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

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Despite differences existing among tertiary education systems across countries, there is a growing concern about the rise of the time to bachelor degree. Italian university system, in particular, has been traditionally affected by this form of internal inefficiency and a baseline motivation of shorter bachelor degrees introduced in 2001 was the reduction of the average time spent at university. Notwithstanding the remarkable enhancement in terms of study regularity, the average time-to-degree in Italy still remains however larger than the legal duration. This paper aims at investigating which factors are responsible of this poor performance of university students in Italy. Besides students' abilities, parental background and labour market conditions, we include additional controls measured at the university and faculty level. A survival analysis approach indicates that the elapsed time to degree in Italy is the result not only of pre-college conditions, but also of students' choices and behaviour once enrolled at university, external conditions, and of the availability of human endowment and facilities provided by university.

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1. Introduction and motivations

Italian university system has been traditionally characterized by an average time to completion of the bachelor degree longer than the time legally required. Although reduction in time-to-degree was one of the objectives of the 3+2 reform, recent data provided by CNVSU (National Committee for the Evaluation of the Italian University System) show that post-reform students still remain at university beyond the legal duration of their courses[1].

The increase in time spent at university is not however 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 average time taken to earn the bachelor degree exceeds the legal duration. Bound and al. (2007) and 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.

Time-to-degree is an outcome in higher education and can be interpreted as an indicator of the university "internal efficiency"[2]. The delay in college completion represents a waste of resources both at the individual and the collective level, thus affecting the returns to investment in higher education. From an individual viewpoint achieving a degree with a delay entails a reduction in the rate of return to college due both to an increase of the opportunity cost of earning the degree and to the potential wage penalization once students find a job. Although empirical evidence on this issue is scarce, estimates show a negative impact on labour market outcomes of the delay *per se*, once controlled for individual ability. Brodaty and al. (2008) in particular find that a year of delay in the time-to-degree causes a 9% decrease of wages over the first years of career. Adopting a different perspective, Monks (1997) finds that there is an earning penalization positively associated with the age at which students graduate. Furthermore, with regard t t he collective point of view, students who did not achieve their degree on time produce a waste of resources if they can keep on using university assets (classrooms, libraries, faculty time, discounted food and books, etc.) without restrictions, thus contributing to congest university sites. Moreover longer times-to-degree deprive the economics system of new and up-to-date competences as graduates enter into the labour market with obsolete skills.

Time-to-degree can be the result of several factors that operate at the individual, college and macroeconomic level. Especially, we can distinguish among students' pre-college characteristics, students' behavior during university, labour market conditions and university endowments. Individual ability is certainly a key determinant of the time spent at university together with motivation and effort. Nevertheless if labor market conditions are bad, also more talented and more motivated individuals could rationally choose to stay longer at university as they are not encouraged at seeking a

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[1] 9th Survey on the National University System, CNVSU (2009)
[2] Other indicators of university internal efficiency are completion rate (drop out), students' satisfaction, class of degree obtained by students.

job. Moreover human and physical endowments of universities in terms of students per teachers, classrooms' seats, libraries, accommodations, study-rooms can affect the length of the academic experience. In addition, the level of tuition fees could affect the time needed to graduate when a student needs to work to finance studies.

Our goal in this paper is to provide evidence on the actual elapsed-time-to-degree for Italian university graduates. We analyze how students' differences in terms of time-to-degree vary according to their personal characteristics, educational background, labour market conditions, and features of the university attended. At our knowledge this piece of work represents the first attempt of understanding the factors affecting students performances, namely time needed to complete a degree, carried out on a sample representative of the whole Italian university population.

Motivations for this analysis are several. First, we aim at understanding whether ability and effort are the only determinants of students' success or if other factors, measured at the individual or at the institutional level, play a role, thus modifying the rate of return to bachelor degrees. Second, our analysis seeks to provide a contribute to the debate about the use of performance indicators for higher education institutions by showing which factors should be taken into account to design a comparison mechanism among universities. Third, by considering also information related to universities we plan to investigate whether the remarkable institutional differences among Italian universities affect students performances. Even if Italian universities do not differ *de jure* in terms of organization, structure, goals and type of degree provided, they *de facto* differ in terms of dimension, localization, human and infrastructural resources, type of students enrolled, relations with the local territory, etc.[3]

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 provides some descriptive statistics. Paragraph 4 describes the empirical strategy used to identify the determinants of the time-to-degree. Paragraph 5 presents the results of the analysis. Finally paragraph 6 concludes.

