

Time-to-degree: individual ability, colleges characteristics or what else?

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PRELIMINARY VERSION

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Italian university system faces an average time to bachelor's degree higher than the legal duration. The time needed to take a degree is a measure of the internal efficiency of Universities together with drop-out rates and students satisfaction. This paper aims at investigating which are the main determinants of time-to-degree by using a sample representative of the whole Italian university system. We find that the main determinants of time-to-degree are individual abilities, labour market conditions and Universities characteristics. In particular we find that the heterogeneous performances characterizing different University types are mostly due to differences in the quality of the students enrolled.

Jel Classification: I23; H42; H52

Keywords: Higher education; Publicly provided private goods; Government expenditures and education; Survival analysis; Unobserved heterogeneity.

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1. Introduction and motivation

Italian university system is concerned by two pathologies 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 duration. 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 a specific characteristic 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 spent on average to earn the bachelor's degree overcomes 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 a waste of resources both at an individual and at a collective level. Individuals lose wages for the years when they are still enrolled full time at university and, according to evidence (Brodaty, 2008) those who get a degree with some delay are penalized in terms of earnings when they find a job. At the collective level then, 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.

Time to degree can be the result of several factors related to students' characteristics, students' choices and universities organization. Individual ability is certainly a factor affecting the time taken to earn a degree. Less able or less motivated individuals are less likely to earn their degree on time. Nevertheless if labor market conditions are bad, individuals could rationally choice to stay longer at university as they are not encouraged at seeking a job. Finally, universities' characteristics such as the availability of classrooms, accommodations to host non resident students, rooms devoted to study, but also the organization of exams sessions and the structure of the tuition fees could affect the time spent at university.

This paper aims at investigating factors affecting time to degree in Italy distinguishing among universities and individuals' characteristics as well as labour market conditions. In the years before the adoption of the 3+2 system, Italy was interested by a notable increase of universities' sites which reached its peak in 1998 when several new universities were established. The expansion 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 goal of this expansion was to reduce the historical 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, relation with the surrounding territory, etc. In this paper we then want to establish if new and regional universities established in the last decades in Italy are more or less efficient in terms of time to degree². We classify the Italian Universities according to two criteria: their date of foundation and their size. In particular, regarding the date of foundation, we distinguish among three types of Universities: those founded before 1960, those founded in the period 1960-1989 and, finally, those founded after 1990. The first group includes the "historical" Italian Universities, some of which were established even in the Middle Age. The second group includes those Universities which were founded around the higher education system reform occurred during the 1960s which opened the access to University to any high school graduate, introducing a sort of "Mass University" in Italy. Finally the third group contains the most recent Universities founded in consequence 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.

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.

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

² A paper (Ghinetti e Moriconi, 2009) which ideally is a complement of this investigates the external efficiency of new and regional universities by comparing the labor market outcomes of this two groups of graduates.

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 the fact of spending a longer period at university beyond the legal length is a growing concern in the Italian tertiary education system, empirical evidence on this issue 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 choice 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 diverse 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 rate, 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 during the fourth academic year decreases the probability of spending more years to get a 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, furthermore 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. Moreover, the authors find that those who attend a private university are more likely to take longer to graduate than those who are enrolled in public colleges, a plausible explanation is that, contrary to the Italian situation, private universities across Europe are in general of lower quality than public ones, so they may attract students with lower abilities. Regarding the issue mentioned earlier on, numerous studies have sought to quantify the effect of private schooling on student achievement. The debate is mainly concentrated between the relative quality of public and catholic schools. Evans and Schwab (1995) study, using the HS&B survey and alternative criteria, schools that have important economic consequences, in particular they examine the impact of a catholic school education on the probability of completing high school and then starting university. From their exercise the authors find that there a positive premium associated with the attendance of a catholic institution. They especially highlight that those who are enrolled in a catholic schools are more likely both to get a high school diploma and to go to college, and this probability is also affected by better peer groups.

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' behaviour³, 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

³ See Ours and Ridder (2002), Ehrenberg and Mavros (1995), Ehrenberg et al. (2005), Stock and Siegfried (2000, 2001).

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 associated with an individual who attends an undergraduate degree programme, but the econometric approaches adopted are extremely useful for our analysis as in many studies they have applied survival analysis methods in sharp contrast with what has been done using Italian data.

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 1st level 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 in the same course, 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. As to work with homogeneous individuals we focus only on people who enrolled since 2001 in a 3-years bachelor's degree, excluding then individuals who earned an “old type” degree (4 or 5 years of duration), individuals who shifted from an “old” to a “new” type degree and individuals who earned a second level 2-years degree (master). We also exclude graduates in Medicine which preserved the pre-2001 organization providing a single-cycle degree (laurea a ciclo unico). We finally focus our analysis on graduates from state universities, thus excluding those who awarded their degree from a private university and from universities financed and managed at a regional level⁴.

