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**AN ECONOMETRIC ANALYSIS OF STUDENT
WITHDRAWAL AND PROGRESSION IN POST-REFORM
ITALIAN UNIVERSITIES**

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AN ECONOMETRIC ANALYSIS OF STUDENT WITHDRAWAL AND PROGRESSION IN POST-REFORM ITALIAN UNIVERSITIES

Abstract:

As in much of Europe, and in the particular context of the Bologna Convention on tertiary education, the Italian university system has experienced substantial reform in recent years, the major aims of which include increasing the participation, progression and retention rates of students in higher education. Reform has reduced the length of undergraduate degree programmes to three years with the intention that students should be able to graduate at an earlier age than in the past, in line with graduates from other European countries. This paper offers a first econometric analysis of student withdrawal and progression three years after the introduction of major reform. We use administrative data on students of two Italian universities in a probit model of the probability that the student drops out, and an OLS model of student progression. Our analyses suggest that, notwithstanding the reforms, the drop-out (withdrawal) rate is still very high and only a small proportion of students are likely to complete their studies within the institutional time. In particular, we find that differences in students' prior educational background and performance have remarkably large effects on their withdrawal and progression probabilities. We infer from our results that poor retention and completion rates of Italian university students are unlikely to improve without further significant institutional change.

Keywords: Dropping out, student progression, probit models, university reform.

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1. Introduction

Following the Bologna Convention of the EU in 1999, the Italian university system – like many others in Europe – has been experiencing a process of radical and ongoing reform. In the Italian context, this process has several major aims. First, there is the objective of raising the participation rate of young people in higher education (HE). OECD figures for 2001, for example, show that while the OECD mean for the percentage of the population aged 25-34 graduating from HE was 28%, the corresponding figure for Italy was just 12%. Second, there is an awareness that the drop-out rate of students from HE is very high in Italy and there is a policy objective to reduce this. Figures from MIUR (Ministero dell'Istruzione, Università e Ricerche) indicate that approximately 20% of students in Italian universities drop out in their first year alone. By way of comparison, the equivalent figure for the UK is less than half this. Third, even for students completing their studies in HE in Italy, the time to completion is much longer than in most other countries. Prior to reform, fewer than 10% of students graduated within the typical institutional four-year degree period. A remarkable 40% graduated four years or more after the expiry of the four-year period. A chief aim of that part of the reform concerned with the introduction of a '3+2' model for undergraduate degrees is to accelerate progression and the completion of studies. The difference between actual years taken to complete a degree and the institutional time established for the degree course programmes is typically higher for Italian university students than students from other European countries. On average, students in Italy graduate in their late 20s rather than in their early 20s as in other European countries. This is seen as acting as a break on labour market efficiency. An important policy objective behind reform is to enhance the efficiency of the transition of graduates into the Italian graduate labour market.

The reform has changed the length, content and structure of the degree programmes, through the adoption of a '3+2' model, consisting of a First Degree (*Laurea di primo livello*) which lasts three years, followed by a two-year Specialised Degree (*Laurea specialistica*). The reduction in the official length of undergraduate degree programmes to three years (from the original duration of four or five years), and the increased variety of curricula offered seem to

have been successful in encouraging greater participation. This is documented by recent aggregate statistics constructed by the Ministry of Education, University and Research (MIUR, 2004) which indicate that more students have been attracted to tertiary education, therefore suggesting that the new curricula offered have met the needs of a larger number of youngsters. Whether the reformed system is achieving a reduction in the dropout rate and enabling students to complete their studies within the established three-year period are crucial issues to be addressed in order to monitor the effects of the reform.

Studies devoted to the analysis of higher education outcomes have attracted a high level of interest in countries like the UK, where various policy initiatives have also been implemented in recent years. This has led to a growth in the number of academic studies evaluating issues such as the determinants of student progression through university (see, for example, Smith *et al.*, 2000, and Smith and Naylor (2001a, 2001b)). This work has exploited the release of full individual records for the cohorts of students leaving UK universities. A selective survey of recent work can be found in Boero *et al.* (2001).

Contrary to other countries, especially the US and the UK where the literature on educational outcomes is well developed, the research in this area is not so well-established in Italy, where the empirical work is complicated by the fact that no consistent national data-set is available with full individual student records. However, in recent years there have been a number of studies dedicated to the performance of Italian university students. Biggeri, Bini and Grilli, (2001) focus on issues related to the transition from university to work using data from the 1995 ISTAT survey on job opportunities, on students graduating in 1992. Boero, McKnight, Naylor and Smith, (2001) use the more recent 1998 ISTAT survey on students graduating in 1995 to analyse the factors affecting graduate performance and the determinants of graduates' pay. There are also various studies that have used data on individual students from particular universities. For example, Gori and Rampichini (1991), Bulgarelli (2002) and Ferrari and Laureti (2004a, 2004b) have conducted various analyses of the academic performance of students at the university of Florence, Checchi (2000) and Checchi *et al.* (2004) for the university of Milano-Bicocca, and Staffolani and Sterlacchini (2001) for four universities of the Marche.

Little work has been done on the two major problems that afflict the Italian university system: high dropout rates and the exceptionally long duration of study prior to completion. Moreover, as far as we know, there are as yet no studies devoted to the analysis of the performance of Italian university students in the reformed system.

In this paper, we present a first analysis of post-Reform outcomes concerning student retention and progression, three years after the introduction of the 3+2 model. We begin in Section 2 with a brief overview of recent trends in the levels of educational achievements in Italy in comparison to experiences in other countries, and a descriptive analysis of the first results of the university reform in terms of the number of students entering higher education, dropout rates and the number of graduates. In Section 3 we conduct an econometric analysis to identify the determinants of the probability of dropping out from university and of student progression, using administrative individual-level data for two Italian universities, namely Cagliari and Viterbo. In Section 4 we close the paper with a summary of key results, conclusions and further remarks.

2. Higher Education attainment in Italy and University Reform

As documented by recent OECD statistics (Education at a Glance, 2003), Italy is characterised by low educational attainment at both secondary and tertiary levels compared to other OECD countries. The percentage of graduates in the 25-34 age group was only 12% of the total population for Italy (year 2001) compared with an OECD average of 28%. More specific figures for other countries are 39% for the US, 29% for the UK, 34% for France, 22% for Germany, 36% for Spain, 48% for Ireland and 37% for Sweden. The only other EU country with a similar average to Italy is Portugal (14%). These low figures for Italy are partly due to low secondary school attendance. In 2001, 57% of the population aged 25-34 had attained at least upper secondary education (OECD, 2003), compared with 68% for the UK, 78% for France and 85% for Germany.

There have been several reforms regarding secondary and tertiary education in Italy which have tried to improve average educational attainment, the most recent being the reform of the university system that was introduced in 2001.

The reform of the Italian university system¹ came into effect in the academic year 2001/2, although some universities applied it on an experimental basis in the academic year 2000/1. The main purpose of the reform was to grant full autonomy to universities for management and finance as well as for teaching and course planning. The reform abolished the old three year degree or short programme (*diploma universitario*) and the old long programme degree (*laurea*) and introduced a new academic qualification organised in three cycles: (1) first cycle of 3 years official duration leading to a Degree qualification, (2) second cycle of 2 years official duration leading to a Specialised Degree and First Level Masters Degree, (3) third cycle – postgraduate studies leading to a Research Doctorate Degree and Second Level Masters Degree. The reform has taken into account the principles of the Sorbonne Declaration and the Bologna Declaration which promote the creation of a European Higher Education Area through the harmonisation of the different European educational systems.

The introduction of the 3+2 scheme was intended to reproduce, at the first degree level, the UK model of the three year Bachelor course with the aim of attracting more youngsters towards shorter degree courses characterized by a professional profile, and with the objective of increasing the number of graduates. Since 2001, the number of entrants to university has increased, with a total increment over the three years of implementation of the reform of 19.6% with respect to 2000. In 2001, 73% of the population aged 19 had achieved the *maturità*, and another 73% of *maturi* entered University. In the years prior to the reform, the proportion of *maturi* on the population aged 19 was about the same (70% on average in the years 1996-2000), but only 65% of *maturi*, (65.1% on average over the years 1996-2000) enrolled to university (Miur-Cnvsu², 2004).

Two major problems of the Italian University are the high dropout rate and the lengthy process typically taken for graduation. Recent OECD data on survival rates in tertiary education (measured as the ratio between number of graduates and number of new entrants at the typical entrance age) document the lowest figure for Italy (42%), compared to an OECD average

¹ The ministerial decree no.509 3/11/99 established the new framework and identified the general criteria for universities to autonomously design their new degree courses.

² Comitato Nazionale per la Valutazione del Sistema Universitario (National Committee for the Assessment of the University System)

of 70%, 83% for the UK, 70% for Germany and 77% for Spain (OECD, 2003). The reduction in the dropout rate is an important objective of the reform.

As documented by the recent MIUR University Education Survey, for the three cohorts of students who entered university in the years 1998-2000, the average dropout rate is about 20%, and it is higher for male students (23% on average) than for female students (18% on average). As shown in Table 1, the dropout rate varies according to the subject studied: it is highest for scientific (27.5%) and geo-biology (27.4%) disciplines, while it is lowest for medicine (2.6%).

One aspect of poor progression in Italy stems from the high proportion of students who are officially 'inactive' – that is, who have failed to accumulate exam credits for the courses for which they are registered. For the same cohort of entrant students (2000/01), Table 2 reports the ratio of inactive students to the total number of entrants. The overall figure for inactive students is very high at 19.5% of the total. As can be seen from Table 2, there are remarkable differences across faculties, with Medicine showing the lowest percentage of inactive students (11.5%), while Sociology, Law and Politics register the highest percentage (34.4%, 25.9% and 22.3%, respectively).

Completion rates, measured as the number of graduates per 100 students enrolled 6 years before, distinguished by subject studied and type of secondary school attended, are shown in Table 3. As can be seen, less than half of students have graduated even 6 years after enrolment. The completion rate is highest (62%) for students who have attended a lyceum and lowest (22.6%) for students with a qualification from a vocational institute.

With regard to the timing of graduation, in contrast with other university systems, students in Italy only rarely complete their studies within the time institutionally established for the degree course programme attended (less than 10%). The majority of students are the so called '*fuori corso*' (registered with an extension). This situation is documented in Table 4 which reports, for the cohorts of graduates in the years 1999-2002, the percentage of 'regular' graduates and of those who graduated 1 to 4 years after the official

institutional time. More than 40 percent of the students who graduated in the years 1999-2002 completed their studies four years after the institutional time expected for their degree course. The percentage of “regular” students varies by Faculties (CNVSU, 2004) ranging from a high percentage in Medicine and Surgery (43.7%) to low percentages in Economics (5.8%), Modern Languages (3.7%) and Law (2.5%).