2. Literature review

Over the recent years the elapsed-time-to-degree has aroused a growing interest among researchers and policy makers. Notwithstanding this increasing attention, literature on this issue still remains less developed as compared with studies investigating other indicators of students' performances such as completion rates, drop-out, etc. (Herzog, 2006).

Although analyses carried out so far agree on the role played by individual ability and individual effort as the main factors affecting the time taken to graduate, it is possible to distinguish between

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[3] Differences among universities widened in the wake of a widespread expansion of the Italian higher education system in the latest 90s. During this period, Italy was interested by a notable increase of university sites which reached its peak in 1998 when several new colleges were established. The prime purpose of this expansion has been the reduction of the overcrowded, especially widespread in the oldest institutions, in order to improve the efficiency of the entire university system. New universities sites have been established also under local policy maker pressures to boost the economy of the areas

studies which emphasize the effects of the external economic conditions and studies which stress the role of the university institutional characteristics. To the first group of studies belongs the paper by Brunello and Winter-Ebmer (2003) which investigates the determinants affecting the expected college completion time with an analysis conducted at the European level. This study finds that excess time to graduation is higher in countries characterized by a greater share of public expenditure for tertiary education, high unemployment rates and stricter employment protection. In particular they argue that when entry into the labour market is difficult individuals are discouraged from completing in time their studies. The paper of Messer and Wolter (2007) supports the last result aforementioned, as they find that the 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.

To the second group of analysis belongs the paper by Light and Strayer (2000) which attempts to determine whether college quality and students' ability have causal effects on university completion. Their main conclusion is that ability is an important, positive determinant of college success. In addition, they find 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.

According to Bond and al. (2006) the growing stratification of the higher education system, together with the reduction in the public resources devoted to colleges and the corresponding increase of the tuition fees are the main causes of the rise of the time to graduate in the US in the last decades

Furthermore, several researchers have focused on graduate students' behaviour[4] as, especially in the US, the high drop-out rate and the increasing time to complete Ph.D. programmes represent growing concerns for academics and policy makers (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 differ from those associated with an individual who attends an undergraduate degree programme. Nevertheless a few studies on graduates performances (Siegfried and Stock, 2001; Stock and Siegfried 2006) are particularly useful to our goal from a methodological point of view as the type of dataset and the econometric approach used are very similar to those adopted in the present paper.

At the Italian level, notwithstanding the relevance of this issue to the comprehension of the university system inefficiencies, empirical evidence is not widespread because of the paucity of data-set providing such information. An empirical contribution that covers also this aspect has been presented by Checchi et al. (2000). Using administrative data on students enrolled in the University of Milan, they attempt to analyse both college choices and subsequent students' performance. Their

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[4] See Ours and Ridder (2002), Ehrenberg and Mavros (1995), Ehrenberg et al. (2005), Stock and Siegfried (2001).

major findings is that progression towards 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. An *ordered probit* approach has been applied 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, on the whole, 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), then, using a sample of students who got a degree at 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 new organisation of degree programmes does not affect the time needed to complete the degree. Garibaldi et al. (2006), 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 remarkable result is that an increase in tuition fees level during the last academic year decreases the probability of expanding time-to-degree.

3. Data and descriptive statistics

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 used in this paper is composed by individuals graduated in 2008 and enrolled in the period 2001-2005, namely after the reform that suppressed the most 4 or 5 years degree courses and introducing the so called "3+2 system." We are therefore interested in elapsed time-to-degree among individuals receiving their degree in a specific year, namely 2008. In order to work with homogeneous people we focus only on people who enrolled 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 shifted 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 level[5]. The final sample is then composed by 60178 students graduated from 38 universities[6].

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[5] 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.

[6] University of Bari, Basilicata, Bologna, Cagliari, Camerino, Cassino, Catania, Catanzaro, Ferrara Firenze, Foggia, Genova, Messina, Modena and Reggio Emilia, Padova, Parma, Perugia, Piemonte Orientale, Roma La Sapienza, Roma Tre, Molise, Napoli II, Sassari, Siena, Torino, Torino Politecnico, Reggio Calabria, Trento, Trieste, Udine, Venezia Ca' Foscari, Venezia IUAV, Viterbo Tuscia.