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

⁴ 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 in graduation sessions, according to the academic year calendar. 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 individual 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 are 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.

But there is another problem affecting data as far as the time to degree is concerned. Almalaurea data are organized by year of graduation, independently from when they students enrolled in their degree course. This implies that in 2007 we do not observe two types of individuals: those who enrolled at university in the years 2001-2003 and who took their degree before 2007 and those who enrolled at university in the years 2001-2004 and who will earn their degree after 2007⁵. 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 year from 2001 to 2004⁶.

⁵ Table A1 in appendix represent the structure of our data.

⁶ 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 in time (those enrolled in 2002) or graduates with a delay of one year (those enrolled in 2001) in 2006 only graduates in time

4. Descriptive statistics

Descriptive statistics are reported for the whole sample and then distinguishing by type of University (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 historical Universities, group 2 to large and historical 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.

Our final sample is composed by 67.985 observations. Observations are not distributed among the six Universities groups uniformly. Group 2, composed by large and historical 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 different number of Universities included in each group and on the number of students enrolled in each University.

Concerning our dependent variable, the average number of sessions goes 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 “historical” Universities perform better in terms of duration than those enrolled in the more recent Universities. With regard to the size, in 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 if they depend also on the Universities characteristics and organization.

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

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.

graduates differ in terms of ability among the six groups of Universities identified. In particular those from large Universities are on average more able than those from small Universities and, among them, those from newly established Universities are the less able.

About the parental background, which is crucial for offspring educational outcomes, graduates from large historical 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 condition 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% had to move to another province of the same region and only 21.1% had to move to another region. Students of newly established Universities are on average less mobile. This can be viewed as a signal of the fact that probably these Universities have been established where the demand of higher education was high. About working experiences, about 70% of the graduates had a part time job during University with no remarkable differences among the six groups. With regards to living condition, 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 the field of study 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 relationship between students' and colleges characteristics and students' 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 l and 1 when they graduate (Jenkins, 2004). The characteristic of our data is that we observe for each individual a complete spell duration as the sample is composed by graduates.

Obviously it is questionable whether all students with the same set of observed covariates face the same expected hazard of graduating. 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 section 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.

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).

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.

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). The comparison of estimates between the two econometric specifications provides interesting insights on the nature of the differences in education choices between natives and migrants.

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 in particular 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 we are not controlling for any students characteristics. However it is interesting to compare these results with those reported in the following specifications so as to evidence if the coefficients of the University types change once controlled for students characteristics. In column (I) all the estimated hazard rates are lower than one, thus evidencing that students enrolled in large or in more recent Universities (after 1960) take a longer 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 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 to achieve their degree. Another proxy for ability is represented by the dummy indicating if students enrolled in a college without graduating. These students have a lower probability to graduate by 37%. Also parental background affects the analysed outcome and students as expected: the more parents are educated the less students stay at University longer than necessary. Quite

interestingly we do not find any statistically significant effect associated to gender. According to our estimates women have the same probability than male to 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%. This result is in line with the literature on this issue which highlight that students' performances at University are strongly affected by the labour market conditions. If there are good job opportunities students experiment higher cost opportunities in staying at University and, as a consequence, they are probably encouraged at achieving their degree on time.

With regard to students experiences at College we find that working part time has a negative effect on the 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 grants from University are then more rapid 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 other 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 in the time-to-degree, differences among students performance in any University type as compared with those of the reference category slightly increase with respect to the estimates of column IV, thus evidencing that there are some. The only University type for which the difference with the reference group remains low is represented by small and post-1990 Universities.

7. Conclusions

This paper investigates the determinants of the time needed to take a bachelor degree in Italy.

By this analysis we evaluate whether such duration, which often go beyond the legal duration, depends only on the ability and motivation of the 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.

According to our results time-to-degree is affected by individual ability, field chosen, working status, labor market and living conditions. Universities 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 relate with teaching staff, better organization of the exam 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 poorer backgrounds. Once controlled for students' characteristics differences among universities narrow but still remain significant thus evidencing 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) Smelite	(2) Bigelite	(3) Smassa	(4) Bigmassa	(5) Smdeco	(6) Bigdeco
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 graduating (discrete time duration models without control for unobserved)

	Specifications											
	(I)			(II)			(III)			(IV)		
	coeff	z	Hazard rates	coeff	z	Hazard rates	coeff	z	Hazard rates	coeff	z	Hazard rates
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
Int	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 graduating (discrete time duration models with control for unobservations)

	(V)			(VI)		
	coeff	z	Hazard rates	coeff	z	Hazard rates
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	2.5	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	9.5	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	8.1	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
Int	1.9209	37.46	6.827	1.916	37.55	6.797
Wald chi2	2318			2337		

Table 5 Estimated effect of the college type on the time-to-degree

College type	(2)	(3)	(4)	(5)	(6)
			$\delta_1 + \delta_2 + \delta_4$		$\delta_1 + \delta_3 + \delta_5$
(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 in 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.