As a consequence of this phenomenon, Italian graduates are typically older than graduates in the other European countries. According to the CNVSU data, only a small proportion of graduates are less than 24 years old (14.1% in 2000 and 17.5% in 2002), while the highest percentage of graduates are between 25 and 29 (67.1% in 2000 and 60.1% in 2001). Finally, 18.8% of the 2000 cohort (22.4% of the 2002 cohort) is over 30. The shorter duration of the new Italian first level degree courses has been thought to bring the Italian graduates in line with the other European graduates (Istat, 2004).

The indicators discussed in this section provide a useful background for a first evaluation of the effects of the reform. However, one shortcoming of this analysis is that it does not help our understanding of the factors which determine the dropout rate behaviour or the speed of student progression towards graduation.

Both of these questions will be addressed in the next sections with an econometric analysis aimed at identifying the major determinants of the probability of dropping out and of student progression. The first probability will be modelled with a binary probit model, while student progression, measured by the proportion of credits achieved, will be analysed in the context of an OLS regression.

3. Dropout rate and student progression: data and modelling

Unlike in some other countries (for example, the UK), in Italy there is not a census of all university students, so most empirical work on tertiary education in Italy is based on specific survey data or administrative data on individual students from particular universities. The empirical analysis in this section is based upon a data set that we have constructed from the administrative archives of two Italian universities: Cagliari and Viterbo. The data refer to all the students enrolled for the first time in the academic year

2001-2002, the year of effective implementation of the reform. In addition to information collected at the time of application to university, the data include follow-up information about the progress of each student. Therefore, the data contain information about continuation through the university course in addition to the number of exams and credits obtained by each student for every year of enrolment. The background information provided for each student includes date of birth, type of *maturità* and score obtained, date of achievement of *maturità*, residence, and amount of university fees paid (on the basis of declared parental income).

Our intention is to analyse student progression in the reformed degree system and to estimate the influence of various factors on the probability that a student will progress successfully through their degree course. For example, we wish to estimate how progression probabilities vary with factors such as pre-university academic and social background. The motivation for our analysis is to inform the ongoing development of tertiary education policy in Italy in the light of our findings regarding student behaviour. Specifically, we estimate two distinct econometric models in order to identify (i) the determinants of the probability of dropping-out from university and (ii) the determinants of student progression. In the first case we use a binomial probit model. In the second case we estimate an OLS regression with the logit transformation of the proportion of credits achieved as the dependent variable.

We concentrate our analysis on students who have entered university for the first time in 2001-02 in the reformed system. Therefore our sample excludes individuals who moved from a pre-reform course. Moreover, we did not consider those individuals who transferred to a different degree course from the one initially undertaken, as it was not possible to follow up their progression.

In total we have 15 faculties, specifically 5 in Viterbo and 10 in Cagliari. The data base that we constructed for the dropout analysis consists of 6,606 students (1,181 for Viterbo and 5,425 for Cagliari), while the analysis of student progression is based on 4,837 students (706 for Viterbo and 4131 for Cagliari). In constructing our data base, the students' status and careers were observed at a cut-off date that we fixed at the end of December 2003 (first term of the final year). These students are expected to complete their degree programme approximately one year later.

For the dropout analysis, we consider the *effective* dropout rate, rather than the *formal* dropout recognised by the universities. A dropout is recorded formally in the university archives if a student has either explicitly (officially) withdrawn or transferred to another institution. In our definition of *effective* dropout we include those students who have abandoned their studies either because they have formally withdrawn or because they have not renewed their registration for two consecutive years after enrolment. Thus the effective dropout rate is greater than the official rate.

As a measure of student progression, we have considered the number of credits accumulated by each student by the end of December 2003 in proportion to the total number of credits that should have potentially been achieved in the first- and second-year modules, according to the institutional curriculum of the relevant degree course. In contrast to other European university systems, in the Italian system students can be registered in their second and successive years of study even if they have been inactive in the previous years. Thus, the proportion of credits observed in our data basis at the cut-of-date of December 2003 can vary between zero and one.

3.1 Description of the data

In Table 5 we report information on the composition of the population under study, distinguished by university and gender, for the overall sample and for the dropout sample. The last row of Table 5 shows that, in total for the two universities, 25.8% of new entrants have effectively dropped out during the first two years. We notice that, in line with previous research for other countries, the overall dropout rate is higher for male (31.9%) than for female students (21.3%). There are, however, considerable differences between the two universities: the overall dropout rate is much higher for Viterbo (38.1%) than Cagliari (23.1%). Table 5 also shows that there is a different composition by gender across the two universities. In particular, the composition by gender is equal for the new entrants in Viterbo, while it is strongly unbalanced in favour of female entrants (59.6%) in Cagliari. There are differences also in the gender composition of the students who dropped out: of the 38.1% students who dropped out in Viterbo, the majority (58.7%) are male students, while the gender composition is more or less equal among the 23.1% students who dropped out in Cagliari. Finally, the dropout rate of male students who entered university in autumn 2001 is as high as 44.9% in

Viterbo (28.4% Cagliari), while the dropout rate for female students is 31.4% in Viterbo and 19.5% in Cagliari. A higher dropout rate for males ought not to be surprising if it reflects selection differences by gender into university. But it is striking that in Cagliari, the male dropout rate is much higher than that for females despite the fact that a much higher proportion of students are female. One hypothesis might be if the most highly qualified male high school graduates are selected into employment rather than higher education. But we are not aware of any evidence to support such a hypothesis.

In Table 6, we present summary statistics on progression for the total of 4,837 individuals who renewed their registration in the second year, distinguished by university and gender, and by four levels of progression: inactive students (zero credits), students who have accumulated less than 30 percent of the credits, between 30 and 70 percent of the credits, and more than 70 percent of the credits. Table 6 shows that the distribution of students by their rate of progression is quite similar in the two universities. As indicated in the last row of Table 6, the highest percent of total students across both universities (49.2%) has achieved between 0.30 and 0.70 of the credits due at the end of their second year, 29% of the students have achieved a proportion of credits lower than 0.30, and only 18% of the students have accumulated a proportion of credits higher than 0.70. There are also a very small percentage of 'inactive' students across both universities (3.6%) who have renewed their registration even if they have achieved no credits: these students may decide to drop out at a later stage. The analysis of the data in Table 6 clearly suggests that only a marginal fraction of students are likely to complete their degree programme within the established three-year period. This is in sharp contrast with the expectations of the Reform and very much in line with the national trends before the Reform discussed in Section 2 (Table 4).

Definitions and descriptive statistics of the variables used in our econometric models are summarised in Table 7, while in Tables 8 and 9 we report more detailed information on the dropout rates and on student progression distinguished by other specific characteristics.

The first group of variables in Table 7 includes individual attributes (age and gender). With regard to age, we can see that, on average, students in the dropout sample are older than students in the overall sample. In particular, the last two columns of Table 7 show that, for the total population

comprising both universities, the average age of students in the dropout sample is 22.9 against an average age of 21.2 in the overall sample. We also notice that the average age of entrants is higher for the University of Viterbo than for the University of Cagliari. Table 7 also reports average values of a set of binary indicators for different age classes. These show that 62.3% of the total population is less than 20 years old at entry, while the percentage of young individuals is lower in the dropout sample (43% of the 1,702 students who dropped out in the two universities).

With regard to entry qualifications, the score at *maturità* ranges between 60 and 100 for students who obtained the diploma under the new secondary school system and it ranges between 36 and 60 for diplomas achieved under the previous school system. In the overall sample, the highest percentage of students (42.5%) have a low score at *maturità* (Score1 in Table 7), while only 16.3% entrants have a high score (Score4 and Score5). In the dropout sample 54.8% students fall in the low score category against 8.5% individuals who have a high score (Score4 and Score5).

The percentage of individuals with an irregular performance at school is higher in the dropout sample (45.4) than in the overall sample (31.9%). School regularity is a binary indicator, with value zero for regular completion (in five years) and with value one if the student repeated one or more years of school.

With regard to the type of *maturità*, entrants from the Scientific Lyceum are the most frequent in the overall sample (30%), while in the dropout sample students from a Technical-Commercial Institute represent the highest percentage (28.1%), followed by entrants with a diploma from an Industrial, Agricultural or Surveyors Institute (22.5%)

Performance at university is measured by a student's grade point average, which in the Italian system ranges between 18 and 30. The average exam mark is just above 25 in the overall sample, and 23.8 in the dropout sample, with similar values across universities. It is also interesting to note that 79.1% individuals in the dropout sample are inactive students, with no exam credits obtained. Moreover, more than 40% of the students in the overall sample have an average mark of 25 or above (avercl4 and avercl5 in Table 7), while the percentage of students with average mark above 25 is only 7.5% in the dropout sample.

The variable (Progress) which measures performance in terms of rate of progression shows that on average students have achieved 34.2% of the credits that should have been accumulated in the first- and second-year modules, while 3.5% is the average percentage of credits for the individuals in the dropout sample. From the variable progress grouped into classes we see that, in the overall sample, 36.8% of the students have accumulated between 30 and 70 percent of the credits, while a minority (14.3% students) have accumulated more than 70 percent of the credits. The University of Viterbo shows a higher percentage of inactive students (32.3% in the overall sample) than the University of Cagliari (21%) which is probably the result of the higher average age of entrant students in Viterbo.

With regard to the family income variable, the evidence for the two universities is dissimilar. In particular, for the University of Cagliari it is interesting to note that students with high income represent a small proportion of the overall sample (32.4%) while the proportion is reversed in the dropout sample, where high income students represent the majority (56.7%) of the withdrawing population. For the University of Viterbo the proportion of high income and low income students is about the same in the overall sample and in the dropout sample, suggesting that the variable income does not play any specific role.