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 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 our analysis. The exact day when a student graduates in Italy does not only depend on student's ability, but also on calendar of the graduation sessions by each university. Since there is not a rule set at a national level, each university can organize the graduation sessions autonomously, thus affecting 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 starts the 1st May and ends the 31th August, the second graduation session is 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.

There is an additional problem affecting data when time-to-degree is considered. AlmaLaurea data are organized by year of graduation (outflow sample), independently from when students enrolled in their degree course. This implies that in 2008 we do not observe two types of individuals: those who enrolled at university in the years 2001-2005 and who took their degree before 2008 as well as those who did not yet graduate[7]. Nevertheless, if two conditions hold, namely if the number of students enrolled at university and their time-to-degree distribution did not significantly change for the different cohorts of first enrollment (2001-2005), time-to-degree observed for the 2008 graduates' cohort is not different from that which would be observed if one could follow one entire freshmen's cohort of whatever year[8]. As regard the first condition, according to the data provided by the Italian Ministry of Education (MIUR) and reported by Baldissera and al. (2009), the number of first enrollments during the academic years from 2001/2002 to 2004/2005did not significantly change[9]. Concerning the second condition Baldissera and al. (2009), by matching data on graduates provided by AlmaLaurea with data on first enrollments provided by MIUR, calculate the distribution of the time-to-degree by cohort of first enrollment during the period 2001-2004 finding that the percentage of graduates on time and with a delay of one year did not significantly change nor in the complex nor at the level of each university. The two conditions holding, we can be confident that 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 2004.

In order to control for the effect of institutional characteristics we match the AlmaLaurea data set with several information on university endowments in terms of human and physical "capital"

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[7] Table A1 in appendix represent the structure of our data.
[8] On the problems of data arising from outflow samples to study this issue see Bowen and al. (1991) and Sigfried and Stock (2001).
[9] 175.218 in the academic year 2001/2002, 181.562 in 2002/2003 , 184.208 in 2003/2004.

which allow us to calculate four different indicators. First, we use a comprehensive index provided by the first available edition (2006) of the Grande Guida dell'Università by Repubblica/L'Espresso which takes into account colleges endowment in terms of structures devoted to students' activities such as seats in the classrooms, in the libraries and in the laboratories. This indicator represents a proxy of the overall resources provided by each university. However, since there is great variation in terms of available resources also within Italian universities among different faculties (Facoltà)[10], we exploit two other indicators defined at the faculty level. These indicators, calculated on the basis of several dataset provided by MIUR[11], are respectively the student per teacher and the student per seat in the classroom ratios. Both indicators have been calculated in the first academic year in which students in our sample could enrol (2001/2002). Finally, to test the robustness of our results, we use another comprehensive indicator of the quality of the teaching activity provided (at the faculty level) by the Grande Guida dell'Università by Repubblica/L'Espresso[12].

Descriptive statistics are reported for the whole sample in table 1, which includes mean and standard deviation of elapsed time to degree..

[TABLE 1 AROUND HERE]

The average number of sessions needed to graduate is 4.5 which corresponds to a medium delay of about one year and a half.

Women, which represent the majority of the graduates population, take a shorter time on average to earn the degree. These figures confirm that girls study more and achieve better performances within the educational system. As regard previous schooling experiences, students with general high school diploma (licei) finish their undergraduate studies faster than those with other high school degrees. We also notice a negative relation between the time spent to get a degree and the final mark at high school. In particular the difference between those with the lowest and the highest leaving grades (60-70 vs 90-100) is, on average, of 2.5 graduation sessions corresponding to around ten months. We then observe, as expected, that the time needed to earn a degree decreases with both parents' educational level and that individuals who already failed during past academic experiences are slower.

