The impact of supply side policies on university drop-out:
The Italian experience

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How to reduce university drop-out is a topic of increasing concern. Although several measures have been the subject of numerous debates, little attention has been given to those impacting on the structure and content of the supply of university education. This paper looks at the Italian experience to see what can be learnt about the effectiveness of these measures. In 2001 the Italian university system embarked on a process of reform that introduced greater flexibility in the degree programme structure along with a wider range of services offered to students. Employing a decomposition analysis, we find that the reform is associated with changes in student behaviour leading to a decline in drop-out risk. This finding is robust even when controlling for student self-selection into university.

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I. Introduction

University drop-out is a topic of increasing concern throughout the world. It is at the top of the current policy agenda in those countries, such as Italy[1], showing persistent high non-completion rates. High university drop-out rates represent a major preoccupation for these governments at least in three respects. First, as university education is typically subsidized by the government, it can be argued that high student attrition constitutes a waste of public money. Second, persistent high drop-out rates may lead to a lower proportion of university degree holders among the labour force. This, in turn, may undermine economic growth and competitiveness given the convincing macroeconomic evidence on the positive effect of skilled labour on productivity (see, for instance, Kahn and Jong-Soo, 1998). Third, as the future will see a growing number of jobs requiring a university degree, university dropouts may be facing decreasing employment opportunities. This increases the chances that sometimes in their life they will have to rely on welfare and other social programmes, leading to a heavier burden for the government.

For decades, there has been much debate on how governments may reduce the incidence of university drop-out. This discussion has largely focused on the effectiveness of measures impacting on the access to university programmes and provisions aimed at increasing the amount of available resources. Successful drop-out prevention may result from setting up selection mechanisms ensuring that only relatively high-ability students are admitted to university, including those from less advantaged backgrounds who would

[1] In Italy the proportion of students who drop out of university is higher than in any other Organization for Economic Cooperation and Development (OECD) country (OECD, 2004).

not be able to afford university without a scholarship. Similarly, small class size and a low student-teacher ratio may also be beneficial. Although all these measures are likely to be effective in countering high drop-out rates, little attention has been given to the impact of those provisions designed to change the content and structure of the supply of university education. These supply side factors are likely to play an important role as they address problems related to the inability of the programmes and services offered by universities to fully meet students' needs.

The Italian university reform of 2001 provides an excellent opportunity to evaluate the impact of these supply side factors on drop-out. This reform has introduced greater flexibility in the degree programme structure along with a number of provisions aimed at creating a university system that is more supportive to students. Thus a wider variety of courses is offered to students, more counselling is available to help students to make informed decisions and new mechanisms facilitating student mobility have been adopted. As these measures are likely to meet previously unsatisfied students' needs, one would expect them to reduce the probability that students will drop out of university.

In this paper, we use individual level data from three entry cohorts of university students, i.e. 1995, 1998 and 2001. These data allow us to observe whether the students have withdrawn from university before the end of their third year. As the university reform came into effect in 2001, we compare 2001 cohort drop-out rate with 1995 and 1998 cohort drop-out rates. Repeated cross sectional analyses are carried out to investigate the changes in the average predicted probability of dropping out of university across these

cohorts. We then employ a decomposition method in an attempt to determine to what extent changes in the probability of dropping out are caused by changes in the observable characteristics of the student population, and to what extent they are instead explained by changes in students' behaviour. Since the second term of the decomposition analysis reflects changes in students' attitude towards drop-out, this measure can be interpreted as providing an indication of the effectiveness of the reform in diminishing the incidence of drop-out.

We first model the probability of dropping out of university using a simple univariate probit model. Next we employ a bivariate probit model where university attendance and university drop-out equations are estimated simultaneously (Light and Strayer, 2000; Di Pietro, 2004). The advantage of this model is that it allows unobservables affecting the decisions to enrol at university and to drop out of university to be correlated. The rationale for using this approach is that one would expect high school leavers possessing unobserved qualities such as "determination" and "drive" to be more likely to attend university and, conditional on enrolment, to be less likely to drop out. There is, however, an additional reason why in our analysis it is important to estimate a two-period model that includes a university attendance equation. This is because the reform might have affected not only students' drop-out behaviour, but also university enrolment. If student self-selection into university has changed, then one needs to account for this when estimating the probability of dropping out of university.

The remainder of the paper is organised as follows. Section II outlines the channels through which one would expect the reform to impact on drop-out rates. Section III reviews a number of relevant academic studies on university drop-out. Section IV presents the models used in this study to analyse the probability of dropping out of university and outlines the decomposition methods. Section V describes the data used to estimate these models. In Section VI the empirical results are both reported and discussed. Section VII concludes.

II. The Italian University Reform and drop-out

Following the Bologna Declaration, which aims at the development of a coherent and cohesive European Higher Education Area by 2010, university education in Italy has undergone a process of reform in the early 2000s. This reform has changed the duration, structure and content of the university programme. The traditional four to five year programme has been replaced by a '3+2' model consisting of a First Degree (*Laurea di primo livello*) that lasts three years, followed by a Specialised Degree (*Laurea specialistica*) of two years length. Additionally, universities have adopted a credit system[2] according to which student workload is measured in credits[3]. As the credit system sets up a way of measuring and comparing learning outcomes, it facilitates student mobility across courses as well as institutions and provides common procedures to guarantee academic recognition of studies abroad. Finally, within university curricula greater emphasis is placed on those types of knowledge and skills typically required by employers. Hence working experience, knowledge of a foreign language and information

[2] Although the credit framework was first set out by Ruberti's reform at the end of the 1980s, it has been practically disregarded by universities (Varia, 2003).
[3] One credit corresponds to 25 hours of work.

and communication technology (ICT) skills are recognised to be important elements of the undergraduate programme across all courses.

There are several channels through which this reform may bring drop-out rates down. To begin with, the division of the undergraduate programme into two degrees may lead to lower student attrition. There are two ways through which this may occur. First, the reform enables those students, who find themselves either unable or unwilling to study for an extra fourth or fifth year, to still manage to get a first level degree rather than leaving university without qualifications. Second, perhaps less obvious but nonetheless equally important, the reform may make students change their attitude towards drop-out. It may encourage those first and second year students, who find it hard to study at university level, to make an additional effort to get at least a first level degree.

Additionally, the reform has been accompanied by other measures designed to lower drop-out rates. More resources have been put into pre-university guidance in order to help students make informed decisions about their academic career. Counselling may enable students to choose a path for which they are fitted rather than grimly failing at a task for which they are ill-fitted. Similarly, it is possible to argue that the tendency to bring university curricula closer to the demands of employers may reduce drop-out rates. Students may develop a further interest to stay at university as they are aware that they will be able to use some of the knowledge and skills acquired at university in their future jobs.