We now turn to the analysis of the dropout rate distinguished by specific characteristics. As shown in Table 8, amongst the students who dropped out, 88.4% overall in the two universities are students who have achieved no credit (Progress0 in Table 8). With regard to other characteristics, Table 8 shows that the dropout rate is inversely related with the *maturità* score and varies with the kind of diploma. In particular, the dropout rate appears to be higher for students who had previously attended a professional or a technical institute (more than 40%), while students with a *maturità* from a scientific or a classical Lyceum show a relatively low dropout rate (of about 15%). This is the first indication that school type might play a potentially significant role in shaping the dropout probability. But, of course, a correlation in the raw data might simply be reflecting compositional factors. In Table 8 we also report the dropout rate by different age classes. This distinction of age by class shows that the dropout rate increases with age, especially for male students, reaching a maximum at age 30-35, and decreasing again for entrant students aged more than 35. In order to take this effect into account, as we will see

below, in the econometric analysis the variable age enters the regression models in a quadratic form. Finally, the variable residence does not seem to have any obvious association with the dropout rate, while family income appears to play a role only for the sample population of the University of Cagliari, where the dropout rate of students with high income is 40% against a much lower figure of 14.8% for lower income students.

In Table 9 we report more detailed information on student progression (the mean of the variable 'Progress') distinguished by gender and by other specific characteristics. The first row of Table 9 shows that, over the total population of continuing students, progression is faster for female students (an average of 46.1% of the total credits achieved) than for male students (40.5% of credits achieved). Also progress is faster amongst the youngest students, with 48% of credits achieved on average by students aged less than 20.

With regard to other characteristics, it is interesting to note how progression increases steadily with the *maturità* score, going from an average of 34% of the total credits achieved for students with low entry qualification to 62.9% for those students with the highest *maturità* score. This is a substantial difference in the raw data. In subsequent sections of the paper we will be particularly interested to analyse whether the *ceteris paribus* effects are similarly strong once we have controlled for other confounding factors. Residence does not seem to be associated with progression, nor is family income, while progression appears to be higher for students with a regular performance at school. Table 9 also shows that there is some variation of progression by kind of diploma, the average proportion of credits achieved being relatively higher for students with a scientific, classical or pedagogical Lyceum (more than 46%) than for students with a different type of *maturità*. In terms of university performance, students who progress faster are also students with higher average mark in the exams (for the overall population, 55% of credits are achieved on average by students with average exam mark above 27, against 24% of credits achieved by students with average exam mark below 22). Finally, progression varies considerably across faculties, while within each faculty it is consistently higher for female than male students.

3.2 Econometric Models

The generic model used in the analysis that follows is of the type:

$$y_{ij}^* = X_{ij}\beta + \varepsilon_{ij}$$

where the observed values of y are outcomes for individual ' i ' enrolled in faculty ' j ' generated by the regressors. X is a vector of exogenous variables representing: individual's personal characteristics (such as gender and age), pre-university qualifications (such as score at *maturità* and type of school attended), indicators to capture family background (for example income), possible peer group effects, and faculty characteristics measured by dummy variables. β is a set of parameters to be estimated and ε is an error term. The first model is a binomial probit for the individual's dropout probability, where $y_{ij} = 1$ if the individual drops out ($y_{ij}^* =$ registration not renewed) and $=0$ otherwise. The second is a model for the identification of the determinants of the student's progression, measured as the proportion of credits achieved by each student : $P_i = C_i/TC_i$, where C_i is the number of credits achieved by individual i , and TC_i is the total number of credits established by the relevant degree course for the first- and second-year modules. We estimate this model by OLS, where, to convert a bounded dependent variable into an unbounded one, we use a logit transformation of the proportion of credits achieved. This normally requires a transformation of the form:

$$LP_i = \ln\left(\frac{P_i}{1-P_i}\right)$$

where the log odds LP_i may take on any value between plus and minus infinity, whereas P_i is constrained to lie between zero and one. However, in our sample, for a very small fraction of observations P_i takes the value of zero (3.6% of the observations) and one (0.29% of the observations) which causes LP_i to be undefined. To overcome this problem, we have estimated the logistic regression in two ways: (i) by excluding the observations with $P=0$ and $P=1$, and (ii) by applying the following adjustment (see Cox, 1970, and Gart and Zweifel, 1967):

$$LP_i = \ln \left[\left(P_i + \frac{1}{2TC_i} \right) / \left(1 - P_i + \frac{1}{2TC_i} \right) \right]$$

The differences between the two sets of estimates were negligible, so below we will present only the results obtained by using the correction factor.

3.3 Empirical results

The estimates of the probability of dropping out are presented in section 3.3.1, while results of the model of the determinants of student progression are presented in section 3.3.2.

3.3.1. The determinants of the dropout rate

The estimated results obtained from the probit model for the probability of the student dropping out, distinguished by university, are presented in Table 10. The Table reports the probability values and the marginal effects derived from the reported coefficient estimates. The marginal effects are obtained by multiplying the probit coefficients by the standard normal probability density function $\phi(x_i; \hat{\beta})$ evaluated at the average values of the independent variables (including the average of squared age, and averages of the dummy variables). For each university we report separate results for female and male student regressions, and for the overall sample.

It is interesting to note that the results from the pooled regressions confirm previous empirical research which shows that gender is one of the principal determinants of the probability of dropping out (McNabb, Pal and Sloane, 2002, Smith and Naylor, 2001). Specifically, controlling for other factors, the binomial probit estimates show that males have a higher probability of dropping out relative to the reference group of females. For example, in Cagliari the effect of gender in the equation for all students is significant at the 5% level. The probability of dropping out is about 3 percentage points higher for a male student relative to a female student with otherwise sample mean characteristics. This is less than the raw difference in the drop-out rates by gender and suggests that much of the raw difference is

attributable to composition effects. For the Viterbo population, the marginal effect is almost 9 percentage points – very similar to the raw difference reported in Table 8. Age has a significant and quantitatively substantial positive effect. The variable has been entered in a quadratic form to allow the effect of age to have diminishing impact on the dropout probability, as suggested from the descriptive analysis of the raw data in Table 7. The marginal effect of age computed at mean values is 6.5 percentage points for a male student of Cagliari, and it is slightly smaller for females at 4.1 percentage points. The corresponding marginal effects estimated for the sample population of the university of Viterbo are more sizeable: one more year of age increases the probability of dropping out by 12.1 percentage points for a male student, and by 6.5 percentage points for a female student with otherwise sample mean characteristics.

The results in Table 10 do not suggest any clear and significant pattern of differences in the probability of dropping out for a student resident near the university (in the city) relative to a student resident in the district or outside the district. One exception is that male students in Cagliari are more likely to dropout if they reside outside the city and in the neighbouring district.

With regard to pre-university educational qualifications, it is interesting to note the significant effect on the probability of dropping out associated with the type of school previously attended. Relative to the reference group of those possessing the *maturità* from the scientific lyceum, the coefficients on the dummy variables for most of the other types of schooling are positive and statistically significant, indicating a higher probability of dropping out. However, there is no statistically significant difference between those in possession of the classical lyceum *maturità* and the reference group. The estimated marginal effects indicate, for example, that the probability of dropping out for a male student enrolled at the university of Cagliari and with a diploma from a professional institute is a substantial 24 percentage points higher relative to a student with the *maturità* from a scientific lyceum, and 18 percentage points in the case of females. The corresponding marginal effects for students at the university of Viterbo are even more sizeable, estimated at about 0.27 and 0.40 for males and females, respectively. These are huge effects.

Also, as expected, the score in the *maturità* has a significant impact on the probability of dropping out. In particular, students with a good performance at the *maturità* have a significantly lower probability of dropping out from university. More specifically, a high score (93-100 in the new system, or 56-60 in the old system) is estimated to decrease the probability of dropping out by about 17 percentage points for a male student at the university of Cagliari (34 percentage points for a male student at the university of Viterbo) relative to a student with a low score (60-80 in the new system, 36-48 in the old system), with otherwise sample mean characteristics. The corresponding marginal effects from the female regressions are smaller and of similar size in both universities: at 10 percentage points for Cagliari and 12 percentage points for Viterbo. As with the type of school attended, so with the prior academic performance do we see huge effects on the drop-out probability of university students.

The estimated coefficients for the family income variables are significant with sizeable marginal effects in the regressions for the university of Cagliari, indicating that the probability of dropping out is about 0.28 higher for a male student from a high income family relative to a student with a lower income (about 0.21 for a female student). On the other hand, the coefficients of the income variable are not statistically significant in the regressions for the university of Viterbo, confirming the impression from the analysis of the raw data in Tables 7 and 8. The income variable recorded in the administrative data archives, however, may not be a very accurate indicator of actual parental income, and therefore these results should be interpreted with some caution. This is because parental income is a dummy variable reflecting high income if the student paid full university fees, and low income for lower or no fees. Interpretation of the results on parental income, however, should be cautious, as this variable may not reflect very accurately the actual family income. A further reason for not finding significant family income effects of the expected sign might lie in the fact that family income is likely to be correlated with other confounding factors such as type of school previously attended and prior educational performance.

Another interesting result is that related to the peer effects which appear to be significant for the university of Cagliari. Interestingly, when an individual is enrolled in a faculty or degree course where the average

performance is high, other things equal, this decreases the likelihood of dropping out. This result highlights the importance of matching and peer group effects, which have been found to be important determinants of student performances in other countries (see Summers and Wolfe, 1977, Henderson, Mieskowski and Sauvageau, 1978, and Arulampalam, Naylor and Smith, 2004).

Other differences between dropout rates across subject studied are captured using faculty dummy variables. The reference faculties are Law for Cagliari, and Agriculture for Viterbo. The results suggest that there is no significant variation across faculties in the regressions for males. A noticeable exception is the result for the Faculty of Medicine in the University of Cagliari, which shows that the probability of dropping out for a medical student is 0.28 lower relative to a student enrolled in the Faculty of Law. In the female regression, faculty effects appear to be highly significant, with a clear indication that a student of the Faculty of Law is in general more likely to drop out relative to students from other faculties.

3.3.2. Determinants of student progression

The binomial probit model presented in the previous section groups together all students not dropping out of their course. But this group is potentially very heterogeneous. Furthermore, for policy purposes, it is important to analyse the extent to which continuing students are failing to keep to the administrative timetable for their degree. Therefore, in this section of the paper we examine the determinants of the probability that an individual proceeds through his/her studies regularly: that is, that they have accumulated the number of credits required by the degree course in each year. The cohort considered consists of students who, in December 2003, were at the beginning of their third year of study: officially their final year of study.

In Table 11 we report the results from the OLS model where the dependent variable is a logit transformation of the proportion of credits achieved by the student two years after entry, relative to the total credits required in the first- and second-year modules. Table 11 gives the logistic coefficient of each explanatory variable, the probability value and the corresponding computed marginal effects. These are calculated as

$\bar{P}(1-\bar{P})\hat{\beta}_j$, where $\hat{\beta}_j$ is the estimated logistic coefficient of the j-th explanatory variable, and \bar{P} is the sample mean of the variable ‘progress’. For each university we show separate results for males and females, as well as those for the joint estimation.