When we consider the geographical area, we notice that students who attend a college located in Southern Italy stay longer at university, as compared with those studying in a Northern region. It is

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[10] In Italy state university traditionally apply an "open-door" policy with no restrictions at the entry. This policy entails that faculties can greatly differ in terms of enrolment rate and this has effects on the resources available at per capita level.
[11] MIUR, Ufficio Statistico.
[12] This guide provides further comprehensive indicators on other aspects of universities quality such as the level of the research activity, the strength of the international relationships and so on. We have decided to exploit however only those indicators which are more connected, almost in principle, with students' performances in terms of time-to-degree.

noteworthy that students who have to move to attend classes (to another province of the same region or to another region) are faster than those who remain in the province of residence of their family. About the field of specialization data show a remarkable heterogeneity, probably due to the diverse levels of effort required along with different job opportunities associated to each field.

When we look at college characteristics in terms of dimension and localisation, we find that students enrolled in small and non-metropolitan colleges are faster than those enrolled in large and metropolitan colleges[13]. Concerning university (faculty) endowments in terms of human and physical assets we rank universities (faculty) according to each of the four indicators above described and we define for each rank five tiers. In each case Tiers 1 and Tiers 5 respectively represent the "richest" and "poorest" colleges/faculty[14]. Looking at students performances we observe that, overall, students enrolled in poorest colleges (faculties) take longer time to graduate. We especially notice that the higher is the rank in terms of the comprehensive indicator on college' structures (Tier_CI_Structures) the lower is students average time-to-degree.

4. 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 results[15]. 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.

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[13] Following ISTAT classification of metropolitan areas we define as "metropolitan" the following universities: Bari, Bologna, Cagliari, Catania, Firenze, Genova, Messina, Roma La Sapienza, Roma Tre, Napoli II, Torino, Torino Politecnico, Trieste, Venezia Ca' Foscari, Venezia IUAV.

[14] As an example, faculties ranked in the Tier_1 student/teacher ratio are those with the *lowest* number of students per teacher, namely the "richest" in terms of human capital resources. Faculties ranked in the Tier_5 students/teacher are, on the contrary, whose with the *highest* number of students per teacher, namely the "poorest" in terms of human capital resources.

[15] 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.

The variables included in the estimation are of several types. Concerning pre-enrolment characteristics we control for gender, type of high school attended, leaving grade obtained, and parents' education. As regards post-enrolment variables we include controls for the area of residence at university, the field of study chosen, movements to other provinces of the same region or other regions to attend university, working condition, type of accommodation and class attendance. Finally we control for the whole set of institutional characteristics of the college attended.

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 "intrinsically" more or less likely to graduate in any session. Ignoring unobserved heterogeneity may then produce a bias in the results.

As a consequence, we present results obtained controlling for unobserved heterogeneity issues. Denoting with v the unobserved component shifting schooling duration (where v 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 v 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.

5. 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/faculty characteristics do matter as well.

Table 2 presents the results of a specification that controls only for information provided by AlmaLaurea data set, namely pre-collegiate characteristics, type of degree course attended, college localisation (macro-area), living and studying conditions, class attendance. In table 3 we then report the results of five additional specifications that take into account a number of institutional controls measured at the college or at the faculty level. In this case we only report the estimated coefficients of those institutional variables as the results of the other characteristics do not remarkably change. In specification (I) we control for the "type" of college distinguishing between small-medium and large-mega colleges and between regional and metropolitan. Specification (II) introduces controls about availability of physical assets at the college level on the basis of the comprehensive index above described. In specifications (III), (IV) and (V) we then introduce controls measured at the faculty level in a linear form (III) or on the basis of rankings (IV and V).

All specifications control for unobserved heterogeneity. We report both coefficients and hazard ratios where the latter represents the complement to one of the probability of graduating[16].

[TABLE 2 AROUND HERE]