With the entry into force of the reform, many universities have introduced new undergraduate courses. As a broader choice of courses is likely to improve the match between students' interests and what is offered within academic institutions, one would also expect this provision to yield lower drop-out rates. Finally, easier student mobility may provide an additional incentive for students to stay at university. Since transferring to another university or to another course does not represent a big burden anymore, unsatisfied students would be more willing to attempt the degree again rather than simply leaving the university.

III. Literature review on determinants of university drop-out

There is a sizeable US and UK literature that investigates the determinants of university drop-out using student level data. The emerging consensus is that there are a number of personal, family and institutional characteristics which are likely to influence the decision to leave university.

Several studies show that students' academic ability, often proxied by their prior qualification, affects university completion. In a recent study Arulampalam *et al*. (2005) find that in the UK the probability of dropping out of university is higher among students with relatively poor levels of prior qualifications. A similar result was obtained by Light and Strayer (2000) for the US. They observe that the match between student ability and college quality has a statistically significant effect on drop-out risk.

Completion rates may also vary across gender and age. Focusing on medical students in UK universities, Arulampalam *et al*. (2004) conclude that males and more mature students are more likely to drop out relative to females or younger students respectively. This finding is consistent with that obtained by Bean and Metzner (1983) who report that mature students show higher attrition rates. They argue that this may reflect problems associated with family or work commitments.

There is also evidence showing that the type of school attended influences the likelihood that a student will be successfully completing university. Smith and Naylor (2001), using individual level data on an entire cohort of undergraduate students in the 'old' universities in the UK, note that individuals who have attended independent schools are less likely to leave university relative to their peers who have studied at comprehensive schools, *ceteris paribus*.

Family background is expected to be a strong predictor of the probability that a student will be withdrawing from university. Parents may affect their children's academic performance by encouraging them to high educational expectations as well as by providing a supportive learning environment at home. Johnes (1990) finds that the parental social class exerts a significant influence on university completion for UK students. Similarly, Sandy *et al.* (2006) use parental educational attainment as a proxy for family background and find that, other things being held constant, US students whose parents have some college education are more likely to successfully complete a 4-year college degree.

There are also significant effects on drop-out risk that are associated with the subject studied at university. Johnes and McNabb (2004) analyse the determinants of the probability of dropping out of university in the UK in 1993 and find that, *ceteris paribus,* the likelihood of withdrawing tends to be higher among students in the 'hard' science disciplines (mathematics, engineering & technology and physical science).

In addition to individual characteristics, several institution-specific factors are also found to affect university completion. Robst *et al.* (1998), using student level data from the State University of New York at Binghamton, provide some evidence on the effect of the gender composition of faculty on students' persistence. Their work shows that female students in science, mathematics and computer science have higher first-year retention when a greater percentage of their classes are taught by female faculty. Johnes and McNabb (2004) study the effect of institutional quality, as measured by the results of subject-specific Teaching Quality Assessment (TQA), on student withdrawal. They find that students attending universities characterised by high standards of quality in teaching have a lower probability of dropping out relative to their peers studying at universities that do not achieve the same standards.

Finally, a number of studies support the hypothesis that peer effects have some bearing on drop-out behaviour. Arulampalam *et al*. (2005) find that the propensity to withdraw is higher among those males who are placed in classes characterised by a greater heterogeneity of students with respect to prior qualifications.

There are a small but growing number of studies on university drop-out in Italy. Employing data from the Italian National Institute of Statistics (ISTAT) for a representative sample of the university population, Cingano and Cipollone (2003) find that parental education and the type of high school attended are important determinants of university withdrawal. Though the interpretation of the first factor is straightforward, the second one needs brief discussion as it acts as a proxy for academic preparedness. In Italy there are three types of upper secondary schools[4]: general schools (*licei*), technical schools (*instituti tecnici e professionali*) and teaching schools (*istituti magistrali*). The first two types comprise a five-year curriculum and upon successful completion students gain the automatic right of entry to university. While general high schools serve as a basis for academic education at university, technical high schools explicitly aim to provide vocational education. General high schools can be in turn classified according to the major chosen: science (*liceo scientifico*), classical studies (*liceo classico*), foreign languages (*liceo linguistico*) and art (*liceo artisico*). *Liceo scientifico* and *liceo classico* account for a very large proportion of the enrolment at general high schools and their curriculum is designed to provide to students a more comprehensive preparation for university relative to *liceo liguistico* and *liceo artistico*. Teaching high schools (*istituti magistrali*) are based on a four-year program and they are specifically targeted to train primary school teachers. Individuals graduating from teaching secondary institutions may still enroll at university but they would have to attend an additional school year.

Aina (2005), using data for the Italian component of the European Community Household Panel (ECHP), shows that family income does not exert any influence on the

[4] The terms "upper secondary school" and "high school" are used here interchangeably.

likelihood that a student will be leaving university. This finding may be partially attributed to the fact that in Italy tuition and fees are, on average, lower than in most other OECD countries.

In a recent paper Di Pietro (2006) outlines that regional labor market conditions may play a key influence on the decision to drop out of university. Lower regional unemployment rate may encourage a number of students to leave university in order to take advantage of the apparently improved labor market conditions.

Boero *et al*. (2005) estimate the probability of dropping out among students of two Italian universities (i.e. Viterbo and Cagliari). Focusing only on two institutions gives them the advantage of using a rich data set that includes explanatory factors that are typically not available in national representative surveys. Thus they are able to find some evidence supporting the importance of peer effects. Individuals enrolled at courses characterized by a larger proportion of students with high academic ability are less likely to withdraw from university, *ceteris paribus*.

IV. Model

In this Section we sketch the methodological approaches used to estimate the probability of dropping out of university and to decompose changes over time in this probability.

Let $univ^{*}$ to be the latent variable indicating the individual propensity of attending university, specified as:

$$univ^* = \beta_1 x_1 + \varepsilon_1 \qquad (1)$$

where β_1 is a vector of coefficients, x_1 is a vector of explanatory variables that are thought to influence the decision to attend university and ε_1 is an error term distributed normally with zero mean and unit variance. If $univ^* \geq 0$ the individual chooses to attend university, whereas if $univ^* < 0$ the individual chooses not to attend university. Note that $univ^*$ is not observed. In practice, we observe a dummy variable, *univ*, that takes the value of 1 if $univ^* \geq 0$ and the value of 0 if $univ^* < 0$.

Only for those individuals who choose to attend university (i.e. $univ^* \geq 0$), we are able to observe whether they drop out of university. Assume that $drop^*$ is the latent variable measuring the individual propensity of dropping out of university. This can be expressed as:

$$drop^* = \beta_2 x_2 + \varepsilon_2 \qquad (2)$$

where β_2 is a vector of coefficients, x_2 is a vector of explanatory variables that are likely to affect the decision to leave university and ε_2 is an error term distributed normally with zero mean and unit variance. If $drop^* \geq 0$ the individual chooses to drop out of university, whereas if $drop^* < 0$ the individual chooses not to drop out of university. Note that $drop^*$ is not observed. We only observe a dichotomous variable, *drop*, that takes the value of 1 if $drop^* \geq 0$ and the value of 0 if $drop^* < 0$.