First of all, we can see that age tends to exert a negative influence on student progression, with a diminishing effect as age squared is positive. Controlling for other factors, in the pooled regressions gender appears to be a significant determinant of student progression only in the University of Cagliari, with a sign which suggests that females progress on average faster than male students. Gender is not significant in the regression for Viterbo. Residence dummies are not, in general, statistically significant across models.

We now look at the influence of variables reflecting past educational choices and performance (type of *maturità* and score) on subsequent performance of students at university. Relative to the reference group of those possessing the *maturità* from the scientific lyceum, the coefficients on the dummy variables for most of the other types of schooling indicate a worse performance in terms of credit achieved. These results are not surprising, and, combined with those obtained for the analysis of the dropout, may indicate a better academic preparedness of students who have chosen to attend a lyceum. However, as we can see from Table 11, the strength of the relationship varies across regressions. Specifically, the effect of type of school is highly significant for the regression estimated for the overall population of students of the university of Cagliari, a result which is mainly driven by the female regression. Relative to a female student from either a scientific or classical lyceum, a female student at Cagliari from a different type of school proceeds more slowly: the estimated marginal effect implies that a student from a technical or professional institute will have obtained 8 credits fewer after two years, against the 120 credits that would represent being on schedule to finish in the regulation time. The average number of credits after two years is 54 credits, implying the marginal effect is not trivial.

With regard to entry qualifications, as expected, controlling for other factors, the score in the *maturità* has a highly significant impact on university performance. A high *maturità* score increases the proportion of credits achieved by a male student of the University of Cagliari with a marginal

effect on the dependent variable of 0.21 relative to a student with a low score, implying a difference of 25 credits – a very large difference relative to average attainment of just 48 credits for male students at Cagliari. The corresponding marginal effect for the other regressions range between 12 and 20 credits.

On family income, the evidence for the two universities is mixed: this variable is not significant in the regressions for Viterbo, while for Cagliari it appears that progression at university is faster for students from higher income families, even after controlling for prior education and other causes of study progression. As it appears from the regressions distinguished by gender, this finding is again mainly driven by the results for female students. The result stands in contrast to that for the probability of dropping out. We note again, however, the need for caution in interpreting the effects of our measure of parental income. Among other results, we again note significant differences according to faculty of study.

4. Concluding Remarks

In this paper, we have presented results from econometric analyses of (i) the probability of dropping out of university and (ii) the rate of progression of students studying at one of the Italian universities of Cagliari or Viterbo for the entry year 2001/2. These students were among the first cohort to enrol at university in Italy after the introduction of the new ‘3+2’ degree programme, a major aim of which is to reduce student withdrawal and to accelerate student progression. We note, however, that despite the reforms, the average drop-out rate for Italian universities continues to be high. From our analysis of data for two Italian universities, we have found that significant influences on drop-out and progression behaviour include gender, age, previous school type, prior academic performance and faculty of study at university. In particular, we have estimated very large marginal effects associated with previous schooling and students’ prior educational performance. For example, we estimate that the probability of dropping out for a male (female) student at the university of Cagliari is 24 (18) percentage points higher if they previously studied at a professional institute rather than at a scientific lyceum. For students at Viterbo the corresponding effects are even larger at 27 percentage points for male and 40 percentage points for females. Similarly, there are huge differences in the probability of dropping

out according to the score obtained in the final secondary school examinations. For students who studied for the *maturità* qualification, for example, we estimate that a score in the 93-100 interval is associated with a reduction in the probability of dropping out of about 17 (10) percentage points for otherwise observationally equivalent male (female) students but with a score in the interval 60-80. For students at Viterbo the corresponding effects are 34 percentage points for male and 12 percentage points for females.

We interpret these results as indicating that the Italian university system is significantly better adapted to the needs and capacities of students who have studied at either a scientific or a classical lyceum and who have performed well at the *maturità* qualification. In contrast, students with a weaker prior performance or from a different school background are significantly more likely to drop out of university or, at best, are more likely to progress slowly through their degree. To accelerate progression rates and to improve student retention in Italian universities, systemic changes are likely to be necessary: either students with weaker academic backgrounds will need to be discouraged from attending university – for example through competitive admissions processes – or a better match will have to be engineered between their prior preparation and the expectations placed upon them once at university. It is interesting to note that where entry is more competitive – as, for example, in the case of Medicine at the University of Cagliari – the drop-out rate is much lower.

References

- Arulampalam, W., R. Naylor and J. Smith (2004), Effects of in-class variation and student rank on the probability of withdrawal: cross-section and time-series analysis for UK university students, *Economics of Education Review*, forthcoming.
- Biggeri L., M. Bini and L. Grilli (2001), The transition from university to work: a multilevel approach to the analysis of the time to obtain the first job, *Journal of the Royal Statistical Society, A*, Part 2, pp. 293-305.
- Boero G., A. McNight, R. Naylor and J. Smith (2001), Graduates and Graduate Labour Markets in the UK and Italy, *Lavoro e Relazioni industriali Rivista di Economia applicata*, No. 2, 131-172.
- Bulgarelli G. (2002), Esito degli studi degli immatricolati dell'ateneo fiorentino dal 1980/81 al 1997/98, Università degli Studi di Firenze.
- Cecchi D., Iacus S., Negri I. and Porro G. (2004), Formazione e percorsi lavorativi dei laureati dell'Università degli Studi di Milano, Working Paper #4.2004, Dipartimento di Economia Politica e Aziendale, Università di Milano
- Cecchi, D. (2000), University education in Italy, *International Journal of Manpower*, vol 21, n.2-4, 160-205.
- Cox, D.R. 1970, *The Analysis of Binary Data*, London, Methuen
- Ferrari, G. and Laureti T. (2004a), Evaluation of University Graduates Technical Efficiency Using Data Envelopment Analysis Combined with Multiple Correspondence Analysis: the case of the University of Florence, *Proceedings of the International Conference on Quantitative Methods, Virt.*
- Ferrari G. and Laureti T. (2004b), Multi-Factor Efficiency Analysis of the Florence University Graduates *Atti della XLII Riunione Scientifica SIS*.
- Gart, J.J. and Zweifel, J.R. 1967, On the Bias of Various Estimators of the Logit and its Variance with Application to Quantal Bioassay, *Biometrika*, Vol. 54, no. 1, pp 181-187.

- Gori E. and Rampichini C. (1991), I risultati dell'istruzione universitaria. Un'analisi degli archivi dell'Ateneo fiorentino, Working Paper, 36, Dipartimento di Statistica, Università di Firenze.
- Istat (2004), Università e lavoro: statistiche per orientarsi.
- McNabb R., Pal S. and Sloane P. (2002), Gender Differences in Educational Attainment: The Case of University Students in the UK', *Economica*, 29, 481-503.
- Manski, C.F. (1995), Identification Problems in the Social Sciences, Cambridge, MA: Harvard University press.
- MIUR, CNVSU (2004), Proposte per la costruzione di un nuovo modello per la ripartizione teorica del FFO delle università statali.
- OECD (2003), University at a Glance, OECD indicators, www.oecd.org
- Smith J., McKnight, A. and Naylor, R. A., (2000) Graduate Employability: policy and performance in higher education in the UK, *Economic Journal*, 110, pp. F382-411.
- Smith J. and Naylor R. (2001a), Determinants of degree performance in UK universities: a statistical analysis of the 1993 student cohort, *Oxford Bulletin of Economics and Statistics*, 63, 29-58
- Smith J. and Naylor R. (2001b), Dropping out of university: a statistical analysis of the probability of withdrawal for UK university students, *Journal of the Royal Statistical Society*, 164, 389-405.
- Staffolani S. and Sterlacchini A. (2001), *Istruzione universitaria, occupazione e reddito. Un'analisi empirica sui laureati degli atenei marchigiani*, F. Angeli, 2001.

Table 1 Dropout rate after one year by subject studied. Entrant cohort 2000/01

<i>Subject studied</i>	<i>Dropout rate in the first year %</i>
Medicine	2.6
Politics	14.8
Psychology	16.9
Physical education	20.4
Engineering	20.8
Economics-statistics	21.2
Languages	21.3
Education	22.7
Law	23.2
Chemical-Pharmaceutics	23.3
Agriculture	23.6
Humanities (Literature and classics)	23.6
Biological-Geological sciences	27.4
Scientific	27.5
Total	19.3

Source: Istat, Università e lavoro: statistiche per orientarsi, 25/02/2004.

Table 2 Cohort 2000/01. 'Inactive' students in 2002 as a percentage of total entrants by subject studied

<i>Faculties</i>	$\frac{\text{inactive students}}{\text{total entrants}} \cdot 100$
Medicine	11.5
Political Science	22.3
Psychology	16.1
Physical education	20.0
Engineering	16.3
Economics	18.6
Statistics	16.9
Languages	15.2
Education	17.6
Law	25.9
Agriculture	21.2
Literature and Philosophy	24.5
Sociology	34.4
Maths Physics and Natural Science	19.4
Total	19.5

Source: Comitato Nazionale per la Valutazione del Sistema Universitario (CNVSU)

Table 3 Graduates in different degree subjects by type of secondary school (2001) per 100 students enrolled 6 years before.

