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Family background and university dropouts during the crisis:

the case of Italy

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Family background and university dropouts during the crisis: the case of Italy

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Abstract

The Italian university system has long been characterized by high non-completion rates, though aggregate data show a slight reduction of dropouts in recent years. The most straightforward theoretical explanation for this lies in the lowering opportunity cost of studying due to the financial and economic crisis. Nonetheless, this interpretation is likely to be partly misleading. Indeed, when the crisis hit Italy, enrolment rates had been declining for years and the sample of freshmen has become increasingly selected according to family 'social class'. Since a good family background significantly increases students' probability of succeeding, the recent decline in dropouts could partly depend on sample selection. By applying probit selection models and decomposition techniques to a sample of Italian university students enrolled in different periods of time, I find that the change in students' background characteristics plays a major role in the recent reduction of the dropout rate.

1. **Introduction**

The Italian university system is characterized by high dropout rates and by a scarce performance in terms of higher education achievement among the population. Dropping out was expected to decline after the implementation of the university reform in 2001, which introduced more flexibility in the duration, content and structure of the supply of tertiary education. Nevertheless, the main aim of the reform was to widen access to university and, inevitably, involved admitting more students with a relatively weak level of academic ability and less academically oriented (Bratti, Broccolini, Staffolani, 2007). In this framework, Di Pietro and Cutillo (2008) find that the change in students' characteristics after the reform would have contributed to increasing dropout rates, though the change in students' 'behaviour' (induced by the same reform) compensated the former effect. The net outcome was a substantial stability in the aggregate dropout rate[1] (see Fig. 1).

A more decisive and lasting reduction of dropouts occurred in recent years, in concomitance with the economic and financial crisis (see again Fig. 1).

On a theoretical ground, an economic downturn can have two opposite effects on dropouts. On the one hand, the decrease in parental resources is expected to increase dropouts, due to financial difficulties and credit constraints. On the other hand, the worsening of youth labour market conditions can either reduce the incentives to continue studying, or reduce the opportunity costs of attending university. In the latter case it would decrease dropouts. Then, the net effect of the crisis on university withdrawals is unclear and depends upon the relative sizes of each effect.

The purpose of this paper is to shed light on this issue. To this aim I use data from two waves of the ISTAT *Survey on Educational and Professional Paths of Upper Secondary School Graduates* based, respectively, on students who got their upper-secondary diploma in 2004 interviewed in 2007 (2007 Survey), and students who got their upper-secondary diploma in 2007 interviewed in 2011 (2011 Survey). Clearly, enrolment and dropout decisions of students gathered in the 2007 survey did not reflect the effect of the crisis. Conversely, students involved in the 2011 survey did not (fully) internalized the crisis in their enrolment decisions, but made their choices of dropping out during the course of a severe recession. Then, the timing of the Survey would have allowed us to study the crisis effect on dropouts net from any potential effect on enrolment (Adamopoulou and Tanzi, 2014), if the composition of the sample of enrolled students had remained stable over time. As a matter of fact, enrolment rates in Italian universities have been declining for years, well before the start of the crisis

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[1] More recently, Horstschräer and Sprietsm (2013), analyse the consequences of a change in degree regulations in Germany, such that students need less time to earn a first degree, and find no significant effects on college enrolment or dropout rates.

(see Fig. 2), and the enrolled sample has become increasingly selected on the basis of family 'social class' (see section 3 for details).

As correctly pointed out by Cingano and Cipollone (2007), dropping-out analysis drawn from samples of university enrolled can easily underestimate the impact of economic and cultural family background on dropout probability, especially in countries (like Italy) where family background strongly affects both the choice of enrolment and the choice of dropping-out. In these cases selection bias must be accounted for, in particular if we want to compare dropout decisions taken in different periods of time by samples of enrolled students characterized by a very different composition by family 'social class'. To the best of my knowledge this is the first attempt to assess the impact of the crisis on dropout probability in Italy which take into account this important feature of the Italian university system[2].

By merging ISTAT data with data from other sources, at local and university institutions level, I estimate a bivariate probit model of dropping-out with sample selection disaggregated by year of the survey. Next, I decompose changes over time in the probability of dropping out in a part explained by the changes in the characteristics of students (due to pre-crisis factors) and a part ascribable to changes in students' behaviour (that is, to changes in estimated coefficients) which can be taken as an indicator of the effect of the crisis on the individual probability of dropping-out.

I find that the very slight decrease of dropouts we recently observed in aggregate data have been the result of two opposite forces. In particular, changes in family background of enrolled students contributed to reduce dropout probabilities, whereas changes in students' behaviour, particularly in response to family income (proxied by family 'social class'), university costs, individual ability and adults' labour market conditions at local level contributed to push dropouts upward.

The paper is organized as follows. In section 2 I discuss the related literature and hypotheses. Section 3 presents the data and descriptive statistics. Section 4 provides the econometric specification to test my hypothesis. Section 5 presents the main results of the analysis and section 6 concludes.

2. Hypotheses and previous literature

University dropouts are a serious concern for policy makers in many countries, particularly in Italy where high and persistent dropout rates are one of the causes of the low proportion of university degrees among the population. Concern about university withdrawals before completion depends on

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[2] E.g., a recent study by Troelsen and Laursen (2014) finds that enrolments and dropouts in Danish Universities are less influenced by socio-economic factors than in most other European countries. In this case, a dropping-out analysis without sample selection correction on enrolments would give more reliable results than in Italy.

a number of reasons. First of all, they represent a clear waste of public and private resources. Secondly, they tend to generate a low level of human capital accumulation, undermining the foundation of economic growth (Hanushek and Wößmann, 2010) and labour productivity (Moretti, 2004) in a knowledge society. Thirdly, when they are clearly driven by socio-economic family background, they tend to reproduce and to enlarge distribution inequalities[3]. Lastly, dropping out is proven to have a significant negative and persistent effect on self-esteem, which is an important labour market skill affecting wages and careers (Hoeschler and Backes-Gellner, 2014).

The financial and economic crisis that hit Italy since 2008 is very likely to have a strong influence on educational choices of Italian students, especially on university enrolment and dropout rates. Indeed, the crisis has substantially affected factors that have long been considered key determinants of human capital accumulation choices (Becker, 1964). In particular, the recent economic turmoil deteriorated most families' financial situation, worsened labour market prospects for both graduates and undergraduates and reduced employment opportunities and job security for youth and adult workers.

On a theoretical ground a reduction of household income, as well as a decline of adult employment rates, would decrease college affordability and increase dropouts. The deterioration of graduates' employment prospects should work in the same direction, through a reduction of the economic incentive to keep on studying. On the other hand, a slump in youth employment rates diminishes opportunity costs of studying and decreases dropouts. In this case universities serve as a parking lot (Becker, 2006; Oppedisano, 2007) or, better, as a 'safe port in a storm' (Betts and McFarland, 1995). Given these positive and negative pressures, the net effect of the crisis on dropout probabilities cannot be taken for granted *a priori* and represents an empirical matter.

The extensive economic literature on the cyclicality of schooling focuses more on enrolment decisions rather than dropouts and reaches mixed results.

Dellas and Sakellaris (2003) examine the college enrolment decisions of US students during the period 1968-1988 and find that their propensity to enrol is countercyclical. However, they admit that college enrolments may be more procyclical among people who face liquidity constraints. In this line, Christian (2007) finds that college enrolments by people from poorer households is significantly more procyclical than enrolments by people from well-off households. Becker (2006) applies a time-to-educate model to Italian students' choices, and finds that, given the modest tuition fees of Italian universities, entering university is the most rational thing to do when faced with the absence of job opportunities immediately after leaving high school. Many students, however, drop out as soon as

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[3] Conversely, the presence of income inequality can increase aggregate dropout rate, by convincing students from disadvantaged families that it is not worth finishing school (Kearney and Levine, 2014).

they get the first suitable job offer and instead wait to obtain a degree in case they never get a job offer throughout their studies. In this case enrolments and dropouts are countercyclical.

More recently, Long (2014) showed that part-time college attendance levels increased during the recession, especially in the states most affected by rising unemployment and declining house prices, while full-time enrolment declined. This can have some effects on the propensity to continue studying, given that, as pointed out by Shady (2004), full time students have more time available and may put more effort into school[4]. By contrast, Aguiar, Hurst, and Karabarbounis (2013), who try to identify how market-work time is reallocated to different time uses during the business cycle, affirm that time spent in education by (single) men in the US has increased during the Great Recession. Nevertheless, they admit to have failed to measure how much of the increase in time spent on education depends on the lower opportunity cost of time during the crisis.

The relevance of the expected duration of the crisis is highlighted by Heylen and Pozzi, (2007). Their econometric analysis, performed on a 25-year period in 86 countries, predicts an increase in a country's human capital stock during an economic downturn only when the crisis is seen to be temporary. A crucial idea is that young agents decide to study during the crisis and work later, with more human capital and under better aggregate conditions. Their findings also point to a significant positive role of government spending on education, as a way to reduce the burden of tuition fees. The negative effects of university budget cuts entrained by declining economic conditions during the business cycle are also pointed out by Bradley (2012)[5].