Concerning table 2 we first notice that the logarithm of the duration has a positive and statistically significant effect on students' withdrawal. This is a standard result and suggests that students are more likely to graduate as time elapses. Looking at students' characteristics we observe that females are slightly slower in achieving their bachelor degree. This result, which appears in contrast with the huge empirical literature on women's educational performances, can have several explanations. Women have in general better results at school and tend to enrol more in some types of college, namely those considered as less effort-demanding. Once controlled for schooling ability and for the type of college girls turn out to be slower than boys. A different explanation could involve the worse labour market conditions expected by women in terms of unemployment rate and wage differentials that could lead them to postpone graduation to achieve a higher leaving grade. Concerning previous education we find that students with technical or professional diploma take more time to achieve their degree with respect to those with general backgrounds (licei). Interestingly also, students who graduated abroad, independently of the high school diploma, face a greater probability to get their bachelor degree beyond the legal length with respect to the reference category (general Italian high school diploma). Probably these students, who represent only 1.4% of the whole sample, are more motivated or have higher opportunity costs as they had to move from their country of origin to enrol in an Italian university. Still focusing on previous educational performances, high school leaving grades are very good predictors for college outcomes, too. Namely, any grade over 70[17] increases the probability to graduate in any session from 25%, for those with a leaving grade ranging from 70 to 80, to 132% for those with a leaving grade over 90. Another proxy for ability is represented by previous not successful college experiences. According to our estimates students who experienced a drop out from a foregoing bachelor degree have a lower probability to graduate in any session by 35%. Looking at parental background, we find that parents' education affects students' outcomes in the expected ways even if their effect is quite small. This result is in line with the empirical literature which shows that parental education affects children outcomes mainly at the beginning of their educational path .

A variable which strongly influence students' performance in terms of time-to-degree is represented by the macro-area of study. Notably students living in Centre regions are less likely to graduate in any session by 30% and, those living in Southern regions by about 44% with respect to the reference category (North Western area). According to our estimates students from North Eastern

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[16]For 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.

[17] In Italy high school leaving grades range from 60 to 100.

regions are the most time-savings. These results seem to be in line with the real business cycle explanation introduced in previous studies (Brunello and Winter-Ebmer, 2003; Messer and Wolter, 2007) according to which students' performances at university are strongly affected by the labour market conditions: in presence of good job opportunities students face higher cost opportunities in staying at university and, as a consequence, they are encouraged to earn their degree on time. Quite interestingly, we then find that students who move to another province of the same region or to another region to attend university courses are faster than those who do not move, thus suggesting that having a university "at home" do not necessarily improve students' performance.

When we look at the field of study we find that students in any fields, apart from sociology, political sciences, teaching, psychology experience a lower probability to graduate in any session with respect to the reference category - students in business administration, economics and statistics. For some fields (scientific or engineering) this result is likely due to a greater difficulty associated with such studies, while for the remaining it is probably the effect of less job opportunities.

Time-to-degree is not however only the result of pre-college characteristics or of the field of study chosen but it is also affected by students' behaviours during university. Since decisions taken by the state or by universities can modify these behaviours, following results can provide some advices on the type of policies to be implemented to reduce delays to bachelor degree. Our results show in particular that students working part-time are less likely to graduate in any session by 25%. Subtracting time to the study, on the one hand increases financial resources, on the other hand it enlarges the time required to graduate, thus nullifying the positive effect on students' economic conditions. Furthermore, living in a rented flat and, as a consequence, outside the household, slightly decreases the probability to graduate in any session. This negative result, which is partly in contrast with previous results on the positive effect of mobility, could depend on the fact that living on one's own again reduces the time devoted to study and it probably calls for a job to support studies. Students living in an accommodation provided by universities are instead more likely to graduate faster but this is probably due to a partially merit-based system to provide this kind of accommodation . As expected then, effort is positively correlated with the compulsory time to graduation: students who have attended more than 75th of the classes of their study plans are more likely to graduate in any session by more than 70%. This result is in line with previous work on this issue arguing that the introduction of a mandatory attendance to improve students performances should deserve a great attention (Romer, 1983). The estimated coefficient of class attendance is not remarkable *per se* but because the effect of the other covariates is "cleaned out" by this measure of students' effort[18].

[TABLE 3 AROUND HERE]

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[18]In a previous version of the estimates, that did not include any control for effort, we found that the coefficient associated to women was not statistically significant. The comparison of these results suggests that probably women are more likely to attend classes regularly and that, once controlled for their effort, their performances are worst.