<i>Subject studied</i>	Vocational Institute	Technical Institute	Teachers' training college	Lyceum ^a	Total ^b
Scientific	8.2	27.9	27.3	57.1	40.6
Chemical	23.1	47.8	34.9	62.6	53
Biological - geological science	16	26.3	30	47.2	35.9
Medical related	96.5	69.2	66.1	85	88
Engineering	12.3	36.1	35.7	67.1	50.6
Architecture	99.7	88.2	81.7	95.6	91.5
Agriculture	32.7	38.7	34.3	59.9	44.7
Economics-statistics	19.7	47.7	42.2	72.8	54.5
Politics	22.7	30.4	44.3	57.2	40.7
Law	13.5	23.8	23.5	51	36.6
Literature and classics	19.8	28.8	37.9	61.6	45.8
Languages	23.2	34.5	37.4	56.4	47.5
Education	31	36.4	49.5	57.7	44.9
Psychology	42.7	35	38.6	60.1	48
Overall	22.6	36.2	38.3	61.5	47.2

Source: Istat-Miur

a. Art and languages school are excluded.

b. Students with other secondary school certificate are included

Table 4 Graduates in the Italian universities by effective time taken for completion (% of total number of graduates)

<i>Cohort</i>	<i>Regular</i>	<i>Number of years after institutional time</i>				<i>Total</i>
		<i>1 year</i>	<i>2 years</i>	<i>3 years</i>	<i>4 years</i>	
1999	6.5	15.4	19.1	18.9	40.1	100
2000	7.3	15.6	18.3	18.7	40.2	100
2001	7.4	15.5	17.9	17.0	42.1	100
2002	9.4	16.6	17.0	15.3	41.6	100

Source: Miur- Cnvsu, 2004

Table 5 Distribution of students by University and gender

University	<i>Overall sample New entrants 2001-02</i>			<i>Dropout sample</i>		
	Females (% of total)	Males (% of total)	Total	Females (% of total dropout) (% of female entrants)	Males (% of total dropout) (% of male entrants)	Total (% of new entrants)
Viterbo	593 (50.2%)	588 (49.8%)	1181	186 (41.3%) (31.4%)	264 (58.7%) (44.9%)	450 (38.1%)
Cagliari	3233 (59.6%)	2192 (40.4%)	5425	630 (50.3%) (19.5%)	622 (49.7%) (28.4%)	1252 (23.1%)
Total	3826 (57.9%)	2780 (42.1%)	6606	816 (47.9%) (21.3%)	886 (52.1%) (31.9%)	1702 (25.8%)

Table 6 Distribution of continuing students by rate of progression, university and gender

University		Proportion of credits achieved (P)				Total
		No credits	0<P<0.30	0.30≤P<0.7	0.70≤P≤1.	
Viterbo	<i>Females</i> (% of total)	13 (3.3)	63 (16.0)	220 (55.8)	98 (24.9)	394 (100.0)
	<i>Males</i> (% of total)	15 (4.8)	81 (26.0)	165 (52.9)	51 (16.3)	312 (100.0)
	<i>All</i> (% of total)	28 (4.0)	144 (20.4)	385 (54.5)	149 (21.1)	706 (100.0)
Cagliari	<i>Females</i> (% of total)	80 (3.1)	708 (27.5)	1,301 (50.5)	488 (18.9)	2,577 (100.0)
	<i>Males</i> (% of total)	68 (4.4)	555 (35.7)	696 (44.8)	235 (15.1)	1,554 (100.0)
	<i>All</i> (% of total)	148 (3.6)	1,263 (30.6)	1,997 (48.3)	723 (17.5)	4,131 (100.0)
Total	<i>Females</i> (% of total)	93 (3.1)	771 (26.0)	1,521 (51.2)	586 (19.7)	2,971 (100.0)
	<i>Males</i> (% of total)	83 (4.4)	636 (34.1)	861 (46.1)	286 (15.3)	1,866 (100.0)
	<i>All</i> (% of total)	176 (3.6)	1,407 (29.1)	2,382 (49.2)	872 (18.0)	4,837 (100.0)

Table 7 Definitions and Descriptive Statistics of Variables (Mean)

VARIABLE NAME	DEFINITION	MEAN					
		<i>Cagliari</i>		<i>Viterbo</i>		<i>Total Cagliari and Viterbo</i>	
		Overall sample	Dropout sample	Overall sample	Dropout sample	Overall sample	Dropout sample
Individual attributes							
AGE	Age on entry (September 2001) Continuous variable	21.009	22.502	22.293	24.079	21.238	22.918
Age1	=1 if age <20	0.637	0.449	0.556	0.378	0.623	0.430
Age2	=1 if 20 ≤ age < 25	0.274	0.366	0.285	0.356	0.276	0.363
Age3	=1 if 25 ≤ age < 30	0.043	0.095	0.057	0.093	0.046	0.095
Age4	=1 if 30 ≤ age <35	0.017	0.037	0.035	0.067	0.020	0.045
Age5	=1 if age ≥35	0.029	0.054	0.067	0.107	0.036	0.068
Gender	=1 if male	0.404	0.497	0.498	0.587	0.421	0.521
Entry qualifications							
Score	Score at maturità can vary between 60-100 (36-60) in the new system (old system)						
Score1	=1 if Score is 60-72 (36-43)	0.420	0.549	0.446	0.547	0.425	0.548
Score2	=1 if Score is 73-80 (44-48)	0.211	0.208	0.221	0.204	0.213	0.207
Score3	=1 if Score is 81-92 (49-55)	0.201	0.161	0.192	0.156	0.200	0.160
Score4	=1 if Score is 93-97 (56-58)	0.072	0.039	0.060	0.038	0.070	0.039
Score5	=1 if Score is 98-100 (59-60)	0.096	0.042	0.081	0.056	0.093	0.046
Residence							
CITY1	=1 if Resident in the city	0.180	0.192	0.156	0.153	0.176	0.182
CITY2	=1 if Resident in the district	0.553	0.567	0.375	0.322	0.521	0.502
CITY3	=1 if Resident outside district	0.267	0.241	0.469	0.524	0.303	0.316

Note: For dummy variables the average value represents the proportion of individuals with such characteristics

Table 7 Definitions and Descriptive Statistics of Variables (Mean) Continued

VARIABLE NAME	DEFINITION	MEAN					
		<i>Cagliari</i>		<i>Viterbo</i>		<i>Total Cagliari and Viterbo</i>	
		Overall sample	Dropout sample	Overall sample	Dropout sample	Overall sample	Dropout sample
Regularity at school							
REG	=1 if irregular performance at school (more than 5 years to complete)	0.315	0.456	0.339	0.449	0.319	0.454
Type of Maturità							
ScientLyc	=1 if Scientific Lyceum	0.312	0.185	0.252	0.176	0.301	0.182
ClassLyc	=1 if Classical Lyceum	0.134	0.077	0.147	0.091	0.137	0.080
PedagLyc	=1 Socio/Psyco/Pedagog Lyceum (ex Magistrale)	0.098	0.094	0.052	0.058	0.090	0.085
OtherLyc	=1 if Other Lyceum (Linguistic)	0.036	0.033	0.039	0.042	0.037	0.035
ArtistLyc	=1 Artistic Lyceum	0.011	0.022	0.015	0.018	0.012	0.021
Other/ArtistLyc	Other lyceum+Artistic	0.047	0.055	0.054	0.060	0.049	0.056
CommInst	=1 Tech/Commercial	0.218	0.296	0.216	0.240	0.218	0.281
IndusInst	=1 Tech Institute	0.065	0.107	0.064	0.084	0.065	0.101
SurveyorInst	= 1 Tech/Surveyors (Geometri)	0.060	0.080	0.047	0.049	0.058	0.072
AgricInst	=1 Agricultural Institute	0.014	0.027	0.095	0.122	0.028	0.052
Indus/Agric/Surveyor	Industrial/Agricultural/ Surveyors	0.139	0.214	0.206	0.256	0.151	0.225
ProfInst	=1 Professional	0.049	0.077	0.062	0.111	0.051	0.086
OtherInst	=1 Other unspecified	0.002	0.002	0.011	0.009	0.004	0.004
ProfInst/OtherInst	Professional + other unspecified	0.051	0.079	0.073	0.120	0.055	0.090

Table 7 Definitions and Descriptive Statistics of Variables (Mean) Continued

VARIABLE NAME	DEFINITION	MEAN					
		<i>Cagliari</i>		<i>Viterbo</i>		<i>Total Cagliari and Viterbo</i>	
		Overall sample	Dropout sample	Overall sample	Dropout sample	Overall sample	Dropout sample
Performance at university							
Average	Average of exam marks (weighted with number of credits) ³ Range between 18 and 30	25.072	23.839	25.294	23.875	25.107	23.849
Average in classes	Average of exam marks grouped into class intervals						
Avercl0	=1 if inactive student (no credits and no exams)	0.210	0.793	0.323	0.787	0.231	0.791
Avercl1	=1 if exams without marks (idoneità)	0.011	0.019	0.013	0.022	0.012	0.020
Avercl2	=1 if $18 \leq \text{Average} < 22$	0.081	0.052	0.061	0.044	0.077	0.050
Avercl3	=1 if $22 \leq \text{Average} < 25$	0.279	0.062	0.213	0.071	0.267	0.064
Avercl4	=1 if $25 \leq \text{Average} < 27$	0.232	0.038	0.212	0.036	0.229	0.037
Avercl5	=1 if $27 \leq \text{Average} \leq 30$	0.187	0.037	0.179	0.040	0.185	0.038
Peer effects	Average exam marks obtained by peers in the same degree course (weighted by number of credits)	25.570	25.435	25.832	25.732	25.617	25.514
Credits	Average of credits obtained ⁴	50.983	10.746	53.563	10.552	51.389	10.693
Progress	Credits accumulated in proportion to the total number of credits officially established for the first- and second-year modules (in percentage)	34.589	3.468	32.210	3.652	34.163	3.517
Progress in classes	Credits accumulated in proportion to the total credits grouped into class intervals						
Progress0	=1 if student has no credit	0.210	0.793	0.323	0.787	0.231	0.791
Progress1	=1 if $0.00 < \text{Progress} < 0.30$	0.274	0.177	0.194	0.189	0.259	0.180
Progress2	=1 if $0.30 \leq \text{Progress} < 0.70$	0.375	0.028	0.335	0.024	0.368	0.027
Progress3	=1 if $0.70 \leq \text{Progress} \leq 1.00$	0.142	0.002	0.147	0.000	0.143	0.002

³ Averages are calculated by considering only the students who have passed marked exams, that is:

Overall sample: 5007 (4223 Cagliari – 784 Viterbo) **Dropout sample:** 321 (235 Cagliari – 86 Viterbo)

⁴ Averages are calculated considering only the students with non zero credits, that is:

Overall sample: 5083 (4284 Cagliari – 799 Viterbo) **Dropout sample:** 355 (259 Cagliari – 96 Viterbo)