Initially, we assume that the error processes across Equations *(1*) and *(2)* are independent, i.e. corr($\varepsilon_1, \varepsilon_2$)=0. This means that we can compute the probability of dropping out of university using a simple probit model given by Equation *(2)*. Thus we have:

$$P = \Pr[drop^* \geq 0] = \Pr[drop = 1] = \Phi_U(\beta_2 x_2) \qquad (3)$$

where Φ_U is the cumulative univariate distribution function for standard normal distribution.

Next, we relax the assumption of independence between ε_1 and ε_2 thereby allowing for the possibility that these two error terms are correlated, with a correlation coefficient equal to ρ, i.e. corr($\varepsilon_1, \varepsilon_2$) $\neq 0 = \rho$. The rationale for this approach is that unobserved characteristics possibly influencing the individual's decision to drop out of university are likely to have affected his/her earlier choice to attend university. Given that one only observes whether an individual withdraws from university if he/she has previously enrolled at university, there are three possible outcomes: the individual does not attend university, the individual attends university but he/she does not drop out and the individual attends university and he/she drops out. The bivariate joint probabilities for these three outcomes can be defined as:

$$P = \Pr[univ^* < 0] = \Pr[univ = 0] = \Phi_U(\beta_1 x_1) \qquad (4)$$

$$P = \Pr[univ^* \geq 0, drop^* < 0] = \Pr[univ = 1, drop = 0] = \Phi_B(-\beta_2 x_2, \beta_1 x_1, -\rho) \qquad (5)$$

$$P = \Pr[univ^* \geq 0, drop^* \geq 0] = \Pr[univ = 1, drop = 1] = \Phi_B(\beta_2 x_2, \beta_1 x_1, \rho) \qquad (6)$$

where Φ_B denotes the cumulative bivariate normal distribution function. Estimating a bivariate probit with sample selection leads to consistent parameter estimates for the vectors β_1 and β_2 and for ρ.

Following Van de Ven and Van Praag (1981), the likelihood function for this model is:

$$L = \sum_{univ=1,drop=1} \ln\left[\Phi_B(\beta_2 x_2, \beta_1 x_1, \rho)\right] + \sum_{univ=1,drop=0} \ln\left[\Phi_B(-\beta_2 x_2, \beta_1 x_1, -\rho)\right] + \sum_{univ=0} \ln\left[\Phi_U(\beta_1 x_1)\right] \quad (7)$$

The probability of dropping out of university, conditional on enrolment, is equal to the joint probability of enrolling and then dropping out of university divided by the probability of university enrolment. Thus we have:

$$P = \Pr\left[drop = 1 \mid univ = 1\right] = \frac{\Phi_B(\beta_2 x_2, \beta_1 x_1, \rho)}{\Phi_U(\beta_1 x_1)} \quad (8)$$

Changes over time in the probability of dropping out of university can be due to changes in students' characteristics and/or changes in estimated coefficients. In line with the approach of Gomulka and Stern (1990), Van Den Berg and Grift (2001) and Arulampalam *et al*. (2005) we apply an Oxaca-type decomposition method.

If the univariate probit model is employed, using year j as reference, the change in the average predicted probability of dropping out of university between year i and year j can be decomposed as:

$$\Phi_U(\beta_{2j}\bar{x}_{2j}) - \Phi_U(\beta_{2i}\bar{x}_{2i}) = \left\{\Phi_U(\beta_{2j}\bar{x}_{2j}) - \Phi_U(\beta_{2i}\bar{x}_{2j})\right\} + \left\{\Phi_U(\beta_{2j}\bar{x}_{2j}) - \Phi_U(\beta_{2j}\bar{x}_{2i})\right\} + I \quad (9)$$

where $\Phi_U(\beta_{2j}\bar{x}_{2j})$ is the average predicted probability of dropping out of university using characteristics x_{2j} and coefficients β_{2j}. The first term in brackets in Equation *(9)* indicates the changes in the average probability due to changes in estimated coefficients (i.e. coefficient effect). The second term measures the contribution of a change in students' characteristics to the change in the average probability of dropping out of university (i.e. variable effect). The third term is the interaction effect that is defined as the difference between the total difference and the sum of the two main effects, i.e. the coefficient and the variable effects. If the interaction term is split over the two main effects, the composition becomes unique and thus independent of the reference year.

In the case of the bivariate probit model with sample selection, still using year j as reference, the change in the average predicted conditional probability of dropping out of university between year i and year j can be decomposed as:

$$\frac{\Phi_B(\beta_{2j}\bar{x}_{2j},\beta_{1j}\bar{x}_{1j},\rho_j)}{\Phi_U(\beta_{1j}\bar{x}_{1j})}-\frac{\Phi_B(\beta_{2i}\bar{x}_{2i},\beta_{1i}\bar{x}_{1i},\rho_i)}{\Phi_U(\beta_{1i}\bar{x}_{1i})}=\left\{\frac{\Phi_B(\beta_{2j}\bar{x}_{2j},\beta_{1j}\bar{x}_{1j},\rho_j)}{\Phi_U(\beta_{1j}\bar{x}_{1j})}-\frac{\Phi_B(\beta_{2i}\bar{x}_{2j},\beta_{1i}\bar{x}_{1j},\rho_i}{\Phi_U(\beta_{1i}\bar{x}_{1j})}\right\}$$
$$+\left\{\frac{\Phi_B(\beta_{2j}\bar{x}_{2j},\beta_{1j}\bar{x}_{1j},\rho_j)}{\Phi_U(\beta_{1j}\bar{x}_{1j})}-\frac{\Phi_B(\beta_{2j}\bar{x}_{2i},\beta_{1j}\bar{x}_{1i},\rho_j)}{\Phi_U(\beta_{1j}\bar{x}_{1i})}\right\}+I \qquad (10)$$

where $\frac{\Phi_B(\beta_{2j}\bar{x}_{2j},\beta_{1j}\bar{x}_{1j},\rho_j)}{\Phi_U(\beta_{1j}\bar{x}_{1j})}$ is the average predicted conditional probability of dropping out of university using characteristics x_{1j} and x_{2j} and coefficients β_{1j}, β_{2j} and ρ_j. The interpretation of the terms in brackets in Equation (*10*) is similar to that given above for Equation *(9)*.

V. Data and variables

The data sets used in this paper come from three waves (i.e. 1998, 2001 and 2004) of a national cross-sectional survey (*Percorsi di Studio e di Lavoro dei Diplomati*) carried out by the ISTAT[5]. Each wave consists of a representative sample of high school leavers who are surveyed three years after their graduation. These data sets are suitable for the purpose of this study as one of the possible destinations of high school leavers is university enrolment. This allows us to identify three cohorts of university students who enrolled for the first time in 1995, 1998 and 2001. Of course there are other possible trajectories after completing high school. Some people may start to work immediately while others may become job seekers. The survey contains individual information on previous educational attainment, degree results, parents' socio-economic status as well as a range of personal attributes.