These results about the role of government spending on education bring up the issue of college affordability. In this framework, many economic researches indicate that financial constraints have played a big role in college enrolment and completion rates over the last decades. Even in the early 2000s Brunello and Winter-Ebmer (2003), by using a survey conducted in 26 Economics and Business faculties across 10 European countries, find that a higher share of public expenditure helps in limiting the negative enrolment effects of liquidity constraints, even though at the price of delaying expected college completion. In a different institutional context, Bound, Lovenheim and Turner (2010, 2012) find evidence that the increases in time to degree and/or the decline in college completion rates over the last three decades in the US were more marked amongst low income students, due to the decline in collegiate resources and the rise in students' working hours to meet increasing college costs.

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[4] To confirm this point, Theune (2015) shows that part-time work has a strong and increasing effect on students' time to degree.

[5] This author also finds that when job and income prospects of the more tedious scientific majors are weakened by recession, students will switch to Humanities majors.

In the same line, Belley and Lochner (2007) found that family income has become a more and more important factor in determining college enrolment in the US between the early 1980s and the early 2000s. This result has been confirmed by Lochner and Monge-Naranjo (2011), who develop a human capital model with borrowing constraints and find out the rising importance of family income for college enrolments in the US during the same period. The relationship between family income and post-secondary school attendance is found to be stronger in the US than in Canada, due to different financial aid policies (Belley, Frenette, and Lochner, 2014). More recently, Lovenheim and Reynolds (2011) show that the probability of 2-year college enrolment increased among high-ability but low-family income (male) students to the expense of 4-year college enrolment in the US between 1975 and 2004. All these researches highlight the growing influence of family income on university attendance and suggest that credit constraints are becoming more relevant for the recent cohorts.

As to the effect of the recent crisis, housing prices and the liquidity of housing market have been proven to become increasingly important components of the college enrolment decision. Lovenheim (2011) finds that in the early 2000s US families used to finance university enrolment with their housing wealth. This implies that the housing market collapse following the Great Recession could negatively affect college enrolments through reduction in the (liquidity of) housing wealth of families with college-age children.

Stinebrickner and Stinebrickner (2008) use institutional longitudinal data from Berea College (Kentucky) in order to analyse the impact of credit constraints on college attrition. Their findings suggest that credit constraints are likely to play an important causal role in the dropout decisions of some students, although a large majority of attrition is due to factors unrelated to short-term constraints during college, such as ability/motivation, belief about financial return to schooling and risk aversion at the time of college entrance. These authors also find that 40% of all dropouts between the first and second years at Berea College arise as students learn about their academic ability or grade performance (Stinebrickner and Stinebrickner 2012).

In this framework, my hypothesis is that the decline in enrolments and the changes in the composition of the sample of Italian enrolled students (in place before the crisis) had partially hidden the "true" impact of the crisis on dropouts *via* financial constraints. Indeed, between the 2007 Survey and the 2011 Survey we observe a slightly reduction of the aggregate dropout rate. Nevertheless this finding was detected on two deeply different enrolled samples. The enrolled sample in the 2011 Survey is characterised by a stronger concentration of high 'social class' students, whose dropout decisions are less likely affected by financial constraints. If the crisis had struck on a sample of enrolled students similar to that of the 2007 Survey, we would have most likely observed an increase

in the aggregate dropout rate, thus highlighting the "true" impact of financial constraints on dropouts during the Great Recession.

3. Data and descriptive evidence

The empirical analysis is based on the last two waves (2007 and 2011) of the *Survey on Educational and Professional Paths of Upper Secondary School Graduates*, conducted by ISTAT (Italian National Statistical Institute) at a national level. Each survey covers a representative sample of Italian upper secondary school graduates interviewed about 3 years after their upper secondary graduation (Maturità).

In particular, the 2007 Survey includes 25,880 individuals who graduated in 2004 and who were surveyed at the end of 2007. Similarly, the 2011 Survey covers 26,588 individuals who graduated in 2007 and were interviewed in 2011. The Survey contains detailed individual information on educational choice and educational achievement (before and after the attainment of the Maturità), as well as parental background and personal attributes, by distinguishing between individuals who enrolled/not enrolled at university during a three year period[6] after upper secondary graduation, students who got a university degree during the same period, students who had not yet got a degree but were still enrolled and those who dropped-out.

Obviously, these data do not (fully) account for the crisis's impact on enrolments. The most recent wave (2011) involves students who exited upper secondary education in 2007, the vast majority of which took the decision of enrolling during the summer of 2007[7], that is before the crisis could be predicted (Bezemer, 2009) or actually hit Italy. Conversely, the data set allows comparing dropout behaviour before the crisis (survey 2007) with dropout behaviour in the course of the crisis (survey 2011). At any rate, the dataset is particularly suitable to the purpose of this analysis, because it allows analysing dropouts by controlling for selection into enrolment, as well as family background, past educational choices and individual characteristics (Cingano and Cipollone, 2007).

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[6] Given that in 2011 the survey took place 4 years after high-school graduation I do not consider in the enrolled sample the 26 students who enrolled in the Academic Year (A.Y.) 2011-12 (see Table A1-1). Since dropouts begin to manifest themselves only one year after enrolment, I also excluded from the analysis students enrolled during 2007-08 A.Y. in 2007 survey and students enrolled in A.Y. 2010-11 in 2011 survey, for which any dropout can be detected. As to dropouts, I do not consider individuals who dropped out in A.Y. 2011-12 in 2011 survey (see Table A1-2). Due to differences in the wording of the question between 2007 and 2011 Istat questionnaires, information on the time of dropping out are not fully comparable (see last column in Table A1-2). In this case I chose to eliminate from the analysis the 165 students enrolled in 2007/08 who dropped 3 years *or more* after enrolment. Then, even in the best-case scenario, dropouts decreased negligibly during the crisis.

[7] More than 85% of students who enrolled into university did it in their first year after high-school graduation (in both surveys).

In order to take into account some relevant characteristics of the individuals' province of residence, ISTAT data have been merged with local data from various sources referring, when possible, to the 4-year period involved in each survey (see Table A2 in the Appendix A for details).

Among local variables, enrolment costs, measured by both tuition fees and housing costs, deserves to be explained in more detail. Information on tuition fees for various years is available on the website of the Italian Ministry of Education, University and Research (MIUR). I assign to enrolled students the tuition fees of the chosen university in the year of enrolment, and to non-enrolled students the average value of tuition fees in the universities chosen by enrolled students residing in their same province[8]. The idea is that the observation of how much the 'nearest' enrolled students have spent for university enrolment is the main source of information about tuition fees for non-enrolled students. Moreover, university institutions chosen by enrolled students resident in a given province, are those in which non-enrolled students, resident in the same province, would have been more likely to enrol if they had enrolled.

Information on housing costs are drawn from the 'Quality of Life Dossier' published once a year by Il Sole 24 Ore[9]. Students enrolled in a province other than that of residence have been assigned the housing cost of the province in which they enrolled. For students enrolled in the same province of residence, housing costs are set to zero (Pigini and Staffolani, 2013). Non-enrolled students have been assigned the average housing costs incurred by enrolled students residing in the same province. Indeed, in some provinces where the supply of university courses is large and differentiated (e.g. the province of Rome), the majority of enrolled students enrolled in the province of residence, thus avoiding to incur heavy housing costs. In these provinces the expected housing cost for students who decided not to enrol should be lower than in those provinces where the majority of the students are forced to move in order to attend university.

Table A3 reports descriptive statistics of the main variables involved in the analysis, for all students included in the surveys and for enrolled students only. Note that enrolment rates declined from about 60% in 2007 survey to 56.2% in 2011, whereas dropout rates decreased very little[10].

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[8] The same procedure has been employed with regard to university quality index. In this case I use an indicator of the quality of scientific production of Italian Universities (R-Index) calculated by ANVUR (Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca) during the period 2004-2010 (see Appendix A for details).

[9] 'Il Sole 24 Ore' magazine reports provincial housing costs referring to the average rent per month required in each province for a 100 square meters apartment in a semi-central area until 2005, and referring to the average square meter price for a semi-central apartment from 2006 onwards. To make data as comparable as possible, I use the average 2006-2007 provincial values in the 2007 survey and the 2007-2010 provincial values in the 2011 survey. Note that housing costs did not change very much in 2004-2007 period, and missing data for the biennium 2004-2005 should not bias my results.

[10] Adamopoulou and Tanzi (2014), who used the same datasets and confine their analysis to those who enrolled in a 3+2 program, also find a negligible reduction of dropouts during the crisis (-0.65 percentage points).

