Parental background and university dropout in Italy

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Abstract Using longitudinal data drawn from the European Community Household Panel, this paper examines Italian university entry and dropout rates in the context of specific parental and family characteristics. We are interested in the effects of the household's cultural and financial conditions on shaping investment in tertiary education and its failure, at the national level. Our estimates confirm the persistence of intergenerational correlations related to education. Cultural constraints affect outcomes—enrolment in and withdrawal from tertiary education; low income negatively affects the transition from high school to college. Our results suggest that a comprehensive policy intervention is needed to ensure optimal human capital investment.

Keywords University dropout · Parental background · Household financial conditions · Survival analysis · Italy

Introduction

Human capital accumulation has been increasingly central in debates and policy decisions related to national economic performance. Although there is overwhelming evidence that people who invest in education, especially tertiary education, have better job opportunities, experience reduced probability of being unemployed, and earn more over their entire working lives compared to those who have spent fewer years in education (see e.g. Ashenfelter and Ham 1979; Becker and Chiswick 1966; Bratti 2001; Card 1999; Lochner 2004; Meara et al. 2008), in Italy only a tiny fraction of the population achieves the highest level of education. According to the OECD (2011), despite an increase in educational achievement—mainly for recent cohorts—Italy remains in the bottom part of the education distribution for the OECD countries and shows a persistent gap with other developed

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countries. For instance, in 2009, the fraction of Italy's population aged 15–64 with tertiary education was 15 %, while the average in the OECD countries was around 30 %; for the youngest cohort (aged 25–34), the figures were 20 and 37 %, respectively. The small number of graduates is strongly related to persistent high dropout rates from the Italian university system despite efforts by the Italian Ministry of Education over the years, to increase retention. This paper uses national micro level data to investigate some of the determinants of dropout behaviour. The analysis focuses on the roles of parental background and household financial conditions in the higher education attainment of children, and their effects especially on university enrolment and degree course attendance. We aim to understand whether the Italian college system offers equal opportunities to children, regardless of personal family characteristics. The social and individual consequences associated with dropout behaviour, namely waste of public and private resources, less well-qualified pool of labour and lower wages, coupled with better availability of data, have motivated several studies on the phenomenon of dropout. Most research concludes that dropping out is a problem for universities and is also a complex social issue, and that there are no simple solutions. A focus on one part of the problem calls attention to the need for solutions to many other parts. The present paper contributes by using longitudinal data on a representative sample of Italian universities and a sample of Italian individuals, drawn from the European Community Household Panel (ECHP) survey for the period 1995–2001. The aim is to study the effects of parental background and household economic conditions on the likelihood of enroling at a university and of non-completion. The structure of the data enables the use of time-to-event models. Unfortunately, data on student's academic performance while enroled at the university are not available.

The analysis shows that college enrolment is negatively correlated to the geographical area of residence: the richer areas (e.g. north-east) show lower university entry rates. Transition from high school to university is positively and strongly associated with a better cultural background; having parents with more than a compulsory schooling enhances the probability that the child will continue his or her studies. Financial conditions are statistically significant, but prevent college enrolment only for individuals in the lower tail of the distribution. Dropout rates are higher for males and for the children of (both) parents with low levels of education, but are not influenced by family income.

The paper is organized as follows. 'The Italian tertiary education system' section describes the Italian university system. 'Existing studies' section reviews the literature. 'Data, sample selection criteria and variables' section describes the data and the sample selection criteria. 'Econometric approaches and models' section discusses the econometric approach. The sixth section presents the results and the last section concludes.