Following the approach of Becker (2001) and Di Pietro (2004), those individuals who enrolled at university, but did not do so right after high school[6], are excluded from our final samples. This choice is made in an attempt to ensure comparability in the analysis of drop-out risk. Students who enrolled at university one or more years after leaving high school are in fact observed for a shorter period of time relative to those who started university following high school graduation. Thus our measure of drop-out indicates whether or not students have dropped out of university before the end of their third year[7].

[5] These data can be obtained from the ISTAT, but permission must be first granted from the President of ISTAT.
[6] Yet, it is important to observe that in Italy the large majority of individuals who enrol at university do so right after high school graduation. In all our data sets approximately 85% of those individuals who enrolled at university did so immediately after leaving high school.
[7] The survey does not record the year of study at which the student dropped out of university.

In line with the approach of Cappellari (2004), we also remove from each data set those individuals who graduated from teaching schools. As outlined in Section III, the latter type of schools has a different structure relative to general and technical schools. After deleting observations with missing variables of interest we are left with the following sample sizes[8] for the three data sets: 16,098 (1998), 19,966 (2001) and 18,422 (2004). Within these samples the number of high school leavers who enrolled at university is: 7,798 (1998), 7,124 (2001) and 8,850 (2004).

However, one should bear in mind that in our final samples there is the potential for some bias. We are likely to underestimate drop-out rates as one would expect a lower response amongst the less successful university students. A number of those individuals who have decided to leave university are likely to be reluctant to admit this and hence they may not wish to participate in the survey. In addition, there is a bias introduced by the possible non-random nature of student mobility. High school leavers who have moved house without leaving forwarding contacts will not included in the survey.

In our empirical analysis a number of factors are considered to explain the decision to drop out. These factors can be divided into six major categories: personal, school related, ability related, family related, geographical and attendance related. Personal attributes include gender, age, and marital or cohabiting status. School-related characteristics refer to the type of upper secondary school attended. Individual's academic ability is proxied by early school performances. Thus the model comprises high school degree classification and a dummy variable recording whether the individual has failed any high

[8] The original sample sizes are: 18,443 (1998), 23,262 (2001) and 20,408 (2004).

school year. Family background is measured by both mother's and father's education. The drop-out specification comprises also geographical area dummies in order to account for location-characteristics that may affect drop-out. Unemployment rate (among people aged between 20 and 24 and broken down by gender and geographical area) is also introduced among the explanatory variables in an attempt to analyse the impact of labour market conditions on drop-out. We include an average of the unemployment rates over a three-year period, namely between the first year of enrolment and the year the survey was carried out. Finally, we also include a dummy variable recording whether the individual has attended the classes of at least a core subject at university. The rationale for including this variable is that one would expect attendance to reduce drop-out risk.

It is important to note that our empirical analysis suffers from some limitations. In our drop-out specification we are unable to control for neither university-related characteristics nor the subject studied at university. Although this is unfortunate, information on the university attended is only available for those individuals who were still enrolled at university at the time of the survey, but not for those who had dropped out[9]. One important implication being that we cannot account for university fixed effects in the estimation of the drop-out model.

Table 1 compares the characteristics of those high school leavers who enrolled at university after graduation in 1995, 1998 and 2001. From Table 1 it emerges that the cohort drop-out rate declined from 18% in 1995 to 13.7% in 1998, but increased to 15.5%

[9] In the 2004 wave for the first time the survey reports information on the subject studied at university also for dropouts. However, for reasons of comparability this factor is not included among the explanatory variables in our analysis.

in 2001. Although these data seem to question the ability of the reform to reduce the incidence of drop-out, it would be premature to draw a conclusion based on this evidence. It is possible that differences in the composition of the university student population between 1998 and 2001 may account for the increase in the drop-out rate. There might be a possibility that students who enrolled in 2001 had, on average, less academic ability than those who started university in 1998. This argument is supported by the higher proportion of students who failed at least one high school year in the 2001 cohort relative to the 1998 cohort.

Insert Table 1 about here

We also account for the possibility that student self-selection into university may not be random and thus may be a source of bias in our estimates. Thus we estimate an equation for university attendance jointly with our drop-out equation through the use of a bivariate probit model with sample selection. In the university participation equation we include all the explanatory factors introduced in the drop-out equation, with the exception of the dummy variable for university attendance. Additionally, the unemployment rate comprised in the equation for university participation refers to the high school graduation year[10]. One would expect high school leavers from high-unemployment areas to be more likely to enrol at university relative to their peers living in low-unemployment areas given the lower opportunity cost of university education.

[10] As in the drop-out equation, we consider the unemployment rate among individuals aged between 20 and 24 years old by gender and geographical area. Additionally, since information on the area of residence of individuals at the time of high school graduation is not available (the survey records only the current area of residence), we use the location of the high school attended as our reference.

Table 2 reports some characteristics of all the high school graduates included in our final samples. The proportion of high school leavers who enrolled at university decreased from 48.4% in 1995 to 35.6% in 1998, but increased to 48% in 2001. A main reason for the higher proportion of recent high school graduates who started university in 1995 relative to 1998 and 2001 is likely to lie in the significantly larger proportion of high school leavers who graduated from *liceo classico* and *liceo scientifico* in 1995 (i.e. 23.2%) relative to 1998 and 2001 (13.2% and 15% respectively). Furthermore, the proportion of high school leavers coming from a province with its own university campus has increased over time. This reflects the remarkable efforts made by the Italian regional governments towards the creation of university campuses in most provinces.

Insert Table 2 about here

The credibility of the estimates obtained from the bivariate probit model with sample selection depends on the validity of the instrumental variable. This means that the university participation equation should comprise at least one variable that determines the individual's decision to enrol at university, but has no effect on drop-out. Although our data sets do not contain any information on the individual's residence during the high school period, they report the province of the school. Our approach is to exploit this information to derive an instrumental variable for the university attendance equation on the assumption that the individual was living close to the school. More precisely, following the approach adopted by Card (1995) we employ the presence of a nearby university as an instrument that can be legitimately excluded from the drop-out equation.

As high school leavers coming from an area that has a university tend to face a lower cost of university education relative to their peers living in an area without a university, one would expect university proximity to be an incentive to enrol at university. On the other hand, it is not obvious that this factor influences drop-out behaviour. Thus we construct a dummy variable that takes the value of 1 if the province of the high school attended by the individual has its own university campus, and 0 otherwise.

VI. Empirical results

Univariate probit

Table 3 reports the univariate probit estimates of the drop-out probability for the 1995, 1998 and 2001 cohorts.

Students with higher high school degree classifications are less likely to leave university than those with lower classifications. This finding confirms the important role of early educational performances in predicting drop-out risk. The effect associated with high school degree classification appears to be particularly strong for the most recent cohort.