Table 7 Definitions and Descriptive Statistics of Variables (Mean) Continued

VARIABLE NAME	DEFINITION	MEAN					
		<i>Cagliari</i>		<i>Viterbo</i>		<i>Total Cagliari e Viterbo</i>	
		Overall sample	Dropout sample	Overall sample	Dropout sample	Overall sample	Dropout sample
Family income	Binary indicator						
Faminc	=0 if income <23850.00	0.676	0.433	0.494	0.489	0.644	0.448
	=1 If income >23850.00	0.324	0.567	0.506	0.511	0.356	0.552
Faculty dummies							
Fac1	Agriculture (Viterbo)			0.288	0.338	0.051	0.089
Fac2	Cultural Heritage (Viterbo)			0.163	0.109	0.029	0.029
Fac3	Economics (Viterbo)			0.251	0.313	0.045	0.083
Fac4	Languages (Viterbo)			0.164	0.136	0.029	0.036
Fac5	Biology (Viterbo)			0.133	0.104	0.024	0.028
Fac6	Law (Cagliari)	0.097	0.117			0.080	0.086
Fac7	Political Science (Cagliari)	0.093	0.095			0.076	0.070
Fac8	Economics (Cagliari)	0.121	0.145			0.100	0.106
Fac9	Humanities (Cagliari)	0.086	0.070			0.071	0.052
Fac10	Education (Cagliari)	0.191	0.187			0.157	0.137
Fac11	Languages (Cagliari)	0.069	0.073			0.056	0.053
Fac12	Medicine (Cagliari)	0.037	0.006			0.030	0.004
Fac13	Pharmacology (Cagliari)	0.035	0.043			0.029	0.032
Fac14	Math& Other Sciences (Cagliari)	0.111	0.118			0.091	0.087
Fac15	Engineering (Cagliari)	0.161	0.146			0.132	0.108
Faculty characteristics							
Size	Number of teaching staff	113.191	104.788	63.612	65.440	104.328	94.385
Docenti	Average number of teaching staff per student	0.026	0.024	0.050	0.050	0.031	0.031
Number of Students		5,425	1,252	1,181	450	6,606	1,702

Table 8 Dropout rates by specific characteristics

VARIABLE NAME	DEFINITION									
		<i>Cagliari</i>			<i>Viterbo</i>			<i>Total Cagliari and Viterbo</i>		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
TOTAL		19.5	28.4	23.1	31.4	44.9	38.1	21.3	31.9	25.8
Individual attributes										
AGE	Age on entry (September 2001)									
Age1	=1 if age <20	14.9	18.5	16.3	22.2	30.7	25.9	15.9	20.7	17.8
Age2	=1 if 20 ≤ age < 25	26.3	36.6	30.9	39.1	52.9	47.5	28.1	40.5	33.9
Age3	=1 if 25 ≤ age < 30	40.9	63.1	50.6	54.5	70.6	62.7	43.6	65.0	53.3
Age4	=1 if 30 ≤ age <35	28.6	74.4	50.0	63.6	84.2	73.2	39.4	77.4	57.1
Age5	=1 if age ≥35	30.4	60.9	42.9	61.3	60.4	60.8	38.2	60.7	48.9
Entry qualifications										
Score	Score at maturità can vary between 60-100 (36-60) in the new system (old system)									
Score1	=1 if Score is 60-72 (36-43)	24.7	37.3	30.1	36.5	53.5	46.7	26.4	41.2	33.3
Score2	=1 if Score is 73-80 (44-48)	19.9	26.6	22.8	32.3	38.3	35.2	22.1	29.0	25.1
Score3	=1 if Score is 81-92 (49-55)	16.8	21.4	18.5	25.4	38.7	30.8	18.2	24.6	20.6
Score4	=1 if Score is 93-97 (56-58)	10.5	17.1	12.6	27.5	15.0	23.9	13.2	16.8	14.3
Score5	=1 if Score is 98-100 (59-60)	11.3	8.0	10.2	28.1	22.6	26.3	13.9	10.1	12.6
Residence										
CITY1	=1 if Resident in the city	22.8	26.6	24.6	31.4	45.6	37.5	24.3	29.4	26.6
CITY2	=1 if Resident in the district	19.4	30.4	23.7	26.9	39.2	32.7	20.3	31.7	24.8
CITY3	=1 if Resident outside district	17.6	25.8	20.9	35.4	48.7	42.6	21.6	33.6	26.9
Regularity at school										
Reg	binary indicator									
	=0 if regular performance at school (5 years to complete)	16.5	21.4	18.3	27.1	37.6	31.8	18.1	24.7	20.7
	=1 if irregular performance at school (more than 5 years)	27.3	40.3	33.4	43.0	55.4	50.5	29.7	43.8	36.7

Table 8 Dropout rates by specific characteristics Continued

VARIABLE NAME	DEFINITION	<i>Cagliari</i>			<i>Viterbo</i>			<i>Total Cagliari and Viterbo</i>		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Type of Maturità										
ScientLyc	=1 if Scientific Lyceum	11.4	16.4	13.7	16.8	34.1	26.5	12.1	19.6	15.6
ClassLyc	=1 if Classical Lyceum	11.8	16.4	13.2	23.1	25.0	23.6	14.1	17.8	15.2
PedagLyc	=1 Socio/Psyco/Pedagog Lyceum	21.2	36.4	22.1	39.6	62.5	42.6	22.9	41.5	24.2
OtherLyc	=1 if Other Lyceum (Linguistic)	19.8	27.6	20.9	35.1	66.7	41.3	22.5	36.8	24.8
ArtistLyc	=1 Artistic Lyceum	47.7	41.2	45.9	33.3	100.0	44.4	44.1	50.0	45.6
Other/ArtistLyc	Other Lyceum+Artistic	25.6	32.6	26.9	34.6	75.0	42.2	21.4	41.4	29.9
CommInst	=1 Technical/Commercial Institute	27.8	37.7	31.3	34.1	50.8	42.4	28.7	40.8	33.3
IndusInst	=1 Technical/Industrial Institute	22.9	39.9	38.2	44.4	50.7	50.0	27.3	41.8	40.3
SurveyorInst	=1 Tech/surveyors (Geometri)	17.6	34.0	30.6	14.3	43.8	40.0	17.3	35.5	31.9
AgricInst	=1 Agricultural Institute	37.5	50.0	45.9	33.3	51.5	49.1	35.9	51.0	47.8
Indus/Agric/SurvInst	Industrial/agricultural/surveyors	22.8	38.2	35.6	32.3	49.5	47.3	24.7	41.1	38.5
ProfInst	=1 Professional	33.0	43.0	36.0	68.5	68.4	68.5	40.9	48.0	47.8
OtherInst	=1 Other unspecified	0.0	60.0	27.3	33.3	25.0	30.8	20.0	44.4	29.2
ProfInst/OtherInst	Professional + other unspecified	32.0	44.1	35.6	62.8	60.9	62.8	39.7	47.7	42.0
Family income	<i>Reddito equivalente</i> binary indicator									
Faminc	=0 if income <23,850.00 Euro	13.3	17.5	14.8	32.1	44.4	37.7	15.5	22.0	17.9
	=1 If income >23,850.00 Euro	36.0	44.8	40.4	30.5	45.3	38.5	34.7	44.9	39.9

Table 8 Dropout rates by specific characteristics Continued

VARIABLE NAME	DEFINITION									
		<i>Cagliari</i>			<i>Viterbo</i>			<i>Total Cagliari and Viterbo</i>		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Performance at university										
Average in classes	Average of exam marks (weighted with number of credits) grouped into class intervals									
Avercl0	=1 if inactive student (no credits and no exams)	85.6	88.4	87.0	91.7	93.4	92.7	86.9	89.8	88.4
Avercl1	=1 if exams without marks (idoneità)	37.0	41.2	39.3	85.7	50.0	66.7	47.1	42.9	44.7
Avercl2	=1 if $18 \leq \text{Average} < 22$	16.8	12.8	14.8	30.8	26.1	27.8	18.3	15.1	16.6
Avercl3	=1 if $22 \leq \text{Average} < 25$	5.4	4.6	5.1	9.8	15.5	12.7	5.9	6.6	6.2
Avercl4	=1 if $25 \leq \text{Average} < 27$	3.5	4.1	3.7	5.4	7.8	6.4	3.8	4.8	4.2
Avercl5	=1 if $27 \leq \text{Average} \leq 30$	4.4	4.9	4.5	6.7	11.8	8.5	4.8	6.3	5.2
Progression	Credits accumulated in proportion to the total number of credits officially established for the first- and second-year modules (in percentage)									
Progress0	=1 if student has achieved no credit	85.6	88.4	87.0	91.7	93.4	92.7	86.9	89.8	88.4
Progress1	=1 if $0.00 < \text{Progress} < 0.30$	15.9	13.6	14.9	36.4	37.7	37.1	18.1	17.6	17.9
Progress2	=1 if $0.30 \leq \text{Progress} < 0.70$	1.5	2.1	1.7	3.1	2.4	2.8	1.7	2.2	1.9
Progress3	=1 if $0.70 \leq \text{Progress} \leq 1.00$	0.4	0.4	0.4	0.0	0.0	0.0	0.3	0.3	0.3

Table 8 Dropout rates by specific characteristics Continued

VARIABLE NAME	DEFINITION	MEAN								
		<i>Cagliari</i>			<i>Viterbo</i>			<i>Total Cagliari and Viterbo</i>		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Faculty dummies										
Fac1	Agriculture (Viterbo)				39.2	46.2	44.7	39.2	46.2	44.7
Fac2	Cultural Heritage (Viterbo)				25.0	26.4	25.4	25.0	26.4	25.4
Fac3	Economics (Viterbo)				45.7	49.1	47.5	45.7	49.1	47.5
Fac4	Languages (Viterbo)				26.1	51.2	31.4	26.1	51.2	31.4
Fac5	Biology (Viterbo)				21.6	40.6	29.9	21.6	40.6	29.9
Fac6	Law (Cagliari)	26.5	30.3	27.9				26.5	30.3	27.9
Fac7	Political Science (Cagliari)	17.7	32.4	23.6				17.7	32.4	23.6
Fac8	Economics (Cagliari)	19.9	35.9	27.5				19.9	35.9	27.5
Fac9	Humanities (Cagliari)	14.7	27.7	18.8				14.7	27.7	18.8
Fac10	Education (Cagliari)	19.6	37.8	22.6				19.6	37.8	22.6
Fac11	Languages (Cagliari)	20.8	38.0	24.5				20.8	38.0	24.5
Fac12	Medicine (Cagliari)	3.4	3.6	3.5				3.4	3.6	3.5
Fac13	Pharmacology (Cagliari)	27.6	29.9	28.4				27.6	29.9	28.4
Fac14	Math& Other Sciences (Cagliari)	24.0	25.2	24.6				24.0	25.2	24.6
Fac15	Engineering (Cagliari)	13.8	23.7	21.0				13.8	23.7	21.0