The Italian tertiary education system

Unlike most institutional contexts (i.e. Germany), the Italian university system is traditionally university-based since higher vocational education is not well established and is not considered as an alternative by high school leavers. Thus, before the recent reform introduced in 2001, university studies were mainly constituted by only a level of qualification, the *Diploma di Laurea*, which the legal duration varies from 4 to 6 on the basis of the field of study. Law n. 341/90 provided the option of enroling in a short degree level programme (*Diploma Universitario*), lasting 2–3 years, to study mostly vocational subjects. However, only a tiny fraction university applicants showed an interest in these

courses (about 12 % of total university student enrolment in 1999),[1] confirming the *Laurea* degree as the most relevant higher qualification, at the social and academic levels. Award of the degree of *Diploma di Laurea* allowed the individual to go on to specialize (e.g. master degree) or to enter a Ph.D. programme.

Within this university framework, we emphasize the aspects of the system which are relevant to our analysis. First, individuals must have a recognized high school diploma, regardless of the type,[2] to be admitted to a university. Second, with the exceptions of specific faculties, such as Medical Schools, and a few private universities, university enrolment is not based on an admissions test. Third, degree courses are characterized by a remarkable rigidity of curricula, which does not allow students to decide which lectures and courses to follow. Fourth, in public and private universities alike, there is no official limit to the number of years a student can be enroled in a degree programme because progression is not conditional on past performance; students can resit exams several times during an academic year and can refuse a mark if they consider it to be not satisfactory. Consequently, students enroled on standard four-year degree courses, obtain their undergraduate degrees after an average of 7.5 years, with only one in eight students completing within the minimum period (ISTAT 2000). Fifth, financial aid is limited. For example, in 2000, only 12 % of students received state funding in the form of grants (Fondazione RUI and Università di Camerino 2002).

Selection then, begins after admission, resulting in withdrawals from tertiary education system. Despite attempts to increase opportunities for university attendance, the system has been criticized severely because of its inefficiency in the form of high incidence of dropout, long time to degree (beyond the legal length) and selectivity based on social origins. With regard to this, since the Italian tertiary education system is essentially centralized and public, and is paid for through taxation, it would be reasonable for students to expect the same level of education, whatever their parental and family background. However, less financially well off families and families where the parents do not have higher education are less likely to invest in the education of their offspring (Checchi et al. 1999). This sub-optimal investment in education can be understood better if we consider the features of secondary education. After compulsory schooling, students wanting to go on to upper secondary school can enrol on an academically oriented track (the *Licei*) or a labour market-oriented track (the *Istituti Tecnici* and *Istituti Professionali*—aimed, respectively, at preparing students individuals for white-collar or skilled blue-collar careers). There are no formal restrictions on admissions (e.g. based on test scores reported in compulsory education), so the choice rests entirely on the individual and the family. Children from well educated and more cultured parental background mostly select into the academic-oriented track, which leads naturally to university enrolment; the labour market-oriented track is usually chosen by the offspring from less educated families. This 'diversion effect', induced by a lack of vocational tertiary education tracking, is a source of intergenerational correlation in educational attainment (Hanushek and Wößmann 2006; Brunello and Checchi 2007; Checchi and Flabbi 2006).

In relation to university survival rates, the Italian higher education system has always been characterized by low retention rates, even amongst the OECD countries.[3] Figure 1

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[1] ISTAT (2000).

[2] Pre 1969, access to university was allowed to only individuals holding an academic-oriented secondary school qualification (i.e. *licei*). Individuals holding technical and professional high school diploma have only been allowed to enrol for a university degree course since the introduction of law n.910/69.