In order to take into account the impact of family background on university choices, I exploit a 'social class' indicator[11] built by Cobalti and Schizzerotto (1994), and used by MIUR (Ministero dell'Istruzione, dell'Università e della Ricerca) and AlmaLaurea[12]. In this framework, family 'social class' takes four modalities (Bourgeoisie, Petite Bourgeoisie, Middle Class and Working Class) and coincide with the highest socio-economic position attained by one of the two parents (dominance principle)[13]. As previously stated, the composition of enrolled students by family 'social class' has significantly changed in recent years, even before the crisis. Table A3 shows that, amongst enrolled students, the percentage of individuals coming from 'bourgeois' families raises from 26% in 2007 survey to 32% in 2011, whereas the percentage of university students coming from the 'middle class' drops from 20% to less than 15%. At the same time, parents' average years of schooòing of enrolled students increases from 2007 survey to 2011 survey. Overall, enrolled students in the 2011 survey appear to be supported by a better economic and cultural family background.

In general, enrolled student reported better final school grades, both at high-school and at lower secondary school than non-enrolled ones. Nevertheless, average high-school grades drop by more than 1 point in the whole sample of high-school graduates between the two surveys, and this decline is almost fully reflected on the average high-school grade of the enrolled samples in the 2011 survey. By contrast, enrolled students in the 2011 survey reported higher lower secondary school final grades and a lower incidence of failures during high school and, at least in this sense, they appear to be 'more able' than enrolled students in the 2007 survey.

As it is well-known in economic literature, a stronger family background, as well as a higher individual ability, is associated (*ceteris paribus*) to lower dropout probabilities. Moreover, the share of female enrolment keeps on growing (it reached 60% in the 2011 survey) and also female students are generally characterized by a lower probability of dropping-out (Wolter, Diem and Messer, 2014).

As to university costs, Table A3 shows that average tuition fees per enrolled students[14] increased from € 1,002 per year during the period of the first survey to about € 1,200 during the second period[15]. On a theoretical ground, an increase in university costs can either (reduce enrolments and) raise dropouts, due to affordability problems (Bradley and Migali, 2013), or even boost students' effort in

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[11] The notion of 'social class' is already been used by Flannery and Cullinan (2014) and Bratti, Broccolini and Staffolani (2007).

[12] See http://www.almalaurea.it/en/info/chisiamo

[13] See Appendix A for details.

[14] Tuition fees are net from universities spending for actions granted to students (see Table A2). It is worth noticing that less than one out of ten students receive a scholarship in Italy, and that there are no student loans but only tax benefits for parents (EC 2014).

[15] Note that in Table A3, as in the estimated model, I use a logarithmic transformation.

order to speed up graduation (Garibaldi et al. 2012)[16]. So, the net effect of the cost of studies on dropout probability is an empirical matter.

As to provincial economic indicators, I include in the analysis youth employment rates by gender and province, as a proxy of the opportunity cost of studying, and adult employment rates (together with the natural logarithm of per capita added value by province) as a further indicator of financial family support, as well as a measure of the evolution of the crisis at local level. Table A3 reports the average 2004-2007 and 2007-2010 values for all these data and highlights the sharp decline in employment and revenues during the crisis.

4. Econometric strategy

As I stated in previous sections, the timing of available data do not allow to analyze the impact of the crisis on enrolments. At any rate, analyzing dropouts without taking into proper account selection into enrolment would give biased results.

As a matter of fact, the enrolment rates and the number of freshmen in Italy reached a maximum in A.Y. 2003/04 and then begun to decrease sharply (Fig. 2), and the sample of enrolled students became more and more selected on the basis of family background and personal abilities (Table A3). Moreover, one cannot rule out the presence of unobservables which affect both enrolments and dropout probabilities (such as motivation, self-esteem, etc…). In particular, if there are unobservable factors influencing enrolment choices and dropout probabilities, estimation results would be biased. Then, in order to properly analyze and compare dropout behaviour in the two surveys a selection bias procedure is needed.

To deal with the problem of selection bias, I estimated the following bivariate probit model with sample selection:

$$P_{DROP} = \beta_1 X + \varepsilon_1 \qquad\qquad [1]$$

$$P_{ENROL} = \beta_2 Z + \varepsilon_2$$

where: $P_{DROP} = \int_0^{1 \text{ if the individual dropped}} {}_{\text{otherwise}}$ $P_{ENROL} = \int_0^{1 \text{ if the individual enrolled}} {}_{\text{otherwise}}$

X is a vector of individual, family and local characteristics influencing the probability of dropping out, and Z is a set of variables that influence the probability of enrolling.

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[16] From an enrolled student point of view, to continue studying until graduation has the advantage of not wasting time and resources already invested in university education. This could theoretically be an important issue in my analysis, as the crisis was an unexpected shock and students enrolled before 2008 did not fully internalized it when they decided to enrol in university.

The key element of this strategy is to select at least one variable that affects the probability of enrolling but not the risk of dropping out. Following the main reference literature (Cingano and Cipollone, 2007; Di Pietro and Cutillo, 2007) I use as exclusion restrictions two variables related to local supply of university courses, that is, the number of University Faculties and the number of Degree Courses (Corsi di Laurea) in the province of residence of the student. As correctly pointed out by the cited authors, one cannot exclude that any indicator of tertiary education supply at local level can affect dropouts. Indeed, on the one hand, families who place great value on education can choose to live in provinces with wider tertiary education supply[17] and, on the other hand, families and students who live in provinces characterized by poorer university supply are more likely to incur heavy housing costs, due to the necessity of having to move to attend university. If this is the case, housing costs can affect both enrolment and dropout probabilities. However, unlike previous authors, I directly control my econometric models for housing costs in order to reduce the effects of this possible problem. At any rate, I test the quality and the validity of the instruments in Appendix B.

Furthermore, I perform a Likelihood-Ratio test to assess the model structural changes between the two surveys and, following Di Pietro and Cutillo (2007), I employ an Oaxaca-type decomposition method (Gomulka and Stern, 1990; Van Den Berg and Grift, 2001; Arulampalam, Naylor, and Smith, 2005; Golsteyn and Schils, 2014). This way it is possible to determine to what extent the change in dropout probability between the 2007 and 2011 surveys depends upon changes in observable characteristics of university students between the 2007 and 2011 surveys, and to what extent it depends upon changes in estimated coefficients, which are expected to capture changes in dropout behaviour before and after the crisis.

The decomposition model is as follows. Suppose that the latent variables associated with the econometric model [1] are:

$$ENROL_t = \beta_{e,t} X_{e,t} + \varepsilon_{e,t}$$
$$DROP_t = \beta_{d,t} X_{d,t} + \varepsilon_{d,t}$$

where t = (1,2) indicates the years of the surveys, 2007 and 2011.

The probability of dropping out conditional on enrolment at time t is:

$$Pr_t[DROP_t = 1|ENROL_t = 1] = \frac{\phi_B\big(\beta_{d,t}X_{d,t}, \beta_{e,t}X_{e,t}, \rho_t\big)}{\phi_U\big(\beta_{e,t}X_{e,t}\big)}$$

[2]

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[17] Obviously, this factor is hardly observable. Nevertheless, the residence choices of Italian families are more likely to be driven by working purposes rather than educational ones.

where ϕ_B and ϕ_U are, respectively, the cumulative bivariate normal distribution and the cumulative univariate normal distribution.

Using year t=1 as reference, changes in [2] between year t=1 and t=2 can be decomposed as:

$$Pr_1 - Pr_2 = \frac{\phi_B\left(\beta_{d,1}\bar{X}_{d,1}, \beta_{e,1}\bar{X}_{e,1}, \rho_1\right)}{\phi_U\left(\beta_{e,1}\bar{X}_{e,1}\right)} - \frac{\phi_B\left(\beta_{d,2}\bar{X}_{d,2}, \beta_{e,2}\bar{X}_{e,2}, \rho_2\right)}{\phi_U\left(\beta_{e,2}\bar{X}_{e,2}\right)} =$$

$$= \left\{ \frac{\phi_B\left(\beta_{d,1}\bar{X}_{d,1}, \beta_{e,1}\bar{X}_{e,1}, \rho_1\right)}{\phi_U\left(\beta_{e,1}\bar{X}_{e,1}\right)} - \frac{\phi_B\left(\beta_{d,2}\bar{X}_{d,1}, \beta_{e,2}\bar{X}_{e,1}, \rho_2\right)}{\phi_U\left(\beta_{e,2}\bar{X}_{e,1}\right)} \right\}$$

$$+ \left\{ \frac{\phi_B\left(\beta_{d,1}\bar{X}_{d,1}, \beta_{e,1}\bar{X}_{e,1}, \rho_1\right)}{\phi_U\left(\beta_{e,1}\bar{X}_{e,1}\right)} - \frac{\phi_B\left(\beta_{d,1}\bar{X}_{d,2}, \beta_{e,1}\bar{X}_{e,2}, \rho_1\right)}{\phi_U\left(\beta_{e,1}\bar{X}_{e,2}\right)} \right\} + I$$

[3]

The first term on the right-hand side in [3] displays the part of the differential in the outcome variable (conditional average probability of dropping out) between the two periods that is due to differences in coefficients' estimates (coefficients effect), the second term displays the part of the differential that is due to differences in observable characteristics (covariates effect), and the third term is the interaction effect[18].