Table 9 Student progression by specific characteristics (Mean of the proportion of total credits achieved, %)

VARIABLE NAME	DEFINITION	MEAN								
		<i>Cagliari</i> Obs 4,131			<i>Viterbo</i> Obs 706			<i>Total</i> Obs 4,837		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
TOTAL		45.2	40.1	43.3	52.0	42.4	47.8	46.1	40.5	44.0
Individual attributes										
AGE	Age on entry (September 2001)									
Age1	=1 if age <20	49.0	44.0	47.2	57.4	47.0	53.2	50.2	44.5	48.0
Age2	=1 if 20 ≤age < 25	36.4	31.0	34.2	40.0	33.7	36.6	36.8	31.5	34.5
Age3	=1 if 25 ≤age < 30	32.7	33.1	32.8	38.6	48.5	42.6	33.6	36.3	34.5
Age4	=1 if 30 ≤ age <35	38.0	18.6	33.4	40.9	31.4	38.0	38.5	21.3	34.2
Age5	=1 if age ≥35	42.3	44.6	42.9	26.0	37.2	32.8	39.9	41.5	40.5
Entry qualifications										
Score	Score at maturità can vary between 60-100 (36-60) in the									
Score1	=1 if Score is 60-72 (36-43)	35.0	30.2	33.1	43.7	36.0	39.7	36.0	31.3	34.1
Score2	=1 if Score is 73-80 (44-48)	42.7	36.8	40.3	52.6	40.3	46.9	44.2	37.4	41.3
Score3	=1 if Score is 81-92 (49-55)	51.2	46.6	49.5	56.6	53.5	55.5	52.0	47.6	50.4
Score4	=1 if Score is 93-97 (56-58)	57.2	54.3	56.3	58.7	48.5	55.8	57.4	53.6	56.3
Score5	=1 if Score is 98-100 (59-60)	62.6	64.7	63.3	60.9	59.0	60.2	62.4	64.0	62.9
Residence										
CITY1	=1 if Resident in the city	44.8	40.4	42.8	54.7	43.1	50.4	46.2	40.7	43.7
CITY2	=1 if Resident in the district	44.4	38.6	42.4	52.7	41.8	48.1	45.2	39.0	43.0
CITY3	=1 if Resident outside district	47.2	42.6	45.5	50.2	42.7	46.6	47.8	42.6	45.7
Regularity at										
Reg	binary indicator									
	=0 if regular performance at school (5 years to complete)	48.6	44.4	47.1	54.7	46.3	51.4	49.5	44.7	47.7
	=1 if irregular performance at school (more than 5 years)	35.3	30.4	33.2	42.4	34.9	38.3	36.1	31.2	34.0

Table 9 Student progression by specific characteristics (Mean of the proportion of total credits achieved, %)
Continued

VARIABLE NAME	DEFINITION	MEAN								
		<i>Cagliari</i> Obs 4,131			<i>Viterbo</i> Obs 706			<i>Total Cagliari and Viterbo</i> Obs 4,837		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Type of Maturità										
ScientLyc	=1 if Scientific Lyceum	48.4	43.0	46.0	57.1	42.6	49.8	49.3	42.9	46.5
ClassLyc	=1 if Classical Lyceum	49.0	41.0	46.7	55.0	40.8	52.1	50.2	41.0	47.6
PedagLyc	=1 Socio/Psyco/Pedagog Lyceum (ex Magistrale)	46.4	44.3	46.3	49.5	66.1	51.0	46.6	47.0	46.7
OtherLyc	=1 if Other Lyceum (linguistic)	41.4	35.2	40.5	52.1	75.1	54.8	42.9	40.2	42.5
ArtistLyc	=1 Artistic Lyceum	23.7	35.8	27.4	51.8	-	51.8	32.2	35.8	33.1
Other/ArtistLyc	Other Lyceum+Artistic	38.8	35.4	38.2	52.0	75.1	54.0	41.0	38.8	40.7
CommInst	=1 Tech/Commercial	41.3	37.3	40.0	50.1	39.8	45.8	42.5	37.8	40.9
IndusInst	=1 Tech/Industrial Institute	31.0	35.8	35.2	22.2	46.8	43.6	29.7	37.5	36.5
SurveyorInst	= 1 Tech/surveyors (Geometri)	44.3	39.1	40.4	45.2	42.8	43.2	44.4	39.6	40.8
AgricInst	=1 Agricultural Institute	30.9	33.8	32.7	42.8	39.4	40.0	35.6	37.4	37.0
Indus/Agric/SurvInst	Industrial/agricultural/surveyors	38.8	37.2	37.5	38.6	42.6	41.9	38.6	38.3	38.4
ProfInst	=1 Professional Institute	38.6	36.5	38.0	37.7	34.4	36.8	38.5	36.3	37.9
OtherInst	=1 Other unspecified	41.0	49.0	43.0	41.4	57.1	46.6	41.2	53.9	44.9
ProfInst/OtherInst	Professional + other unspecified	38.7	37.0	38.3	38.7	42.0	39.6	38.7	37.8	38.5
Family income	binary indicator									
Faminc	=0 if income <=23,850.00 Euro	44.5	39.4	42.7	54.6	47.4	51.7	45.5	40.3	43.7
	=1 if income >23,850.00 Euro	47.8	41.7	45.0	49.0	38.0	43.7	48.1	40.8	44.7

Table 9 Student progression by specific characteristics (Mean of the proportion of total credits achieved, %)-Cont

VARIABLE NAME	DEFINITION	MEAN								
		Cagliari Obs 4,131			Viterbo Obs 706			Total Cagliari and Viterbo Obs 4,837		
		Female	Male	Total	Female	Male	Total	Female	Male	Total
Performance at university										
Average in classes	Average of exam marks (weighted with number of credits)									
Avercl1	=1 if exams without marks (idoneità)	4.7	4.0	4.3	6.7	8.4	8.0	4.8	4.7	4.7
Avercl2	=1 if $18 \leq \text{Average} < 22$	24.6	23.7	24.2	23.9	25.0	24.6	24.6	23.9	24.2
Avercl3	=1 if $22 \leq \text{Average} < 25$	43.3	39.3	41.7	42.4	39.7	41.1	43.2	39.4	41.6
Avercl4	=1 if $25 \leq \text{Average} < 27$	49.7	48.8	49.4	59.6	51.5	56.3	51.2	49.3	50.5
Avercl5	=1 if $27 \leq \text{Average} \leq 30$	54.7	52.0	53.9	62.9	56.6	60.8	56.0	52.8	55.0
Faculty dummies										
Fac1	Agriculture (Viterbo)				42.4	41.6	41.8			
Fac2	Cultural Heritage (Viterbo)				48.1	48.6	48.2			
Fac3	Economics (Viterbo)				45.7	35.0	40.2			
Fac4	Languages (Viterbo)				63.7	58.5	63.1			
Fac5	Biology (Viterbo)				53.6	48.3	51.7			
Fac6	Law (Cagliari)	35.3	31.6	34.0						
Fac7	Political Science (Cagliari)	56.1	45.0	52.1						
Fac8	Economics (Cagliari)	48.0	41.4	45.2						
Fac9	Humanities (Cagliari)	34.5	32.1	33.8						
Fac10	Education (Cagliari)	48.9	44.8	48.3						
Fac11	Languages (Cagliari)	33.8	31.0	33.3						
Fac12	Medicine (Cagliari)	49.7	47.4	48.7						
Fac13	Pharmacology (Cagliari)	42.3	35.7	40.0						
Fac14	Math& Other Sciences (Cagliari)	42.8	39.2	41.0						
Fac15	Engineering (Cagliari)	57.1	41.9	46.4						

Table 10 Estimated coefficients and marginal effects from the Probit model for withdrawing students

	CAGLIARI									VITERBO								
	Males			Females			ALL			Males			Females			ALL		
	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.
Constant	-1.214	0.396	-0.373	-1.779	0.143	-0.430	-1.503	0.093	-0.406	-5.109	0.122	-2.012	-5.676	0.057	-1.926	-5.548	0.010	-2.077
Gender Reference: females							0.123	0.011	0.033							0.230	0.018	0.086
Age on entry	0.211	0.000	0.065	0.171	0.000	0.041	0.157	0.000	0.042	0.311	0.000	0.123	0.192	0.004	0.065	0.246	0.000	0.092
Age ²	-0.003	0.000	-0.001	-0.003	0.000	-0.001	-0.002	0.000	-0.001	-0.004	0.000	-0.002	-0.002	0.020	-0.001	-0.003	0.000	-0.001
Residence Reference: in the city																		
Resident in the district	0.222	0.010	0.068	-0.086	0.262	-0.021	0.053	0.351	0.014	-0.034	0.852	-0.014	0.043	0.804	0.015	0.026	0.836	0.010
Resident outside district	0.097	0.324	0.030	-0.100	0.260	-0.024	-0.009	0.890	-0.002	0.173	0.356	0.068	0.340	0.064	0.115	0.299	0.020	0.112
Type of Maturità Reference: Scientific Lyceum																		
Classical Lyceum	-0.046	0.722	-0.014	-0.039	0.694	-0.009	-0.023	0.762	-0.006	-0.200	0.445	-0.079	0.364	0.062	0.124	0.182	0.217	0.068
Other Lyceum + artistic	0.456	0.041	0.140	0.603	0.000	0.146	0.554	0.000	0.150	1.115	0.009	0.439	0.671	0.005	0.228	0.676	0.001	0.253
Tech/Commercial	0.426	0.000	0.131	0.678	0.000	-0.164	-0.563	0.000	0.152	0.466	0.006	0.183	0.353	0.087	0.120	0.423	0.001	0.158
Industrial/agricultural/Surveyors	0.614	0.000	0.189	0.459	0.002	0.111	0.624	0.000	0.169	0.481	0.001	0.189	0.359	0.237	0.122	0.469	0.000	0.175
Professional + other unspecified	0.779	0.000	0.239	0.740	0.000	0.179	0.723	0.000	0.195	0.675	0.031	0.266	1.165	0.000	0.395	1.012	0.000	0.379
Socio/Psyco/Pedagog Lyceum	0.646	0.010	0.198	0.503	0.000	0.121	0.463	0.000	0.125	0.597	0.209	0.235	0.816	0.001	0.277	0.723	0.000	0.271
Entry qualifications Reference: 60-80 (36-48)																		
Score at maturità 81-92 (49-55)	-0.401	0.000	-0.123	-0.167	0.020	-0.040	-0.248	0.000	-0.067	-0.221	0.155	-0.087	-0.198	0.190	-0.067	-0.222	0.038	-0.083
Score at maturità 93-100 (56-60)	-0.554	0.000	-0.170	-0.426	0.000	-0.103	-0.468	0.000	-0.126	-0.863	0.000	-0.340	-0.351	0.033	-0.119	-0.493	0.000	-0.185
Family income																		
Income>23,850 euro	0.916	0.000	0.281	0.850	0.000	0.205	0.870	0.000	0.235	-0.006	0.955	-0.003	-0.148	0.220	-0.050	-0.090	0.271	-0.034
Regularity at school																		
Irregular performance	0.110	0.144	0.034	0.093	0.167	0.022	0.121	0.014	0.033	0.197	0.096	0.078	0.120	0.388	0.041	0.173	0.049	0.065
AVERPEER ⁵	-0.131	0.011	-0.040	-0.066	0.120	-0.016	-0.080	0.012	-0.022	-0.001	0.993	0.000	0.067	0.564	0.023	0.037	0.659	0.014