There are also significant effects associated with the type of high school attended. Students graduating from *liceo classico* and *liceo scientifico* are significantly less likely to drop out of university relative to their peers who have attended other types of high schools. The coefficients on our reference category for type of high school are all highly significant and pretty are stable over time, with no obvious trend.

Being married or cohabiting is found to have a significant positive effect on the likelihood of dropping out of university across the 1995 and 2001 cohorts. Women are found to be less likely to withdraw from university relative to men only in the 2001 cohort. With the exception of the 1998 cohort, students aged 21 or less show a lower probability of dropping out of university relative to their peers aged 25 or more.

Insert Table 3 about here

Father's education and mother's education turn out to be remarkable determinants of drop-out. Having parents with a university degree is found to significantly lower the likelihood of withdrawing from university. Interestingly, drop-out behaviour does not seem to be correlated with area of residence. It is possible that controlling for parental education and type of high school account for much of the differences in drop-out behaviour between students from different areas.

As expected, attending classes of at least a core subject systematically results in a lower probability of withdrawing from university. Since the value of the coefficient on this explanatory factor substantially increases over time, one can interpret this as evidence that the effect of attending classes on the probability of dropping out has become stronger.

By contrast, the effect of having failed a high school year on the drop-out probability is not consistent across the cohorts. The coefficient on this variable is not statistically different from zero in the regression for the 2001 cohort, while it is statistically

significant for the 1998 and 1995 cohorts (though at 5% and 10% respectively). However, the sign on this coefficient is always in line with our expectations.

Stability tests

Next we test whether the drop-out model has structurally changed. The rationale for it is that the decomposition method can only be applied if there is evidence that a structural change has taken place. Thus, in order to test the overall stability of the coefficients, we re-estimate the drop-out model pooling data on the 1995-1998 cohorts as well as on the 1998-2001 cohorts. Likelihood ratio tests[11] show that structural changes have indeed taken place thereby indicating that there are statistically significant differences between the values of the coefficients of the 1995 and 1998 cohorts as well as between those associated with the 1998 and 2001 cohorts. More precisely, the value of log likelihood function for the 1995-1998 pooled sample is -5554.659, which gives 119.24 for the value of the likelihood ratio test. Similarly, value of log likelihood function for the 1998-2001 pooled sample is -5618.356, which gives 64.93 for the value of the likelihood ratio test.

Decomposition analysis-Univariate probit

On the basis of the results presented in Table 3, we decompose the differences in the average predicted drop out probabilities into that part explained by difference in students' characteristics and that part attributable to differences in estimated coefficients. Table 4 reports the results of the Oxaca-type decomposition method represented by Equation *(9)*. The diagonal component of Table 3 depicts the average predicted probabilities of

[11] The likelihood ratio statistic is computed as $LR= -2(l_r - l_u)$ where l_r and l_u stand for values of restricted and unrestricted log likelihood functions respectively.

dropping out of university using students' characteristics and estimated coefficients associated with the same cohort. Whilst the columns of Table 4 give the effect on the drop-out probabilities triggered by changing students' characteristics, the rows of Table 3 report the corresponding effect due to changing estimated coefficients.

Insert Table 4 about here

Between the 1998 and 2001 cohorts the average predicted drop-out probability increased from 10.20% to 10.75%. However, if students in the 2001 cohort are attributed students' characteristics of the 1998 cohort, the average predicted probability of dropping out decreases from 10.75% to 10.03%. Alternatively, if 2001 entry students behave as those in 1998, the average predicted drop out probability increases from 10.75% to 12.51%. By splitting the interaction term as outlined in Section IV, we are able disentangle the extent to which the rise in the average predicted drop out probability between the 1998 and 2001 cohorts can be ascribed to changing estimated coefficients and changing students' characteristics. While changing students' characteristics acted to increase the average predicted drop out probability by 1.52%, this was partially offset by changes in students' behaviour that predict a 0.96% decline in the average probability of dropping out. This result supports the effectiveness of the Italian reform in reducing drop-out. Since changes in the estimated coefficients point towards a decline in the probability of dropping out of university between the 1998 and 2001 cohorts, it is possible interpret this as evidence that the reform has made students act in a way that has led to a lower drop-our risk.

The strength of the university reform in impacting on students' attitude towards drop-out is also confirmed by decomposing the differences in the average predicted drop-out probability between the 1995 and 2001 cohorts. Whilst the average predicted drop-out probability decreased by 2.17% (i.e. 12.92% - 10.75%), the decomposition analysis shows that changes in both students' characteristics and estimated coefficients have contributed to this decline. While changes in students' characteristics account for 2.00% of the fall in the drop-out probability, the corresponding value for changes in students' behaviour is 0.17%.

Bivariate probit with sample selection

Table 5 reports the estimates of the bivariate probit model with sample selection for the 1995, 1998 and 2001 cohorts. Let us first review the result of ρ, the correlation coefficient. Whilst ρ has the expected negative sign in all the three regressions, it is statistically significant only in the regressions for the 1998 and 2001 cohorts. The negative sign of ρ indicates that unmeasured predictors of university enrolment are negatively correlated with unobserved factors explaining the decision to drop out of university. In other words, unobservables making students more likely to enrol at university also exert a negative impact on the likelihood of withdrawing from university. Next we briefly discuss the result of the explanatory variables in the enrolment and drop-out equations.

Insert Table 5 about here

Students with a higher high school classification are found to be more likely to enrol at university but, conditional on enrolment, they are less likely to drop out. Similarly, students whose parents have a higher education degree are more likely to attend university but, conditional on enrolment, they are less likely to withdraw. In line with our expectations, graduating from *liceo classico* and *liceo scientifico* increases the probability of enrolling at university but, conditional on enrolment, it reduces the probability of dropping out. Being married or cohabiting lowers the likelihood of enrolling at university but, conditional on enrolment, it exerts a positive influence on withdrawal. High school leavers aged 21 or less have a higher probability of attending university relative to those aged 25 or more but, conditional on enrolment, the former individuals are less likely to drop out relative to the latter ones .

Having attended a high school that is located in a province that has its own university campus is found to increase the likelihood of enrolling at university. Estimates for the 1995 and 2001 cohorts show that living in an area characterised by a higher unemployment rate increases the probability of enrolling at university. The low opportunity cost of university education may encourage many high school leavers to attend university.