It is worth noticing that Di Pietro and Cutillo (2007), who studied the effect of the 2001 Italian University Reform on dropout probabilities by using a sample of students enrolled in 2001, took changes in estimated coefficients as an indicator of the effect of the Reform on dropout behaviour. Nevertheless, in that case, both changes in coefficients and changes in students' observable characteristics were influenced by the Reform itself. Conversely, in my analysis changes in student's observable characteristics are completely pre-crisis and only changes in students' behaviour can be traced to the period of the economic downturn. In this case the 'coefficients effect' can be taken as an indicator of the impact of the crisis on the dropout behaviour of Italian students, conditional on the enrolments' decrease inherited from the pre-crisis period.

5. Estimation Results

5.1 The bivariate probit model

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[18] Note that a two-fold decomposition splits the interaction term over the two main effects (coefficients effect and covariates effect) and the result is independent of the reference year.

In this section I present the results of the bivariate probit model [1]. This estimation has been performed, firstly, by taking into account only the 'social class' indicator. Secondly, as the concept of 'social class' confounds family income with family cultural capital, I introduce a control for father education[19]. Furthermore, as a robustness check, I estimate a model which only includes an indicator of parents' education.

Estimation results, disaggregated by year of the survey, are reported, respectively, in Tables A4-1, A4-2 and A4-3.

Note that social class plays a crucial role in determining both enrolments and dropouts in each of the years considered. Nevertheless, the probability of enrolment for students coming from 'middle class' families is significantly lower than the probability of enrolment for students coming from 'bourgeois' families only in the last survey. Moreover, in the 2011 survey the probability of dropping out for middle class students became significantly higher than for bourgeois students.

The cultural capital of the family (father with tertiary degree, see Table A4-2, and parents' average years of schooling, see Table A4-3) improves the probability of enrolment almost to the same extent in the two different periods, but his protective role against early university withdrawal weakens after the crisis.

Having failed at least one year during high school reduces the probability of enrolling and increases the probability of dropping out more in the 2011 survey than in the 2007 survey. Estimated coefficients for school grades (both at high school and at lower secondary school) show that enrolled students have become, on average, 'more able' over time, and the role of individual ability in decreasing dropout probability was strengthened during the crisis. These results are confirmed by the estimated impact of having got a high school diploma ('Maturità') in a private school[20]. Students who attended a private high school have a significantly lower probability of entering university and a significantly higher probability of dropping out in the course of the crisis rather than in the previous period. As to the influence of the type of high school diploma, Tables A4 show that students coming from a more academically-oriented course of study (Lyceum) increased their advantage over other students, both in terms of higher enrolment and lower dropout probabilities.

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[19] Performing a regression with both 'social class' and family cultural capital indicators is also useful to test if parents' occupation and job prestige had an extra effect on school performances of students, beyond the well-established effects of parents' education (Boll and Hoffmann, 2015).

[20] In the Italian school system students attending high school in private institutions generally perform worse than students attending public schools. In particular, in Italy, more than in other OECD countries, the reading performance difference between private and public high schools' students, after accounting for the socio-economic background of both students and schools, is statistically significant in favour of public schools (OECD, 2011).

Adult employment rate in the province of residence does not influence dropouts before the crisis, but it significantly reduces dropouts after the deterioration of labour market performances of adult people at local level. By contrast, obtained results with reference to the youth employment rate at provincial level put in evidence the presence of a 'parking lot' effect (at least concerning dropout probabilities) only before the crisis.

Finally, university costs (which include tuition fees and housing costs) increased over time their positive impact on dropout probability more than their negative impact on enrolments. It is also worthwhile noticing that provincial added value has a significant positive influence on enrolment probability and a significantly negative influence on dropping out probability in the 2011 survey (see Table A4-3). At the same time, according to results reported in Table A4-3, tuition fees turn out to be significant in increasing dropout probability in the 2011 survey. This seems to confirm, to a certain extent, that university costs and economic conditions of families at local level had an impact on the individual probability of dropping out during the crisis.

The supply of tertiary education at local level performs well as exclusion restriction[21]. Both the number of Faculties and the number of Degree Courses in the province of residence have a significantly positive impact on enrolment probability. As expected, the sign of the correlation coefficient *rho* is negative, putting in evidence that omitted factors positively affecting the probability of enrolling are negatively related to unobserved determinants of the probability of dropping out. Results are proven to be stable in all the specifications of the model.

The picture that emerges confirms that the sample of enrolled students in Italian universities is more and more made up by individuals with a strong family economic (and cultural) background, high personal abilities and academically oriented educational attainments at high school. This process of change in students' characteristics in Italian universities, evidently, was already in place before the crisis hit Italy. The current crisis, however, appears to strengthen the impact of the social class of origin, university costs, personal abilities and labour market performances of adults at local level on students' dropout probability.

5.2 Stability tests

Table A3 shows that the aggregate dropout rate decreases very little between the 2007 and 2011 surveys. Nevertheless, it might be that the underlying model structurally changed over time.

In order to test the stability of the coefficients the complete model presented in Table A4-2 was re-estimated on the pooled 2007 and 2011 data and some likelihood ratio tests were performed on the

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[21] See Appendix B for tests on the quality and the validity of the selection instruments.

total group of coefficients and on the coefficients of separated groups of variables. Table A5 shows the results of the test statistic:

$2[loglikelihood(u) - loglikelihood(r)]$, where (u) stands for the unrestricted model of 2007, while (r) stands for the same model except for the coefficients' values of the particular set of variables denoted in each row, which are replaced by their 2011 values.

As far as the enrolment probability is concerned, the coefficients of 'social class' vary significantly between the 2007 and 2011 surveys, followed by the coefficients of 'ability', type of secondary education and university costs.

As for dropout probability, especially the coefficients of 'social class', type of secondary education, and personal ability have changed significantly, followed by the coefficients of university costs and adult employment rates at local level.

The presence of such structural changes justifies a decomposition exercise performed in the next section. It aims to decompose the change in the average predicted probability of dropping out from university into a 'variable effect' and a 'coefficient' effect.

5.3 *Decomposition analysis*

The decomposition analysis described in section 4 allows to determine to what extent the changes in the average conditional predicted dropout probabilities between the 2007 and 2011 surveys are caused by (pre-crisis) changes in the characteristics of enrolled students (variable effect) and by changes in (post-crisis) dropout behaviour. Table A6 shows the results of such decomposition.

Elements on the main diagonal of the matrix represent the average conditional predicted probabilities of dropping out using coefficients and sample characteristics of the same year. In this case the dropout rate decreases very slightly from 16.01% in the 2007 survey to 15.50% in the 2011 survey (-0.51%).

By contrast, elements on the antidiagonal matrix in Table A6 shows the average conditional predicted probabilities of dropping out using coefficients for year *j* and sample characteristics for year *i*, with *j≠i*. If the characteristics of students in the 2011 survey had remained the same as in the 2007 survey, the dropout rate in the second period would have been 18.24%. Alternatively, if in the 2011 survey students had behaved as in the 2007 survey, the dropout rate in the second period would have been 13.27%. Then, had the characteristics of students not been 'improved' before the crisis, during the crisis we would have observed an increase in the aggregate dropout rate.

Table A7 shows that the (slight) decline in aggregate dropout rate we observe on the data is the net result of the two opposite forces. On the one hand, the pre-crisis change in the composition of students contributed to decrease dropouts (-2.74), while post-crisis changes in students' behaviour contributed

to increase them (+2.23). As a result, the first (negative) effect has overcome the second (positive) effect.

6. Conclusions

The aim of this paper is to analyze the determinants of the reduction of the dropout rate in Italian university system during the crisis. My main hypothesis is that the impact of financial constraints deriving from the economic downturn on dropout rates has been strong, even though it has been hidden by pre-crisis changes in the composition of Italian university students.

To this aim I applied a bivariate probit model of dropping-out with sample selection to the 2007 and 2011 ISTAT *Survey on Educational and Professional Paths of Upper Secondary School Graduates*. Results show that proficient students, with an academically oriented diploma at high school and a strong family economic background had become increasingly present in the sample of university students before the crisis hit Italy. All these characteristics are traditionally associated to lower dropout probabilities. However, during the crisis the conditional probability of dropping-out for students coming from families belonging to the lower social classes and of less proficient/less academically oriented students increased significantly compared to the pre-crisis period. University costs and labour market performances of adults at local level also increased their influence on dropouts after the beginning of the crisis, highlighting the strong impact of financial constraints on dropout probability during the economic downturn. Conversely, the analysis of the impact of youth employment rate at provincial level highlighted that the 'opportunity cost' of studying had significantly influenced dropout behaviour before the crisis but not during the course of it.