Concerning the characteristics of the university in which students are enrolled we firstly include two additional dummies, one for colleges with less than 20.000 students (small colleges) and one for colleges located in a non metropolitan area. Students enrolled in small colleges might benefit of stricter and easier relationships with both teachers and colleagues and of less crowding during classrooms and exams sessions. But, on the other side, they could be penalized in terms of choice of the courses to attend and of the teachers. Moreover, if the number of students enrolled in a college reflects the quality of teaching activity, students enrolled in smaller universities could be penalized also by a lower quality of the courses attended. Concerning university location, as noted by Calcagno and al. (2008), there are no a priori any reason to expect a particular effect, except for the possibility that individuals studying in an metropolitan area could spend more time to reach the university and could enjoy of more alternative uses of their time, thus reducing studying time. Quite interestingly in specification (I) we find that studying in a small college does not provide, *ceteris paribus*, any particular advantage while studying in a non-metropolitan college slightly increases the probability to graduate in any session. However, when we control for colleges endowments in terms of structures in specification (II) we find that the coefficient of college location is no more statistically significant. Moreover, according to our estimates colleges endowments positively affect students' outcomes. Any dummy associated with tier 1 to tier 4 is higher than one and statistically significant at 1% level, thus suggesting that the richer are the structures available to students the lower is the elapsed time-to-degree. Interestingly then this effect is not linearly increasing with the structure rank as the highest coefficient is associated with tier 2[19]. Concerning faculties endowments, measured in terms of students per teacher and of students per classroom seat, the results of specification (III) show that an increase of both ratios (in log) entails a reduction in the probability of obtaining the degree in any session. When we introduce the tiers of the same indicators to get a broader view of the effect of faculties endowments (IV), we find however that the corresponding coefficients are only significant for the students per teacher ratio. According to our estimates students enrolled in those colleges which rank better in terms of students per teacher ratio, namely which have less students per teacher, need less time to achieve their degree, once controlled for the other individual characteristics. The last estimates, represented in specification V, which controls for a comprehensive index summarising faculties teaching quality do not show a clear effect as the only statistically significant coefficients are those associated to the second and third tiers.

6. Concluding remarks

This paper investigates the determinants of elapsed time to get a bachelor degree in Italy. By

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[19] Once controlled for university infrastructural endowments we also find that the hazard rations of the Centre and Southern universities raise respectively by 11 and 9 percentage points, thus signalling that differences in students performances within Italy are due, almost in part, to non homogeneous infrastructural conditions among universities. Estimates are available upon request.

this analysis we evaluate whether such duration, which often goes beyond the legal duration, depends only on the abilities and the motivations of students or if other factors, included institutional 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 university characteristics.

According to our results time-to-degree is, as expected, affected by students' ability at school, measured by their previous educational outcomes. However, we find that students performances at university do not only depend on their intrinsic characteristics: ability being equal, students' effort in terms of class attendance, together with the time devoted to study and living conditions matter as well. We also find that, ceteris paribus, individuals who study at university located in the Centre and, mainly, in the Southern Italy take a long time to graduate. Since our estimates are obtained also controlling for university endowments in terms of physical and human resources, we argue that this result can depend on the less "appealing" labour market conditions which characterize these regions and which do not encourage students at concluding their studies on time. University characteristics in terms of human and physical resources provided to students affect their time-to-degree, too. Assuming that the difficulty level of the degree courses is homogeneous along with universities, this result could be interpreted as the effect of better studying conditions provided by those colleges which can rely on richer infrastructures and on a greater number of teachers.

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Tables

Table 1 Descriptive statistics

		Mean sessions	Standard Deviation
Observations	60178	4.495	3.374
Female	0.601	4.390	3.330
Male	0.399	4.653	3.434
High school track			
General	0.593	4.276	3.345
Technical	0.281	4.753	3.397
Professional	0.020	5.019	3.348
Teaching	0.070	4.868	3.427
Other	0.035	5.084	3.299
Foreign	0.014	4.740	3.287
High school leaving grade			
60-70	0.166	5.952	3.520
70-80	0.220	5.203	3.447
80-90	0.219	4.556	3.325
90-100	0.382	3.412	2.915
Father and mother education			
Father primary school	0.081	5.114	3.516
Father lower secondary	0.287	4.565	3.388
Father upper secondary	0.417	4.441	3.344
Father university degree	0.190	4.140	3.286
Mother primary school	0.080	5.286	3.528
Mother lower secondary	0.282	4.593	3.369
Mother upper secondary	0.450	4.373	3.326
Mother university degree	0.166	4.165	3.336
Previous university experiences	0.067	5.838	3.538
Geographical area			
North West	0.141	3.909	3.149
North East	0.355	3.687	3.148
Centre	0.226	4.895	3.284
South and Islands	0.278	5.498	3.516
Mobility			
Study in the same province	0.519	4.720	3.404
Study in another province of the same region	0.270	4.307	3.343
Study in another region	0.211	4.180	3.300
Field of study			
Economics-statistics	0.186	4.157	3.398
Scientific	0.042	4.393	3.536
Chemical-Pharmaceutical	0.017	4.212	3.397
Geological-Biological	0.052	4.465	3.392
Engineering	0.131	4.446	3.451
Architecture	0.061	4.646	3.083
Agricultural Sc.	0.022	4.635	3.271
Political-Sociological	0.140	4.471	3.331
Law	0.052	5.535	3.476
Humanistic	0.121	4.788	3.332
Foreign Languages	0.076	4.360	3.189
Teaching	0.044	4.893	3.326
Psychology	0.049	3.904	3.395
Other characteristics			
Working during studies	0.721	4.748	3.425
Living in a rented flat	0.357	4.502	3.392
Accommodation from ISU	0.044	4.355	3.160