[3] In 2000, university survival rates were lowest in Italy (42 %) compared to an OECD average of 70 % (70 % for Germany, 59 % for France and 83 % for the UK).
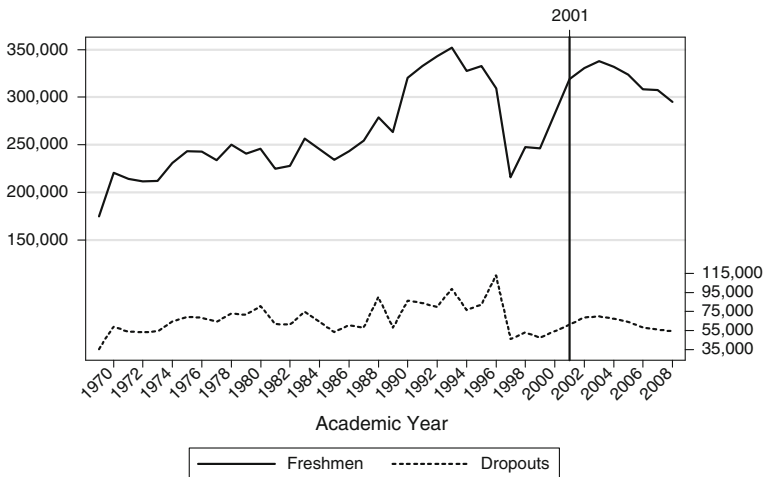
Fig. 1 Evolution of Italian freshmen and dropouts during the period 1969–2009. Dropouts are defined as the number of freshmen who does not enrol at university after their first academic year. *Vertical line* shows when '3 + 2' reform has been introduced. *Source* Own elaboration of ISTAT and MIUR data (1969–2009)

shows that the number of freshmen has risen since 1969 and university enrolment increased dramatically up to the late 1980 s. Over our sample period (1995–2000), there was a lull in this trend and it increased again only with the introduction of the 2001 university reform.

Figure 1 shows, then, the number of freshmen who did not re-enrol at university after their first academic year. It can be seen that dropouts fluctuated between 35,500 and 113,000 in the period 1969–2009 and were similar in trend to freshmen. Withdrawal was particularly high after admission was opened to all upper secondary school graduates (1969 onwards), and only in the most recent years have decreased. Since the 2001 university reform, the tendency has been towards a declining dropout rate (i.e. below 20 %).

This considerable number of dropouts stresses the features of the organization of Italian universities. On the one hand, open access to college for everyone encourages university enrolment, and on the other hand, lack of admission procedures (i.e. aptitude tests), absence of different higher education tracks and a limited number of scholarships[4] induce dropout from tertiary education, especially for the category of less qualified, less motivated and less financially well off students.

Attempts were made to deal with some of these issues in the reform introduced by law n. 509/99 in 2001. Apart from harmonizing the Italian tertiary education system with the European university model, the expected outcomes of this intervention were fall in dropout rates, reduced time to degree and an increase in the population with university qualifications. The reform replaced the previous binary single-tier structure and introduced a two-tier degree course that consisted of an initial three-year cycle (*Laurea Breve*) followed by a two-year degree course (*Laurea Magistralis*—master level). It also gave to universities full autonomy over teaching including freedom to freely decide on curricula and number of exams and their content. These institutional changes, especially the introduction of short degrees and reduced workload, have increased university enrolment rates (see, e.g.

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[4] Italian subsidies for education to private entities as a percentage of GDP were of 0.15 in 2000, while the OECD mean was 0.24 % (OECD 2003).

Cappellari and Lucifora 2008), but only partially reduced the dropout rates,[5] which still remain high.

Existing studies

A number of studies have examined the extent of university enrolment and persistence in the tertiary education system, using factors that influence students' behaviour, for instance, personal aspects, student entry characteristics, parental background, financial resources, academic performance and labour market conditions. Here, we discuss the most important and robust findings based on the determinants used in this paper, focusing mainly on the Italian context.