In order to shed light on the relative contribution of the 'composition effect' and the 'behaviour effect' in determining aggregate dropout rate, I applied an Oaxaca-type decomposition method.

I found that during the economic downturn the aggregate dropout rate would have increased, unless the characteristics of the sample of Italian university students had been 'improved' before the crisis. Indeed, the negative impact on the dropout rate of pre-crisis changes in the composition of students overtook the positive impact on the dropout rate of post-crisis changes in students' behaviour.

In this framework, we can hardly expect the current crisis to cause a positive effect on human capital accumulation *via* the reduction of opportunity costs of studying. Conversely, the increasing impact of family economic background on the probability of dropping out suggests that the scholarships system for disadvantaged students in Italy is actually insufficient, and policy makers

should strengthen it to the benefit of talented students without financial means, at least during the recession.

Appendix A

Fig. 1 – Percentage of dropout between the first and the second year of the academic course, per A.Y.
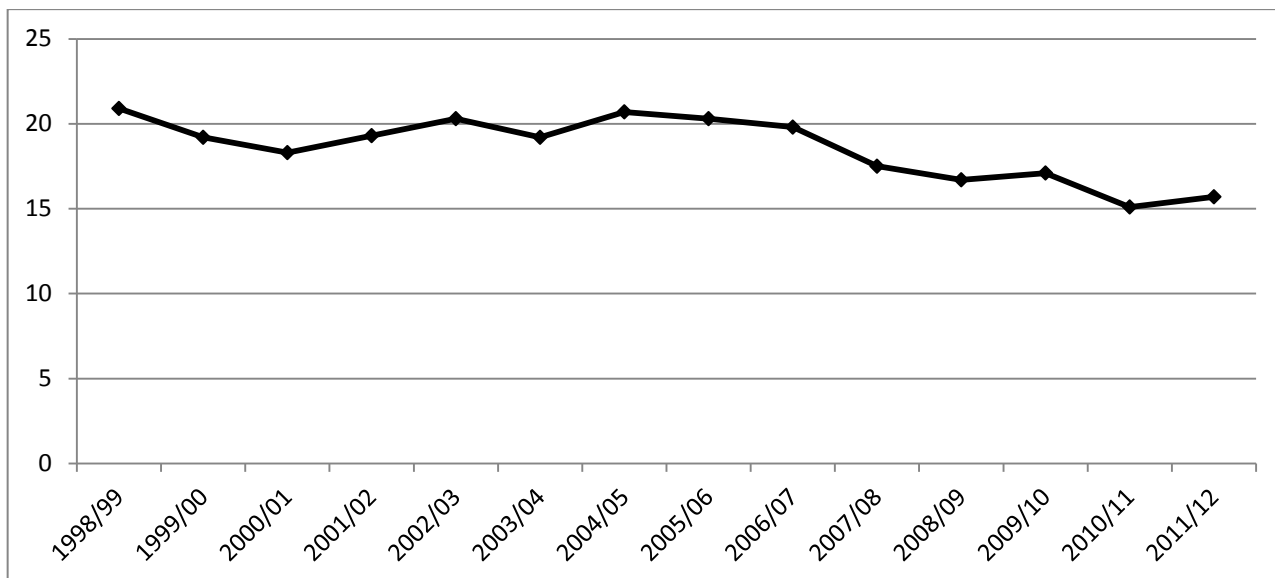
Source: Elaborations on data presented in Anvur, 2014, p. 59.

Fig. 2 – Freshmen per A.Y. and enrolment rates, Italy 1990-2013
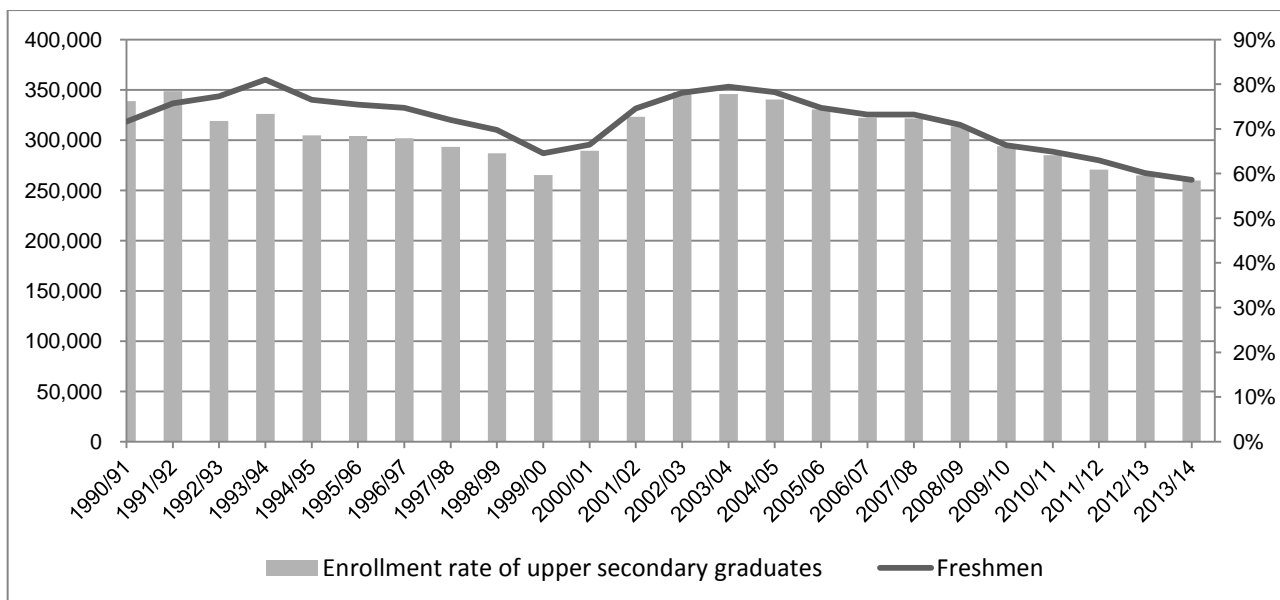
Source: elaborations on MIUR/ISTAT data

Table A1-1 - Enrolments by Istat survey

Istat Survey 2007		Istat Survey 2011	
Enrolled in A.Y.:		Enrolled in A.Y.:	
2004/05	13131	2007/08	12741
2005/06	1599	2008/09	1531
2006/07	479	2009/10	476
2007/08	~~254~~	2010/11	~~201~~
-	-	~~2011/12~~	~~26~~
Tot. enrolled	*15209*	*Tot. enrolled*	*14748*
Not enrolled	10417	Not enrolled	11631
Tot.	25626	Tot.	26361

Elaborations on Survey on Educational and Professional Paths of Upper Secondary School Graduates, Istat

Note: deleted figures have not been included in the operative sample.

Table A1-2 - Dropouts by Istat survey

Istat Survey 2007					Istat Survey 2011				
	Dropped after:				Enrolled in A.Y.:	Dropped after:			
Enrolled in A.Y.:	1 year	2 years	3 years	Tot.		1 year	2 years	3 years or +	Tot.
2004/05	1524	367	109	2000	2007/08	1409	421	~~165~~	1830
2005/06	311	57	0	368	2008/09	305	80	~~18~~	385
2006/07	74	0	0	74	2009/10	107	~~16~~	0	107
2007/08	0	0	0	0	2010/11	~~30~~	0	0	0
Tot.	1909	424	109	2442	Tot.	1821	501	0	2322
% dropout				*16.06%*	*% dropout*				*15.74%*

Elaborations on Survey on Educational and Professional Paths of Upper Secondary School Graduates, Istat

Note: deleted figures have not been included in the operative sample.