⁵ Average exam marks of degree course peers (weighted by number of credits)

Table 10 Estimated coefficients and marginal effects from the Probit model for withdrawing students - Contin

	CAGLIARI									VITERBO									
	Males			Females			ALL			Males			Females			ALL			
	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	
Faculty dummies																			
Reference(Viterbo): Agricultural																			
Cultural Heritage (Viterbo)										-0.432	0.071	-0.170	-0.322	0.145	-0.109	-0.302	0.040	-0.113	
Economics (Viterbo)										0.267	0.256	0.105	0.657	0.024	0.223	0.477	0.006	0.179	
Languages (Viterbo)										0.238	0.452	0.094	-0.313	0.246	-0.106	-0.144	0.443	-0.054	
Biology (Viterbo)										-0.093	0.618	-0.037	-0.242	0.319	-0.082	-0.135	0.341	-0.050	
Reference(Cagliari): Law																			
Political Science (Cagliari)	-0.091	0.534	-0.028	-0.474	0.000	-0.115	-0.319	0.001	-0.086										
Economics (Cagliari)	-0.009	0.949	-0.003	-0.408	0.001	-0.099	-0.213	0.016	-0.058										
Humanities (Cagliari)	0.074	0.691	0.023	-0.244	0.086	-0.059	-0.126	0.261	-0.034										
Education (Cagliari)	-0.093	0.542	-0.029	-0.383	0.000	-0.093	-0.308	0.000	-0.083										
Languages (Cagliari)	0.254	0.182	0.078	-0.198	0.107	-0.048	-0.059	0.563	-0.016										
Medicine (Cagliari)	-0.914	0.004	-0.281	-0.934	0.001	-0.226	-0.967	0.000	-0.261										
Pharmacology (Cagliari)	-0.084	0.688	-0.026	0.085	0.578	0.021	0.015	0.904	0.004										
Math& Other Sciences (Cagliari)	-0.147	0.291	-0.045	0.038	0.751	0.009	-0.080	0.372	-0.022										
Engineering (Cagliari)	-0.164	0.200	-0.050	-0.194	0.169	-0.047	-0.255	0.004	-0.069										
Number of observations			2192			3233			5,425			588			593			1,181	
<i>f(xb)</i>			0.307			0.242			0.270			0.394			0.339			0.374	
<i>Mean dependent var.</i>			0.284			0.195			0.231			0.449			0.314			0.381	
<i>Log likelihood</i>			-1026.3			-1356.5			-2419.41			-349.4			-309.8			-670.60	
<i>Restr. log likelihood</i>			-1307.5			-1594.5			-2930.7			-404.5			-368.8			-784.85	
<i>LR statistic (20 df)</i>			562.3			476.0			1022.59			110.3			118.1			228.502	
<i>Probability(LR stat)</i>			0.000			0.000			0.000			0.000			0.000			0.000	
<i>McFadden R-squared</i>			0.215			0.149			0.174			0.136			0.160			0.146	

Table 11 Least squares estimates of student progression (proportion of credits achieved) using logit transformation

VARIABLE	CAGLIARI									VITERBO								
	Males			Females			ALL			Males			Females			ALL		
	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.
Constant	-5.149	0.000	-1.237	-1.836	0.039	-0.455	-3.442	0.000	-0.845	-5.888	0.109	-1.438	-2.271	0.411	-0.567	-3.387	0.119	-0.845
Gender Reference: female							-0.072	0.063	-0.018							0.064	0.499	0.016
Age on entry	-0.064	0.214	-0.015	-0.123	0.000	-0.031	-0.102	0.000	-0.025	-0.130	0.051	-0.032	-0.101	0.163	-0.025	-0.125	0.009	-0.031
Age^2	0.001	0.167	0.000	0.002	0.001	0.000	0.002	0.000	0.000	0.002	0.088	0.000	0.001	0.415	0.000	0.002	0.040	0.000
Residence Reference: in the city																		
Resident in the district	0.003	0.970	0.001	0.125	0.040	0.031	0.072	0.123	0.018	-0.007	0.969	-0.002	-0.067	0.669	-0.017	-0.080	0.504	-0.020
Resident outside district	0.211	0.011	0.051	0.191	0.005	0.047	0.195	0.000	0.048	-0.011	0.954	-0.003	0.066	0.692	0.016	0.016	0.900	0.004
Type of Maturità Reference: Scientific Lyceum																		
Classical Lyceum	-0.133	0.156	-0.032	0.051	0.418	0.013	0.005	0.924	0.001	-0.225	0.344	-0.055	-0.221	0.148	-0.055	-0.156	0.212	-0.039
Other Lyceum + artistic	0.166	0.418	0.040	-0.205	0.030	-0.051	-0.131	0.128	-0.032	1.224	0.046	0.299	-0.259	0.229	-0.065	-0.070	0.720	-0.018
Tech/Commercial	-0.046	0.601	-0.011	-0.285	0.000	-0.071	-0.202	0.000	-0.050	-0.076	0.683	-0.019	-0.252	0.158	-0.063	-0.142	0.262	-0.035
Industrial/agricultural/Geometri	-0.163	0.030	-0.039	-0.285	0.013	-0.071	-0.214	0.000	-0.053	0.001	0.995	0.000	-0.583	0.023	-0.146	-0.138	0.276	-0.034
Professional + other unspecified	-0.055	0.737	-0.013	-0.265	0.008	-0.066	-0.212	0.013	-0.052	0.020	0.959	0.005	-0.295	0.246	-0.074	-0.195	0.342	-0.049
Socio/Psyco/Pedagog Lyceum	0.046	0.851	0.011	-0.145	0.034	-0.036	-0.120	0.061	-0.029	0.778	0.204	0.190	-0.358	0.103	-0.089	-0.197	0.324	-0.049
Entry qualifications Reference: 60-80 (36-48)																		
Score at maturità 81-92 (49-55)	0.356	0.000	0.086	0.346	0.000	0.086	0.352	0.000	0.087	0.512	0.002	0.125	0.224	0.084	0.056	0.323	0.001	0.081
Score at maturità 93-100 (56-60)	0.875	0.000	0.210	0.639	0.000	0.158	0.718	0.000	0.176	0.408	0.037	0.100	0.405	0.005	0.101	0.413	0.000	0.103
Family income																		
Income>23,850 euro	-0.063	0.309	-0.015	0.102	0.050	0.025	0.028	0.484	0.007	-0.208	0.092	-0.051	-0.159	0.145	-0.040	-0.179	0.026	-0.045
Regularity at school																		
Irregular performance	-0.254	0.001	-0.061	-0.162	0.003	-0.040	-0.190	0.000	-0.047	-0.175	0.202	-0.043	-0.048	0.733	-0.012	-0.106	0.266	-0.027

Table 11 Least squares estimates of student progression (proportion of credits achieved) using logit transformation Continued

VARIABLE	CAGLIARI									VITERBO								
	Males			Females			ALL			Males			Females			ALL		
	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.	Coeff.	Prob.	Marg.
Performance at University																		
Average of exam marks	0.178	0.000	0.043	0.178	0.000	0.044	0.178	0.000	0.044	0.162	0.000	0.039	0.185	0.000	0.046	0.174	0.000	0.043
Peer effect																		
Averpeer ⁶	0.034	0.439	0.008	-0.065	0.038	-0.016	-0.012	0.631	-0.003	0.138	0.336	0.034	-0.035	0.744	-0.009	0.028	0.738	0.007
Faculty dummies										0.142	0.514	0.035	0.201	0.327	0.050	0.132	0.342	0.033
Cultural Heritage (Viterbo)										0.338	0.199	0.083	0.334	0.230	0.083	0.281	0.122	0.070
Economics (Viterbo)										0.339	0.314	0.083	1.001	0.000	0.250	0.807	0.000	0.201
Languages (Viterbo)										0.209	0.277	0.051	0.505	0.016	0.126	0.378	0.005	0.094
Biology (Viterbo)																		
Political Science (Cagliari)	0.563	0.000	0.135	0.994	0.000	0.246	0.817	0.000	0.201									
Economics (Cagliari)	0.571	0.000	0.137	0.630	0.000	0.156	0.617	0.000	0.151									
Humanities (Cagliari)	-0.564	0.001	-0.135	-0.353	0.001	-0.088	-0.452	0.000	-0.111									
Education (Cagliari)	0.597	0.000	0.143	0.702	0.000	0.174	0.673	0.000	0.165									
Languages (Cagliari)	-0.431	0.019	-0.103	-0.273	0.005	-0.068	-0.328	0.000	-0.080									
Medicine (Cagliari)	-0.160	0.334	-0.038	0.020	0.879	0.005	-0.060	0.557	-0.015									
Pharmacology (Cagliari)	0.249	0.177	0.060	0.219	0.093	0.054	0.238	0.026	0.058									
Math& Other Sciences (Cagliari)	-0.031	0.798	-0.007	0.117	0.237	0.029	0.072	0.345	0.018									
Engineering (Cagliari)	0.344	0.002	0.083	0.759	0.000	0.188	0.503	0.000	0.123									
Number of observations			1554			2577			4131			312			394			706
<i>Adjusted R-squared</i>			0.579			0.560			0.568			0.568			0.559			0.571
<i>Root MSE</i>			1.072			1.031			1.051			1.016			1.020			1.020
<i>Sum squared resid</i>			1757.09			2709.41			4529.35			300.31			388.23			712.26

⁶ Average exam marks of degree course peers (weighted by number of credits)