In line with many papers using bivariate probit models (Buddin and Kapur, 2005; Neal 1997) we carry out a number of tests to verify that our instrument is valid. In order to show that our proxy for university proximity significantly affects university enrolment, an F test is performed. A standard F test easily rejects the null hypothesis that the

coefficients on our instrument are equal to zero in the university enrolment equations, with F statistic=5.409 (P-value=0.02) for the 1995 cohort, F statistic=29.766 (P-value=0.00) for the 1998 cohort and F statistic=4.510 (P-value=0.03) for the 2001 cohort. A test for the statistical significance of the instrument in a linear probability model for university enrolment also confirms that the instrument is a good predictor of university enrolment, with t-statistic= 2.552 (P-value=0.01) for the 1995 cohort, t-statistic= 4.993 (P-value=0.00) for the 1998 cohort, t-statistic= 2.187 (P-value=0.03) for the 2001 cohort. An informal test for the exclusion of the instrument from the drop-out equation consists in including the instrument in the probit model explaining the decision to drop out of university. The coefficients on our proxy for university proximity turn out to be statistically insignificant in the drop-out model, with t-statistic= 0.918 (P-value=0.36) for the 1995 cohort, t-statistic= 0.244 (P-value=0.80) for the 1998 cohort, t-statistic= 0.671 (P-value=0.50) for the 2001 cohort. These tests provide some evidence that the instrumental variable used in the bivariate probit model with sample selection is valid.

Stability tests

Before performing the decomposition analysis we need to test whether, as it occurred for probit model, there is evidence of a structural change for the bivariate probit model with sample selection. Here again the overall stability of the coefficients is tested for. First we re-estimate the bivariate probit model with sample selection on the pooled data on the 1995-1998 cohorts and the 1998-2001 cohorts, respectively. Then we carry out a

likelihood test. The results show that there are structural changes between the coefficients of the 1995 and 1998 cohorts as well as between those of the 1998 and 2001 cohorts[12].

Decomposition analysis- Bivariate probit with sample selection

In line with what we did for the univariate probit model, we use the estimates of the bivariate probit model with sample selection depicted in Table 5 to determine to what extent the changes in the conditional probability of dropping out of university are caused by changes in the characteristics of high school leavers and university students on the one hand, and by changes in estimated coefficients, on the other hand. Table 6 shows the result of this decomposition analysis that is based on Equation *(10)* [13]. Note that the interpretation of Table 6 is similar to that of Table 4.

Insert Table 6 about here

Between the 1998 and 2001 cohorts the average predicted conditional probability of dropping out of university increased from 6.19% to 8.12%. Nevertheless, if the characteristics of high school leavers and university students in the 2001 cohort had been those of the 1998 cohort, the average predicted conditional probability of dropping out of university would have declined from 8.12% to 6.85%. On the other hand, if the behaviour of high school leavers and university students in the 2001 cohort had been the same as

[12] The value of the lo likelihood function for the 1995-1998 pooled regression is -22850.86, which gives 383.5 for the value of the likelihood ratio test. The value of the log likelihood function for the 1998-2001 pooled regression is -24734.37, which gives 381.5 for the value of the likelihood ratio test.
[13] Probit estimates for the university enrolment equations are shown in the appendix.

that of their peers in the 1998 cohort, the average predicted conditional probability of dropping out of university would have increased from 8.12% to 8.81%.

The decline in the average predicted conditional probability of dropping out of university associated with the 2001 cohort once one accounts for different characteristics of high school leavers and university students between the 1998 and 2001 cohorts confirms a deterioration in students' characteristics across these cohorts. Moving to the coefficient effect, the results of the decomposition analysis support the view that the reform was successful in reducing drop-out. The analysis shows evidence of a change in the behaviour of students inducing a decline in the average predicted conditional probability of dropping out of university between the 1998 and 2001 cohorts. If the interaction term is split as outlined in Equation *(10)*, we find that whilst a change in the behaviour of high school leavers and university students contributed to a 0.02% decrease in the average predicted conditional probability of dropping out of university, changing characteristics predict a 1.95% increase.

Finally, we decompose the differences in the average predicted conditional probability of dropping out of university between the 1995 and 2001 cohorts. From Table 6 it emerges that this conditional probability decreased by 4.02% (12.14% - 8.12%) and that this decline can be attributed to both changes in the characteristics of students as well as changes in their behaviour. Here again one may interpret such findings as indicating that the university reform succeed in lowering drop-out rate.

VII. Conclusions

The Italian university system has embarked on a process of reform in the very beginning of the 2000s. This reform has led to significant changes in the structure and content of the supply of university education. A greater flexibility in the degree programme structure was introduced along with a wider range of services offered by universities to students. As these provisions are likely to address a broader array of students' needs, they may reduce the incidence of drop-out risk.

This paper has analysed the extent to which this reform was successful in lowering drop-out risk using individual level data on cohorts of students during the pre-reform period (1995 and 1998) and the post-reform period (2001). A decomposition method is employed in an attempt to account for differences in students' characteristics across cohorts, thereby isolating the impact of the reform on student drop-out behaviour.

First we have applied the decomposition method to the estimates of a univarite probit model of drop out. Our findings provide some evidence on the effectiveness of the reform. If the characteristics of those students who enrolled at university in the post-reform period had been the same of their peers who started the university in the pre-reform period, the behavioural model would have predicted a lower drop-out probability.

Second, as the reform might have also affected student self-selection into university, we have applied the decomposition method to the results of a bivarite probit model with sample selection where the university enrolment and the drop-out equations are jointly

estimated. These findings are in line with the previous ones. The reform is associated with changes in student behaviour leading to a decline in the conditional probability of dropping out of university.

This paper has considerable policy implication as it sheds light on the key role of changes in the structure and content of the supply of university education in reducing the incidence of drop-out. Thus this result adds to the debate on drop-out prevention, which so far has been mainly focused on increased education spending and student selection mechanisms.

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Table 1: Descriptive statistics of university students across the three cohorts

Variables	*1995 cohort*		*1998 cohort*		*2001 cohort*	
	Mean	*Stand. Dev.*	*Mean*	*Stand. Dev.*	*Mean*	*Stand. Dev.*
Personal characteristics						
Female=1, otherwise=0	0.553	0.497	0.573	0.495	0.578	0.494
Age						
between 19 and 21 years old=1, otherwise=0	0.101	0.302	0.082	0.274	0.071	0.256
22 years old=1, otherwise=0	0.717	0.451	0.730	0.444	0.753	0.431
between 23 and 24 years old=1, otherwise=0	0.160	0.366	0.159	0.365	0.158	0.364
equal or older than 25 years=1, otherwise=0	0.022	0.148	0.030	0.170	0.019	0.136
Married or cohabiting=1, otherwise=0	0.012	0.109	0.016	0.125	0.018	0.133
Family background						
Father's education is tertiary school degree=1, otherwise=0	0.153	0.360	0.146	0.353	0.156	0.363
Mother's education is tertiary school degree=1, otherwise=0	0.126	0.332	0.121	0.326	0.126	0.332
Academic ability						
Failed high school year=1, otherwise=0	0.153	0.360	0.133	0.339	0.152	0.359
High school degree classification						
60-70=1, otherwise=0	0.293	0.455	0.287	0.453	0.257	0.437
71-85=1, otherwise=0	0.388	0.487	0.374	0.484	0.375	0.484
86-95=1, otherwise=0	0.185	0.388	0.185	0.388	0.189	0.391
96-100=1, otherwise=0	0.134	0.341	0.154	0.361	0.180	0.384
School related characteristics						
Liceo classico and *liceo scientifico*=1, otherwise=0	0.456	0.498	0.347	0.476	0.297	0.457
Geographical characteristics						
Unemployment rate (%)	0.366	0.179	0.323	0.200	0.245	0.148
Area of residence						
South=1, otherwise=0	0.402	0.490	0.397	0.489	0.287	0.452
North=1, otherwise=0	0.389	0.487	0.383	0.486	0.440	0.496
Centre=1, otherwise=0	0.210	0.407	0.220	0.414	0.273	0.446
University attendance-related characteristics						
Attended the classes of at least a core subject =1, otherwise=0	0.877	0.328	0.884	0.320	0.930	0.254
Drop out of university=1, otherwise=0	0.180	0.384	0.137	0.344	0.155	0.362
Number of observations	7,798		7,124		8,850	