Table A2 – Variables description and sources

Variables	Description	Source	Period
Enrolled	Dummy variable; 1 if enrolled, 0 otherwise	(a)	2007 and 2011
Dropout	Dummy variable; 1 if the individual enrolled at University, but he has not yet graduated and is no longer enrolled, 0 otherwise	(a)	2007 and 2011
Social class	Dummy variable in accordance with the highest socio-economic position attained by one of the two parents. Socio-economic position of each parent is a function of his/her occupation and educational degree. In particular: (1) entrepreneurs, professionals and managers belong to the Bourgeoisie; (2) self-employed, members of cooperatives and adjuvants belong to the Petite Bourgeoisie; (3) white collars with educational degree higher than compulsory schooling belong to the Middle Class; (4) white collars with educational degree (at the most) equal to compulsory schooling, blue collars and homeworkers belong to the Working Class.	(a)	2007 and 2011
Father with tertiary degree	Dummy variable; 1 if individual's father has a tertiary degree, 0 otherwise	(a)	2007 and 2011
Parents' average years of schooling	Average years of schooling of parents'	(a)	2007 and 2011
Age group	Dummy variable according to 3 age classes (21-22; 23-25; 26+)	(a)	2007 and 2011
Married	Dummy variable; married =1, 0 otherwise	(a)	2007 and 2011
Female	Dummy variable; female =1, 0 otherwise	(a)	2007 and 2011
Failure at high-school	Dummy variable; failure at high school =1, 0 otherwise	(a)	2007 and 2011
High-school grade	Grade of upper secondary diploma (60-100)	(a)	2007 and 2011
Lower secondary school grade	Dummy variable according to 4 ranges of lower secondary school grade: sufficient, good, very good, excellent	(a)	2007 and 2011
'Maturità' in a private school	Dummy variable; upper secondary diploma in a private school =1, 0 otherwise	(a)	2007 and 2011
Type of high-school degree	Dummy variable according to 5 types of upper secondary school diploma: Vocational School, Technical school, Lyceum, 'Magistrali', Art education	(a)	2007 and 2011
Provincial employment rate 35_64	(Adult) employment rates, 35-64 years old, in the province of residence of the individual	(b)	Average values 2004-2007 and 2007-2010
Provincial employment rate 15_29 by gender	(Youth) female/male employment rates, 15-29 years old, in the province of residence of the individual, if the respondent is female/male	(b)	Average values 2004-2007 and 2007-2010
Tuition fees (ln)	Students' contribution to university revenue by Ateneo (minus university spending for actions granted to students) divided by the number of students by Ateneo	(c)	Average values 2004-2007 and 2007-2010
Quality of University (anvur-r)	ANVUR R-index. The R value is calculated as the ratio between the grade of each University Faculty and the average grade of his field of study. If R>1 the University Faculty is above the average value of his field of study and viceversa	(d)	2004-2010
Housing costs	Average square meter price for a semi-central apartment by province	(e)	Average values 2004-2007 and 2007-2010
Provincial added value (ln)	Natural logarithm of per capita added value in the province of residence of the individual	(e)	Average values 2004-2007 and 2007-2010
N. of cultural associations in the province	Number of artistic, cultural, recreational and sports associations every 100 thousand inhabitants in the province of residence	(e)	2004 and 2007
Youth crime rate in the	Number of underage individuals charged for criminal acts over	(e)	Average

province	1000 underage individuals in the province of residence		values 2004-2007 and 2007-2010
Macroarea	Dummy variable according to 5 macroareas (North West, North East, Center, South, Islands)	(a)	2007 and 2011
N. of Faculties in the province	Number of University Faculties in the province of residence of the individual	(f)	Average values 2004-2007 and 2007-2008*
N. of Degree Courses in the province	Number of University Degree Courses in the province of residence of the individual	(f)	Average values 2004-2007 and 2007-2008*

Source: (a) Survey on Educational and Professional Paths of Upper Secondary School Graduates, Istat

(b) Labour Forces, Istat

(c) Website of the Italian Ministry of Education, University and Research (MIUR)

(d) Final Report on the Assessment of University and Research Quality 2004 – 2010

(e) 'Quality of Life Dossier', Sole 24 Ore

(f) Atlante Statistico Territoriale delle Infrastrutture 2007-2013, Istat.

* Data available until 2008.

Tab A3 - Descriptive statistics

Variable	Survey 2007 - All				Survey 2011- All				Survey 2007 – Only enrolled				Survey 2011 – Only enrolled			
	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max
Enrolled	25626	0.598	0	1	26361	0.562	0	1	15209	1.000	1	1	14748	1.000	1	1
Dropout	15209	0.161	0	1	14743	0.157	0	1	15209	0.161	0	1	14748	0.157	0	1
Social class																
Bourgeoisie	25598	0.204	0	1	26021	0.214	0	1	15144	0.261	0	1	14718	0.320	0	1
Petite Bourgeoisie	25598	0.201	0	1	26021	0.194	0	1	15144	0.183	0	1	14718	0.170	0	1
Middle Class	25598	0.164	0	1	26021	0.152	0	1	15144	0.203	0	1	14718	0.148	0	1
Working Class	25598	0.431	0	1	26021	0.441	0	1	15144	0.354	0	1	14718	0.362	0	1
Father with tertiary degree	25626	0.096	0	1	26361	0.095	0	1	15209	0.142	0	1	14748	0.144	0	1
Parents' average years of schooling	25626	10.434	5	18	25817	10.473	5	18	15209	11.321	5	18	14570	11.594	5	18
Age group																
21-22 years	25626	0.039	0	1	26361	0.036	0	1	15209	0.049	0	1	14748	0.046	0	1
23-25 years	25626	0.905	0	1	26361	0.922	0	1	15209	0.927	0	1	14748	0.939	0	1
26 years +	25626	0.056	0	1	26361	0.042	0	1	15209	0.024	0	1	14748	0.015	0	1
Married	25626	0.056	0	1	26361	0.061	0	1	15209	0.026	0	1	14748	0.029	0	1
Female	25626	0.542	0	1	26361	0.543	0	1	15209	0.593	0	1	14748	0.607	0	1
Failure at high-school	25626	0.192	0	1	26361	0.182	0	1	15209	0.130	0	1	14748	0.117	0	1
High-school grade	25626	77.903	60	100	26361	76.538	60	100	15209	81.543	60	100	14748	80.228	60	100
Lower secondary school grade																
Sufficient	25626	0.289	0	1	26361	0.217	0	1	15209	0.171	0	1	14748	0.117	0	1
Good	25626	0.331	0	1	26361	0.355	0	1	15209	0.310	0	1	14748	0.303	0	1
Very good	25626	0.218	0	1	26361	0.252	0	1	15209	0.276	0	1	14748	0.312	0	1
Excellent	25626	0.162	0	1	26361	0.176	0	1	15209	0.243	0	1	14748	0.268	0	1
'Maturità' in a private school	25626	0.027	0	1	26361	0.044	0	1	15209	0.017	0	1	14748	0.028	0	1
Type of high-school degree																
Vocational School	25626	0.285	0	1	26361	0.273	0	1	15209	0.149	0	1	14748	0.121	0	1
Technical school	25626	0.310	0	1	26361	0.332	0	1	15209	0.286	0	1	14748	0.306	0	1
Lyceum	25626	0.215	0	1	26361	0.200	0	1	15209	0.341	0	1	14748	0.330	0	1
'Magistrali'	25626	0.116	0	1	26361	0.122	0	1	15209	0.165	0	1	14748	0.181	0	1
Art education	25626	0.074	0	1	26361	0.072	0	1	15209	0.059	0	1	14748	0.062	0	1

Variable	Survey 2007 - All				Survey 2011- All				Survey 2007 – Only enrolled				Survey 2011 – Only enrolled			
	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max	Obs.	Mean	Min	Max
Provincial employment rate 35_64	25626	63.481	44.779	73.756	26361	61.809	43.649	73.733	15209	64.327	44.779	73.756	14748	62.147	43.649	73.733
Provincial employment rate 15_29 by gender	25626	42.361	9.98	68.18	26361	37.298	8.05	66.13	15209	42.780	9.98	68.18	14748	40.291	8.05	66.13
Tuition fees (ln)	25646	6.789	5.6837	9.9084	26223	6.982	0.7781	9.7776	15209	6.748	5.6837	9.9084	14592	6.948	0.7781	9.7776
Quality of University (anvur-r)	25293	1.029	0.2	2.01	25925	1.018	-0.02	1.84	14876	1.031	0.2	2.01	14294	1.022	-0.02	1.84
Housing cost	25512	1517.8	0	5125	26205	1480.3	0	5187.5	15095	1509.2	0	5125	14566	1463.9	0	5187.5
Provincial added value (ln)	25626	9.981	9.4153	10.477	26361	9.978	9.4059	10.462	15209	10.015	9.4252	10.477	14748	9.986	9.4059	10.462
N. of cultural associations in the province	25626	104.82	51.48	371.76	26260	78.994	27.6	291.39	15209	104.98	51.48	371.76	14748	79.221	27.6	291.39
Youth crime rate in the province	25626	11.868	3.49	43.36	26361	13.093	4.11	37.95	15209	11.880	3.49	43.36	14748	13.201	4.11	37.95
Macroarea																
North West	25626	0.217	0	1	26361	0.219	0	1	15209	0.224	0	1	14748	0.228	0	1
North East	25626	0.267	0	1	26361	0.240	0	1	15209	0.272	0	1	14748	0.248	0	1
Center	25626	0.163	0	1	26361	0.181	0	1	15209	0.162	0	1	14748	0.183	0	1
South	25626	0.258	0	1	26361	0.231	0	1	15209	0.253	0	1	14748	0.228	0	1
Islands	25626	0.095	0	1	26361	0.129	0	1	15209	0.089	0	1	14748	0.113	0	1
N. of Faculties in the province	25626	9.558	0	48	26361	11.108	0	72	15209	9.794	0	48	14748	11.482	0	72
N. of Degree Courses in the province	25626	27.611	0	128	26361	27.971	0	123	15209	28.284	0	128	14748	28.734	0	123