| Class attendance (more than 75%) | 0.699 | 3.959 | 3.208 |

Table 1 Descriptive statistics (continues)

		Mean sessions	Standard Deviation
Type of college			
Small (less than 20.000 students)	0.169	4.278	3.327
Large (more than 20.000 students)	0.831	4.539	3.382
Regional	0.401	4.398	3.372
Metropolitan	0.599	4.560	3.375
Institutional characteristics (at College level)			
Tier 1_CI_Structures	0.163	3.993	3.232
Tier 2_CI_Structures	0.150	3.749	3.094
Tier 3_CI_Structures	0.325	4.042	3.288
Tier 4_CI_Structures	0.142	4.339	3.341
Tier 5_CI_Structures	0.221	5.438	3.423
Institutional characteristics (at Faculty –Facoltà – level)			
Tier 1_Students/teacher	0.104	4.090	3.332
Tier 2_ Students/teacher	0.200	4.210	3.306
Tier 3_ Students/teacher	0.202	4.545	3.343
Tier 4_ Students/teacher	0.285	4.445	3.345
Tier 5_ Students/teacher	0.210	4.985	3.470
Tier 1_Students/classroom seat	0.113	4.361	3.364
Tier 2_ Students/classroom seat	0.199	4.353	3.350
Tier 3_ Students/classroom seat	0.218	4.608	3.350
Tier 4_ Students/classroom seat	0.207	4.448	3.404
Tier 5_ Students/classroom seat	0.262	4.514	3.381
Tier 1_CI_Teaching	0.172	4.270	3.387
Tier 2_CI_Teaching	0.204	4.490	3.412
Tier 3_CI_Teaching	0.255	4.320	3.373
Tier 4_CI_Teaching	0.176	4.633	3.357
Tier 5_CI_Teaching	0.193	4.805	3.312

Tiers_CI_Structures are defined on the basis of a comprehensive indicator (CI) provided by the Grande Guida dell'Università by Repubblica/L'Espresso which takes into account colleges endowment in terms of structures devoted to students' activities such as seats in the classrooms, in the libraries and in the laboratories. Tiers_Students/teacher are defined on the basis of the data on teachers and students provided by the Italian Ministry of Education (Ufficio Statistico) for each faculty (Facoltà). Tiers_Students/classroom seat are defined on the basis of the data on classroom seats and students provided by the Italian Ministry of Education (Nuclei di Valutazione and Ufficio Statistico) for each faculty (Facoltà). Tiers_CI_Teaching are calculated on the basis of a comprehensive indicator (CI) provided by the Grande Guida dell'Università by Repubblica/L'Espresso which summarizes the following information on teaching activities at the faculty (Facoltà) level: number of degree and courses provided, ratio teachers/courses, teachers/students, classroom seats/students, internships availability, presence of a monitoring-evaluation activity on teaching quality

Table 2 Probability of graduation (discrete time duration models with control for unobserved) with no controls for colleges/faculty endowments