Table 2: Descriptive statistics of high school leavers across the three cohorts

Variables	*1995 cohort*		*1998 cohort*		*2001 cohort*	
	Mean	*Stand. Dev.*	*Mean*	*Stand. Dev.*	*Mean*	*Stand. Dev.*
Personal characteristics						
Female=1, otherwise=0	0.519	0.500	0.514	0.500	0.530	0.499
Age						
between 19 and 21years old=1, otherwise=0	0.068	0.252	0.047	0.212	0.048	0.214
22 years old=1, otherwise=0	0.612	0.487	0.602	0.490	0.648	0.478
between 23 and 24 years old=1, otherwise=0	0.258	0.437	0.276	0.447	0.250	0.433
equal or older than 25 years=1, otherwise=0	0.063	0.242	0.075	0.263	0.054	0.227
Married or cohabiting=1, otherwise=0	0.039	0.193	0.036	0.187	0.048	0.214
Family background						
Father's education is tertiary school degree=1, otherwise=0	0.083	0.275	0.064	0.244	0.088	0.283
Mother's education is tertiary school degree=1, otherwise=0	0.068	0.252	0.052	0.222	0.070	0.255
Academic ability						
Failed high school year=1, otherwise=0	0.248	0.432	0.239	0.426	0.245	0.430
High school degree classification						
60-70=1, otherwise=0	0.429	0.495	0.465	0.499	0.417	0.493
71-85=1, otherwise=0	0.363	0.481	0.342	0.475	0.351	0.477
86-95=1, otherwise=0	0.129	0.336	0.119	0.324	0.127	0.333
96-100=1, otherwise=0	0.079	0.270	0.074	0.262	0.105	0.306
School related characteristics						
Liceo classico and *liceo scientifico*=1, otherwise=0	0.232	0.422	0.132	0.339	0.150	0.357
Geographical characteristics						
Unemployment rate (%)	0.349	0.187	0.373	0.187	0.310	0.198
Area of residence						
South=1, otherwise=0	0.370	0.483	0.368	0.482	0.357	0.479
North=1, otherwise=0	0.418	0.493	0.368	0.482	0.387	0.487
Centre=1, otherwise=0	0.222	0.415	0.208	0.406	0.256	0.436
Living in province with a university campus=1, otherwise=0	0.757	0.429	0.789	0.408	0.795	0.404
Enrolled at university=1, otherwise=0	0.484	0.500	0.356	0.479	0.480	0.500
Number of observations	16,098		19,996		18,422	

Table 3: Results of the univariate probit model explaining the decision to drop out of university

Variables	*1995 cohort*		*1998 cohort*		*2001 cohort*	
	Coefficient	Stand. Err.	Coefficient	Stand. Err.	Coefficient	Stand. Err.
Constant						
Personal characteristics	-0.063	0.393	-0.384	0.448	-0.479	0.510
Female=1, otherwise=0	-0.099	0.094	-0.152	0.099	-0.369*	0.120
Age- Reference group is equal or older than 25=1, otherwise=0						
between 19 and 21 years old=1, otherwise=0	-0.654*	0.129	-0.207	0.141	-0.377*	0.140
22 years old=1, otherwise=0	-0.316*	0.109	-0.040	0.111	-0.226**	0.115
between 23 and 24 years old=1, otherwise=0	-0.208***	0.110	0.005	0.114	-0.038	0.114
Married or cohabiting=1, otherwise=0	0.530*	0.143	0.213	0.144	0.531*	0.110
Family background						
Father's education is tertiary school degree=1, otherwise=0	-0.317*	0.073	-0.333*	0.081	-0.247*	0.066
Mother's education is tertiary school degree=1, otherwise=0	-0.215*	0.081	-0.152***	0.087	-0.288*	0.077
Academic ability						
Failed high school year=1, otherwise=0	0.136**	0.068	0.138***	0.075	-0.021	0.072
High school degree classification- Reference group is 96=100=1, otherwise=0						
60-70=1, otherwise=0	0.817*	0.074	0.457*	0.072	0.889*	0.068
71-85=1, otherwise=0	0.552*	0.072	0.308*	0.069	0.632*	0.066
86-95=1, otherwise=0	0.318*	0.080	0.067	0.080	0.375*	0.074
School related characteristics						
Liceo classico and *liceo scientifico*=1, otherwise=0	-0.906*	0.043	-0.775*	0.055	-0.814*	0.053
Geographical characteristics						
Unemployment rate (%)	-0.366	0.738	-0.059	0.873	0.925	1.204
Area of residence- Reference group is South=1, otherwise=0						
North=1, otherwise=0	-0.290	0.294	-0.063	0.378	0.179	0.400
Centre=1, otherwise=0	-0.137	0.176	0.068	0.250	0.237	0.299
University attendance-related characteristics						
Attended the classes of at least a core subject =1, otherwise=0	-0.516*	0.049	-0.763*	0.052	-1.010*	0.056
Chi-squared	1268.874		786.476		1382.013	
Log likelihood function	-3040.519		-2454.519		-3131.372	
Restricted log likelihood	-3674.956		-2847.758		-3822.379	
Number of observations	7,798		7,124		8,850	

* denotes significance at 1%
** denotes significance at 5%
*** denotes significance at 10%

Table 4: Decomposition of the average predicted drop-out probabilities (%)

	Coefficients		
Characteristics	*1995 cohort*	*1998 cohort*	*2001 cohort*
1995 cohort	12.92	15.62	15.62
1998 cohort	8.85	10.20	10.03
2001 cohort	13.79	12.51	10.75

Table 5: Results of the bivariate probit model with sample selection (Standard Errors in brackets)