Tab. A4-1 – Bivariate Probit Models with sample selection, 2007, 2011, marginal effects *(social class)*

	2007		2011	
	(1)	(2)	(3)	(4)
VARIABLES	Drop	Enrol.	Drop	Enrol.
Social Class *(Bourgeoisie)*				
Petite Bourgeoisie	0.0555***	-0.0884***	0.0853***	-0.0930***
	(0.013)	(0.007)	(0.010)	(0.008)
Middle Class	0.0297	0.0188	0.0313***	-0.0378***
	(0.091)	(0.019)	(0.011)	(0.009)
Working Class	0.0644***	-0.1116***	0.0982***	-0.1146***
	(0.012)	(0.006)	(0.010)	(0.007)
Age group *(21-22)*				
23-25 years	0.0177	0.0016	0.0270	-0.0197
	(0.019)	(0.013)	(0.020)	(0.015)
26 years +	0.0090	-0.0886***	0.0477	-0.1229***
	(0.031)	(0.018)	(0.034)	(0.023)
Married	0.2403***	-0.1410***	0.2477***	-0.1626***
	(0.019)	(0.014)	(0.019)	(0.014)
Female	-0.1212***	0.0494**	-0.1054***	0.0773***
	(0.025)	(0.022)	(0.019)	(0.020)
Failure at high-school	0.0450***	-0.0279***	0.0546***	-0.0386***
	(0.009)	(0.007)	(0.010)	(0.006)
High-school grade	-0.0079***	0.0078***	-0.0082***	0.0082***
	(0.001)	(0.000)	(0.000)	(0.000)
Lower secondary school grade *(sufficient)*				
Good	-0.0419***	0.0300***	-0.0268***	0.0282***
	(0.011)	(0.005)	(0.010)	(0.006)
Very good	-0.0595***	0.0567***	-0.0805***	0.0613***
	(0.012)	(0.007)	(0.013)	(0.008)
Excellent	-0.1154***	0.0889***	-0.1163***	0.0945***
	(0.016)	(0.010)	(0.015)	(0.011)
'Maturità' in a private school	0.0084	-0.0233	0.0943***	-0.0642***
	(0.026)	(0.023)	(0.017)	(0.013)
Type of high-school degree *(Vocational School)*				
Technical school	-0.1200***	0.1390***	-0.1709***	0.1716***
	(0.016)	(0.007)	(0.011)	(0.009)
Lyceum	-0.3741***	0.4768***	-0.4468***	0.5018***
	(0.034)	(0.010)	(0.022)	(0.011)
'Magistrali'	-0.2695***	0.3397***	-0.3070***	0.3671***
	(0.028)	(0.012)	(0.021)	(0.010)
Art education	-0.0968***	0.0584***	-0.1291***	0.1028***
	(0.017)	(0.011)	(0.018)	(0.010)
Provincial employment rate 35_64	-0.0017	0.0200*	-0.0392***	0.0222**
	(0.001)	(0.011)	(0.001)	(0.010)
Provincial employment rate 15_29 by gender	0.0261**	0.0001	0.0168	0.0005
	(0.012)	(0.001)	(0.099)	(0.001)
Tuition fees (ln)	0.0274	-0.2193***	0.0501	-0.2442***

	(0.034)	(0.013)	(0.034)	(0.016)
Housing cost	0.0011***	-0.0108***	0.0338**	-0.0213***
	(0.000)	(0.000)	(0.000)	(0.000)
Quality of University (anvur-r)	-0.0652***	0.0332*	-0.0613**	0.0599***
	(0.025)	(0.018)	(0.028)	(0.023)
Provincial added value (ln)	0.0228	0.0987	-0.0178	0.0242
	(0.053)	(0.087)	(0.014)	(0.018)
N. of cultural associations in the province	-0.0001	-0.0001	0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Youth crime rate in the province	0.0008	-0.0015	-0.0009	-0.0014
	(0.001)	(0.001)	(0.001)	(0.001)
Macroarea (*North West*)				
North East	-0.0243	-0.0382**	-0.0059	-0.0229**
	(0.018)	(0.019)	(0.011)	(0.010)
Center	0.0315	-0.0459**	0.0377***	-0.0725***
	(0.020)	(0.020)	(0.012)	(0.020)
South	-0.0169	-0.0646*	-0.0080	-0.0927***
	(0.033)	(0.035)	(0.032)	(0.028)
Islands	0.0426*	-0.0959***	0.0510**	-0.1495***
	(0.024)	(0.038)	(0.025)	(0.028)
N. of Faculties in the province		0.0192**		0.0193***
		(0.009)		(0.002)
N. of Degree Courses in the province		0.0151***		0.0176***
		(0.001)		(0.000)
athrho	-0.5715***		-0.8941***	
	(0.1874)		(0.2673)	
rho	-0.5164***		-0.7134***	
	(0.1374)		(0.1312)	
Wald test of indep. eqns. (rho = 0)	chi2(1) = 9.30 Prob > chi2 = 0.0023		chi2(1) = 11.19 Prob > chi2 = 0.0008	
Observations	14,531	24,778	13,448	24,755

Standard errors in parentheses . *** p<0.01, ** p<0.05, * p<0.1

Tab. A4-2 – Bivariate Probit Models with sample selection, 2007, 2011, marginal effects *(social class and father education)*

	2007		2011	
	(1)	(2)	(3)	(4)
VARIABLES	Drop	Enrol.	Drop	Enrol.
Social Class *(Bourgeoisie)*				
Petite Bourgeoisie	0.0214*	-0.0623***	0.0668***	-0.0712***
	(0.013)	(0.008)	(0.011)	(0.009)
Middle Class	0.0421	0.0130	0.0383***	-0.0389***
	(0.089)	(0.009)	(0.012)	(0.011)
Working Class	0.0302**	-0.0849***	0.0792***	-0.0924***
	(0.012)	(0.007)	(0.010)	(0.007)
Father with tertiary degree	-0.1157***	0.1059***	-0.0714***	0.1041***
	(0.012)	(0.012)	(0.016)	(0.012)
Age group *(21-22)*				
23-25 years	0.0090	0.0070	0.0231	-0.0150
	(0.020)	(0.013)	(0.020)	(0.016)
26 years +	0.0020	-0.0839***	0.0419	-0.1188***
	(0.031)	(0.018)	(0.035)	(0.023)
Married	0.2412***	-0.1400***	0.2461***	-0.1626***
	(0.018)	(0.014)	(0.018)	(0.014)
Female	-0.1252***	0.0511**	-0.1062***	0.0781***
	(0.025)	(0.021)	(0.019)	(0.020)
Failure at high-school	0.0451***	-0.0288***	0.0562***	-0.0389***
	(0.010)	(0.006)	(0.009)	(0.007)
High-school grade	-0.0079***	0.0077***	-0.0081***	0.0081***
	(0.000)	(0.000)	(0.000)	(0.000)
Lower secondary school grade *(sufficient)*				
Good	-0.0409***	0.0298***	-0.0261***	0.0276***
	(0.011)	(0.005)	(0.010)	(0.007)
Very good	-0.0590***	0.0566***	-0.0806***	0.0606***
	(0.012)	(0.007)	(0.014)	(0.008)
Excellent	-0.1143***	0.0940***	-0.1265***	0.0983***
	(0.016)	(0.011)	(0.015)	(0.010)
'Maturità' in a private school	0.0105	-0.0232	0.0951***	-0.0645***
	(0.026)	(0.022)	(0.017)	(0.013)
Type of high-school degree *(Vocational School)*				
Technical school	-0.1206***	0.1382***	-0.1695***	0.1709***
	(0.015)	(0.007)	(0.011)	(0.009)
Lyceum	-0.3655***	0.4656***	-0.4349***	0.4914***
	(0.031)	(0.010)	(0.023)	(0.011)
'Magistrali'	-0.2663***	0.3352***	-0.3004***	0.3622***
	(0.026)	(0.012)	(0.021)	(0.010)
Art education	-0.0931***	0.0544***	-0.1255***	0.0979***
	(0.017)	(0.011)	(0.018)	(0.010)
Provincial employment rate 35_64	-0.0015	0.0190*	-0.0403***	0.0221**
	(0.001)	(0.011)	(0.012)	(0.010)
Provincial employment rate 15_29 by gender	0.0262**	0.0002	0.0183	0.0005