	Coeff.	Z	Hazard ratios
Female	-0.035	-3.43	0.965
Technical	-0.213	-18.29	0.808
Professional	-0.381	-11.81	0.683
Teaching	-0.245	-12.71	0.783
Other high school Italian diploma	-0.434	-13.56	0.648
Foreign high school diploma	0.963	0.93	2.618
High school leaving grade 70-80	0.220	15.09	1.246
High school leaving grade 80-90	0.435	26.7	1.544
High school leaving grade 90-100	0.844	41.23	2.325
No answer high school leaving grade	-0.429	-0.41	0.651
Father low.sec.	0.066	3.96	1.068
Father high sec.	0.070	4.14	1.073
Father univ. Degree	0.134	6.74	1.144
Mother low. Sec.	0.075	4.44	1.078
Mother high sec.	0.108	6.27	1.114
Mother univ. Degree	0.122	5.91	1.130
Previous univ. exp.	-0.427	-22.58	0.652
North East	0.103	7.16	1.109
Centre	-0.362	-22.19	0.696
South and Islands	-0.577	-32.12	0.561
Study in another province (same region)	0.105	9.24	1.111
Study in another region	0.058	4.08	1.060
Scientific	-0.313	-12.91	0.731
Chemical-Pharmaceutical	-0.151	-4.35	0.860
Geological-Biological	-0.234	-10.51	0.791
Engineering	-0.483	-25.64	0.617
Architecture	-0.186	-8.68	0.830
Agricultural sciences	-0.158	-5.02	0.854
Sociology and Political sciences	0.017	1.06	1.017
Law	-0.387	-16.99	0.679
Humanities	-0.199	-11.57	0.819
Foreign Languages	-0.157	-8	0.854
Teaching	0.094	3.86	1.099
Psychology	0.237	10.06	1.267
Working while studying	-0.280	-24.98	0.756
Living in a rented flat	-0.091	-8.05	0.913
Accomodation from ISU	0.081	3.68	1.085
Class attendance (more than 75%)	0.448	33.75	1.565
Lnt	0.407	22.98	1.502
LR test of rho=0 chi2		19.53	
Observations		273083	
Groups (Individuals)		60178	

Table 3 Probability of graduation (discrete time duration models with control for unobserved) with controls for colleges/faculty endowments

	Coeff.	Z	HR	Coeff.	Z	HR	Coeff.	Z	HR	Coeff.	Z	HR	Coeff.	Z	HR
		(I)			(II)			(III)			(IV)			(V)	
Institutional characteristics (University level)															
Small colleges (less than 20.000 students)	.0034	0.26	1.0034	-.0024	-0.14	0.9976	.0004	0.03	1.0004	-.0045	-0.34	0.9955	.0117	0.88	1.0117
Regional colleges	.0320	3.14	1.0325	-.0124	-1.1	0.9877	.0143	1.36	1.0144	.0100	0.92	1.0100	.0326	3.14	1.0332
Tier 1_CI_Structures				.2231	10.64	1.2500									
Tier 2_CI_Structures				.2625	10.85	1.3001									
Tier 3_CI_Structures				.2071	11.72	1.2300									
Tier 4_CI_Structures				.0696	4.56	1.0721									
Institutional characteristics (Faculty level)															
Students per teacher (ln)							-.0654	-4.57	0.9367						
Students per classroom seat (ln)							-.0289	-2.74	0.9715						
Tier 1_ S/T										.2102	7.59	1.2339			
Tier 2_ S/T										.1784	8.39	1.1953			
Tier 3_ S/T										.0721	3.87	1.0748			
Tier 4_ S/T										.0647	4.15	1.0668			
Tier 1_ S/S										.0257	1.16	1.0260			
Tier 2_ S/S										.0343	-1.86	0.9663			
Tier 3_ S/S										.0019	0.12	1.0019			
Tier 4_ S/S										.0056	0.4	1.0056			
Tier 1_CI_Teaching													.0146	0.92	1.0147
Tier 2_CI_Teaching													.0714	4.75	1.0741
Tier 3_CI_Teaching													.0696	4.95	1.0721
Tier 4_CI_Teaching													-.0105	-0.70	.9895
LR test of rho=0 chi2		20.21			32.27			26.47			28.36			24.44	
Observations		273083			273083			267487			267487			273083	
Groups (Individuals)		60178			60178			59241			59241			60178	

Estimates obtained by including all the covariates shown in table 2.

Appendix

Table A1 Structure of AlmaLaurea data-set

		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
	2005					**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