	-0.4533	-17.07	0.63551
Architecture	-0.0782	-2.37	0.9247	-0.0741	-2.25	0.9282
Agricultural Sc.	-0.1539	-3.27	0.8572	-0.1079	-2.28	0.8976
Political-Sociological	-0.0423	-1.83	0.9585	-0.0329	-1.43	0.967
Law	-0.6008	-17.76	0.5483	-0.5850	-17.36	0.5570
Liberal Arts	-0.2848	-10.68	0.7521	-0.2805	-10.55	0.7553
Language	-0.307	-10.49	0.7352	-0.3138	-10.7	0.7306
Teaching	0.1209	3.34	1.1285	0.121	3.36	1.1291
Psychology	0.2645	8.27	1.3029	0.274	8.58	1.3154
Sport	0.30299	5.88	1.3538	0.3132	6.06	1.3678
Lnt	1.9209	37.46	6.827	1.916	37.55	6.797
Wald chi2	2318			2337		

Table 5 Estimated effects of the university type on the time-to-degree

College type	(2)	(3)	(4)	(5)	(6)
(II) No controls	-19.7%	-28.3%	-30.5%	-26.6%	-32.5%
(IV) Controls for students characteristics	-15%	-14.5%	-15.7%	-3.6%	-11%
(VI) Controls for students characteristics and for unobserved heterogeneity	- 23%	-22.5%	-16%	-5.7%	-16.9%

Reference group: small universities established by 1960.

Appendix

Table A1 Structure of the data

		Graduation year						
		2004	2005	2006	2007	2008	2009	2010 and after
Enrolment year	2001	X	X	X	X	X	X	X
	2002		X	X	X	X	X	X
	2003			X	X	X	X	X
	2004				X	X	X	X

In grey years not observed. In yellow year observed

X : when an individual potentially graduates

X : when an individual graduates on time

Table A2 Students enrolled at the Italian Universities in the period 2001-2004

Ac. Year 2001/2002	Ac. Year 2002/2003	Ac. Year 2003/2004	Ac. Year 2003/2004
319.264	330.802	338.036	331.893

Source: MIUR Official Statistics.

Table A3 The distribution of graduates' time-time-to degree according to Almalaurea dataset

	Graduates in 2004	Graduates in 2005	Graduates in 2006	Graduates in 2007
On time	100%	65% (60%)	49.5% (49%)	44.7%
1 year later		35% (40%)	35.5% (32.5%)	30.2%
2 years later			14.2% (19%)	17.4%
3 years later				7.4%

Distribution of graduates' time-to-degree if their distribution was the same as in 2007 in brackets.