	(1)	(2)	(3)	(4)
	(0.012)	(0.001)	(0.081)	(0.001)
Tuition fees (ln)	0.0299	-0.2218***	0.0470	-0.2454***
	(0.033)	(0.013)	(0.031)	(0.016)
Housing cost	0.0018***	-0.0105***	0.0320***	-0.0229***
	(0.000)	(0.000)	(0.000)	(0.000)
Quality of University (anvur-r)	-0.0659***	0.0291**	-0.0601**	0.0307**
	(0.025)	(0.014)	(0.028)	(0.015)
Provincial added value (ln)	0.0187	0.0989	-0.0177	0.0246
	(0.053)	(0.087)	(0.013)	(0.018)
N. of cultural associations in the province	-0.0001	-0.0001	0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
Youth crime rate in the province	0.0008	-0.0015	-0.0010	-0.0014
	(0.001)	(0.001)	(0.001)	(0.001)
Macroarea (*North West*)				
North East	-0.0233	-0.0392**	-0.0070	-0.0230**
	(0.019)	(0.019)	(0.011)	(0.011)
Center	0.0309	-0.0468**	0.0390***	-0.0735***
	(0.020)	(0.019)	(0.013)	(0.020)
South	-0.0165	-0.0643*	-0.0115	-0.0929***
	(0.033)	(0.035)	(0.031)	(0.028)
Islands	0.0426*	-0.0960***	0.0491**	-0.1512***
	(0.025)	(0.039)	(0.022)	(0.028)
N. of Faculties in the province		0.0184**		0.0189***
		(0.008)		(0.001)
N. of Degree Courses in the province		0.0142***		0.0181***
		(0.001)		(0.000)
athrho	-0.5812***		-0.8471***	
	(0.1778)		(0.2449)	
rho	-0.5236***		-0.6895***	
	(0.1290)		(1284)	
Wald test of indep. eqns. (rho = 0)	chi2(1) = 10.68 Prob > chi2 = 0.0011		chi2(1) = 11.96 Prob > chi2 = 0.0005	
Observations	14,531	24,778	13,448	24,755

Standard errors in parentheses . *** p<0.01, ** p<0.05, * p<0.1

Tab. A4-3 – Bivariate Probit Models with sample selection, 2007, 2011, marginal effects *(parents' average years of education)*

VARIABLES	2007		2011	
	(1) Drop	(2) Enrol.	(3) Drop	(4) Enrol.
Parents' average years of schooling	-0.0172***	0.0216***	-0.0154***	0.0219***
	(0.001)	(0.001)	(0.002)	(0.001)
Age group *(21-22)*				
23-25 years	0.0057	0.0194	0.0179	-0.0076
	(0.019)	(0.013)	(0.019)	(0.017)
26 years +	0.0138	-0.0573***	0.0278	-0.0947***
	(0.030)	(0.018)	(0.032)	(0.023)
Married	0.2309***	-0.1346***	0.2431***	-0.1517***
	(0.018)	(0.013)	(0.018)	(0.014)
Female	-0.1256***	0.0546***	-0.1032***	0.0775***
	(0.025)	(0.021)	(0.020)	(0.020)
Failure at high-school	0.0484***	-0.0293***	0.0543***	-0.0412***
	(0.009)	(0.007)	(0.009)	(0.006)
High-school grade	-0.0079***	0.0076***	-0.0082***	0.0081***
	(0.000)	(0.000)	(0.000)	(0.000)
Lower secondary school grade *(sufficient)*				
Good	-0.0402***	0.0274***	-0.0241***	0.0245***
	(0.010)	(0.005)	(0.009)	(0.006)
Very good	-0.0573***	0.0509***	-0.0743***	0.0539***
	(0.011)	(0.008)	(0.013)	(0.009)
Excellent	-0.1061***	0.0811***	-0.1115***	0.0846***
	(0.014)	(0.011)	(0.015)	(0.010)
'Maturità' in a private school	0.0093	-0.0131	0.0942***	-0.0652***
	(0.026)	(0.022)	(0.017)	(0.013)
Type of high-school degree *(Vocational School)*				
Technical school	-0.1153***	0.1331***	-0.1659***	0.1622***
	(0.015)	(0.007)	(0.011)	(0.009)
Lyceum	-0.3565***	0.4487***	-0.4254***	0.4716***
	(0.027)	(0.010)	(0.020)	(0.011)
'Magistrali'	-0.2580***	0.3220***	-0.2946***	0.3464***
	(0.023)	(0.012)	(0.018)	(0.010)
Art education	-0.0851***	0.0450***	-0.1178***	0.0852***
	(0.016)	(0.011)	(0.018)	(0.011)
Provincial employment rate 35_64	-0.0011	0.0152*	-0.0362***	0.0254**

	(0.001)	(0.008)	(0.011)	(0.012)
Provincial employment rate 15_29 by gender	0.0222**	0.0001	0.0172	0.0007
	(0.011)	(0.001)	(0.091)	(0.001)
Tuition fees (ln)	0.0317	-0.2181***	**0.0494***	-0.2409***
	(0.029)	(0.013)	(0.029)	(0.016)
Housing cost	0.0012***	-0.0121***	0.0331**	-0.0231***
	(0.000)	(0.000)	(0.000)	(0.000)
Quality of University (anvur-r)	-0.0645**	0.0264**	-0.0547**	0.0567**
	(0.025)	(0.013)	(0.027)	(0.024)
Provincial added value (ln)	0.0208	0.0965	**-0.0215***	**0.0291***
	(0.053)	(0.088)	(0.012)	(0.017)
N. of cultural associations in the province	-0.0001	-0.0001	0.0001	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)
Youth crime rate in the province	0.0008	-0.0014	-0.0011	-0.0014
	(0.001)	(0.001)	(0.001)	(0.001)
Macroarea (North West)				
North East	-0.0219	-0.0406**	-0.0083	-0.0215**
	(0.019)	(0.019)	(0.011)	(0.010)
Center	0.0276	-0.0437**	0.0392**	-0.0676***
	(0.020)	(0.020)	(0.016)	(0.020)
South	-0.0207	-0.0525*	-0.0184	-0.0829***
	(0.033)	(0.029)	(0.032)	(0.027)
Islands	0.0363**	-0.0820***	0.0410***	-0.1373***
	(0.018)	(0.032)	(0.015)	(0.027)
N. of Faculties in the province		0.0181**		0.0189***
		(0.008)		(0.001)
N. of Degree Courses in the province		0.0155***		0.0179***
		(0.001)		(0.000)
athrho	-0.5925***		-0.8804***	
	(0.1593)		(0.2337)	
rho	-0.5317***		-0.7066***	
	(0.1142)		(0.1170)	
Wald test of indep. eqns. (rho = 0)	chi2(1) = 13.84 Prob > chi2 = 0.0002		chi2(1) = 14.19 Prob > chi2 = 0.0002	
Observations	14,640	25,050	13,497	24,766

Standard errors in parentheses . *** p<0.01, ** p<0.05, * p<0.1

Tab A5 – Loglikelihood ratio tests for parameter stability

Variables	2007/2011 Dropout probability	2007/2011 Enrolling probability
Social class	36.38***	35.32***
Father with tertiary degree	8.19**	0.04
Personal characteristics (age, marital status, gender)	2.57	7.25*
Ability (failures, school grades, upper secondary degree in private school)	20.02**	19.28**
Type of upper secondary degree	22.31***	20.18***
University costs (tuition fees, housing costs)	17.98***	18.12***
University quality (anvur r)	0.13	0.94
Adult employment rates	15.76***	4.23*
Youth employment rates	11.38***	0.92
Local variables (added value, cultural associations, youth crime, region of residence)	2.25*	9.84**
Tertiary education supply by Province (N. of Faculties, N. of Degree Courses in the province)	-	3.47*
Intercept	0.24	0.01
All	124.89***	147.31***

*** p<0.01, ** p<0.05, * p<0.1

Tab. A6 – Decomposition of the average conditional predicted dropout probabilities using coefficients for year *j* and sample characteristics for year *i*

	Coefficients	
Characteristics	**2007**	**2011**
2007	16.01	*18.24*
2011	*13.27*	15.50

Tab. A7 – Average conditional predicted dropout probability: coefficients effect and variables effect

2007-2011	
Total difference	-0.51
Coefficient effect	+2.23
Variable effect	-2.74

Appendix B

Instrumental quality: partial R^2 and F statistic on instruments in the first stage regression are used to check if there is strong correlation between instruments and the endogenous variable (Bound et al., 1995). I obtained the following results:

Partial R squared on the excluded instruments in the enrolment equation: 0.093 in 2007 survey; 0.100 in 2011 survey.

F statistic on the excluded instruments in the enrolment equation: 16.27 (significant at 99% level) in 2007 survey; 17.71 (significant at 99% level) in 2011 survey.

These results suggest that the instruments jointly make a relevant contribution in explaining enrolment decisions.

Instrumental validity: a valid instrument must be uncorrelated with the error term of the outcome equation, and thus it should not affect the probability of dropping out conditional on the included explanatory variables (Dolton and Vignoles, 2002). Then, the residuals of the dropout equation have been regressed against the instruments to check if the last ones are uncorrelated with the error terms. From these regressions I obtained:

R2 equal to 0.0002 in 2007 survey;

R2 equal to 0.0004 in 2011 survey.

This indicates that the instruments do not explain any significant variation in the residual variability and hence are valid.

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