Variables	*1995 cohort*		*1998 cohort*		*2001 cohort*	
	University participation	University drop-out	University participation	University drop-out	University participation	University drop-out
Constant	-0.699**(0.298)	0.180 (0.447)	-0.383 (0.306)	0.122 (0.499)	-0.880*(0.289)	0.216 (0.583)
Personal characteristics						
Female=1, otherwise=0	-0.184*(0.070)	-0.087 (0.095)	0.023 (0.076)	-0.161***(0.093)	-0.114***(0.060)	-0.308**(0.122)
Age- Reference group is equal or older than 25=1, otherwise=0						
between 19 and 21 years old=1, otherwise=0	0.618*(0.072)	-0.740*(0.143)	0.0494*(0.069)	-0.372**(0.149)	0.822*(0.075)	-0.626*(0.166)
22 years old=1, otherwise=0	0.411*(0.056)	-0.383*(0.117)	0.379*(0.049)	-0.187 (0.126)	0.651*(0.055)	-0.440*(0.138)
between 23 and 24 years old=1, otherwise=0	0.160*(0.056)	-0.240**(0.108)	0.155*(0.049)	-0.063 (0.107)	0.308*(0.054)	-0.152 (0.112)
Married or cohabiting=1, otherwise=0	-0.713*(0.068)	0.623*(0.154)	-0.259*(0.062)	0.291**(0.127)	-0.617*(0.052)	0.701*(0.114)
Family background						
Father's education is tertiary school degree=1, otherwise=0	0.709*(0.061)	-0.381*(0.091)	0.784*(0.055)	-0.528*(0.125)	0.677*(0.048)	-0.412*(0.108)
Mother's education is tertiary school degree=1, otherwise=0	0.463*(0.068)	-0.249*(0.089)	0.592*(0.061)	-0.296**(0.132)	0.617*(0.058)	-0.424*(0.098)
Academic ability						
Failed high school year=1, otherwise=0	-0.070***(0.040)	0.140**(0.066)	-0.094*(0.035)	0.154**(0.071)	0.022 (0.039)	-0.033 (0.065)
High school degree classification- Reference group is 96=100=1, otherwise=0						
60-70=1, otherwise=0	-1.227*(0.051)	0.958*(0.150)	-1.203*(0.043)	0.802*(0.201)	-1.282*(0.042)	1.206*(0.151)
71-85=1, otherwise=0	-0.797*(0.051)	0.643*(0.115)	-0.809*(0.042)	0.535*(0.142)	-0.804*(0.042)	0.817*(0.101)
86-95=1, otherwise=0	-0.399*(0.057)	0.354*(0.091)	-0.467*(0.048)	0.204***(0.118)	-0.325*(0.048)	0.438*(0.075)
School related characteristics						
Liceo classico and *liceo scientifico* =1, otherwise=0	1.923*(0.041)	-1.100*(0.182)	1.886*(0.042)	-1.239*(0.268)	1.752*(0.047)	-1.198*(0.202)
Geographical characteristics						
Unemployment rate (%)	1.712*(0.582)	-0.482 (0.746)	0.463(0.585)	-0.127 (0.817)	1.489*(0.551)	0.371 (1.162)
Area of residence- Reference group is South=1, otherwise=0						
North=1, otherwise=0	0.556**(0.221)	-0.323 (0.296)	0.129 (0.238)	-0.072 (0.352)	0.831*(0.249)	-0.044 (0.390)
Centre=1, otherwise=0	0.287**(0.130)	-0.153 (0.178)	0.050 (0.141)	0.061 (0.234)	0.621*(0.165)	0.048 (0.296)
Living in province with a university campus=1, otherwise=0	0.061**(0.027)		0.114*(0.025)		0.052**(0.025)	
University attendance-related characteristics						
Attended the classes of at least a core subject =1, otherwise=0		-0.508*(0.049)		-0.698*(0.089)		-0.930*(0.101)
Correlation coefficient (ρ)	-0.221 (0.196)		-0.480**(0.255)		-0.486**(0.237)	
Log likelihood function	-10663.050		-11996.06		-12547.560	
Number of observations	16,098		19,996		18,422	

* denotes significance at 1%
** denotes significance at 5%
*** denotes significance at 10%

Table 6: Decomposition of the average conditional predicted drop-out probabilities (%)

	Coefficients		
Characteristics	*1995 cohort*	*1998 cohort*	*2001 cohort*
1995 cohort	12.14	14.87	14.02
1998 cohort	6.36	6.19	6.85
2001 cohort	10.66	8.81	8.12

Appendix: Results of the univariate probit model explaining the decision to enrol at university

Variables	*1995 cohort*		*1998 cohort*		*2001 cohort*	
	Coefficient	Stand. Err.	Coefficient	Stand. Err.	Coefficient	Stand. Err.
Constant	-0.709**	0.299	-0.358	0.305	-0.890*	0.289
Personal characteristics						
Female=1, otherwise=0	-0.187*	0.070	0.030	0.076	-0.113***	0.060
Age- Reference group is equal or older than 25=1, otherwise=0						
between 19 and 21 years old=1, otherwise=0	0.615*	0.074	0.495*	0.069	0.827*	0.078
22 years old=1, otherwise=0	0.410*	0.056	0.379*	0.049	0.649*	0.057
between 23 and 24 years old=1, otherwise=0	0.159*	0.055	0.156*	0.049	0.305*	0.055
Married or cohabiting=1, otherwise=0	-0.712*	0.071	-0.257*	0.064	-0.616*	0.056
Family background						
Father's education is tertiary school degree=1, otherwise=0	0.714*	0.065	0.791*	0.056	0.677*	0.051
Mother's education is tertiary school degree=1, otherwise=0	0.463*	0.073	0.588*	0.064	0.620*	0.059
Academic ability						
Failed high school year=1, otherwise=0	-0.071***	0.039	-0.094*	0.035	0.024	0.040
High school degree classification- Reference group is 96=100=1, otherwise=0						
60-70=1, otherwise=0	-1.224*	0.052	-1.201*	0.043	-1.281*	0.042
71-85=1, otherwise=0	-0.796*	0.052	-0.809*	0.043	-0.803*	0.041
86-95=1, otherwise=0	-0.337*	0.058	-0.465*	0.049	-0.3287*	0.048
School related characteristics						
Liceo classico and *liceo scientifico* =1, otherwise=0	1.923*	0.041	1.883*	0.042	1.752*	0.048
Geographical characteristics						
Unemployment rate (%)	1.736*	0.581	0.117	0.026	1.509*	0.551
Area of residence- Reference group is South=1, otherwise=0						
North=1, otherwise=0	0.561**	0.221	0.105	0.237	0.843*	0.248
Centre=1, otherwise=0	0.287**	0.129	0.033	0.141	0.625*	0.165
Living in province with a university campus=1, otherwise=0	0.061**	0.027	0.117*	0.026	0.050***	0.026
Chi-squared	7053.577		6955.095		6672.472	
Log likelihood function	-7623.666		-9544.699		-12755.01	
Restricted log likelihood	-11150.45		-13022.25		-12755.01	
Number of observations	16,098		19,996		18,422	

* denotes significance at 1%
** denotes significance at 5%
*** denotes significance at 10%