A review of the literature on intergenerational transmission of education shows that parents' education is extremely relevant in children's attainment, although it varies by country and national education system (Haveman and Wolfe 1995). In one of the first comparative studies of intergenerational persistence in education, Blossfeld and Shavit (1993) analyse the relationship between parental background and children's attainment and find that intergenerational mobility was not improved by the observed expansion in tertiary education in 11 of the 13 countries analysed. Based on the substantial expansion in education in the United Kingdom, Galindo-Rueda and Vignoles (2005) find strong evidence for a weaker correlation between ability and educational attainment with an increased impact of parental background. Also for Germany, Heineck and Riphahn (2009) confirm that inequality in educational attainment did not decline in the last half of the twentieth century. Recent research on the association between parental background and children's attainment in Italy, though based on different data sources, shows similar results, that is, that cultural family background is a key factor in explaining university attendance. Triventi and Trivellato (2009), using data from five waves of the Italian Longitudinal Household Survey, analysed the performance of Italian undergraduates in the twentieth century. They show that enrolment and success at university are strongly related to family background, and that the worst results are consistently associated with a lower-middle class background. The persistence of education inequalities is noted also in Checchi et al. (2008). Although they show an increase in the degree of intergenerational mobility in attainment, the relative disadvantage of children from lower parental backgrounds does not change over time because of differences in the degree of risk aversion promoted by parents' background and liquidity constraints. Similarly, Checchi (2000) proposes a formal model to analyse the link between parents' investment in children's education and their school performance, using data from the Bank of Italy and the University of Milan, and finds that university attendance is influenced mainly by cultural constraints. He shows in particular that children with better-educated parents (i.e. education beyond compulsory schooling) face a higher probability of transition from high school to university. This result confirms also the important role of parents in shaping high school track—at least one parent with a university degree increases the probability of selecting into the academic track (i.e. *licei*) and has an impact on children's post-secondary education (Checchi and Flabbi 2006). While the expansion in higher education in Italy has been analysed, the results suggest that reducing inequality increases access for children from poorer backgrounds, but does not increase chances of completion (Bratti et al. 2008). Cappellari and Lucifora (2008) use data on a

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[5] For a comprehensive description of the Italian tertiary education system after the introduction of the 2001 reform, see Bratti et al. (2008) and Bratti et al. (2010).

cross-sectional sample of school leavers interviewed by the National Statistical Office (ISTAT) three years after graduation to investigate the effects of the 2001 reform. They provide evidence that pupils from unfavourable backgrounds benefit more from the provision of shorter degree courses in terms of college attendance but, like Bratti et al. (2008), they find it has no effect on numbers of degrees awarded.

College attendance is also positively affected by family financial resources. The theoretical literature shows that wherever there are credit constraints, low-income families may not be able optimally to invest in the human capital of their offspring (Han and Mulligan 2001). The empirical evidence of substantial differences in university enrolment rates across family income classes suggests that income inequalities across generations and ethnic groups may be widening (see Blossfeld and Shavit 1993; Blanden and Machin 2004; Galindo-Rueda and Vignoles 2005). According to Carneiro and Heckman (2002), different patterns of university participation are related both to short- and long-run factors associated with family income, particularly during a child's adolescent years. Short-run factors include liquidity constraints faced by households that reduce the resources available to finance college education. Long-term factors suggest that a higher income is decisive in shaping the abilities and expectations of children. They show that controlling for children's abilities mostly eliminates family income differences in college enrolment, thus explaining the gaps in educational attainment related to family background in many different environments including those with almost free tuition and no restrictions on college entry. Unfortunately, empirical evidence for the Italian context is limited by lack of data on children's and parents' education over time. For instance, Checchi (2000) finds that the family income has a positive effect on university attendance only if controls for parental background are excluded, otherwise the effect of family income[6] becomes statistically insignificant. This result does not mean that liquidity constraints are not relevant, but rather that better-educated parents are similarly better able to develop scholasticism in their children by influencing their educational choices.

Labour market prospects also play a role in university enrolment, and we would expect a positive correlation between unemployment rate and college participation rates. According to the human capital model (Becker 1964), a fall in the rate of unemployment is likely to increase opportunity costs, hence reducing the relative attractiveness of higher education. Checchi (2000) found that children living in Italian regions where job prospects are good (i.e. north-east and centre) are less likely to enrol in a degree courses. Similarly, Cappellari and Lucifora (2008), controlling for the local unemployment rate, show that better labour market conditions discourage university enrolment. In contrast, Di Pietro (2004) found that better job opportunities promoted college attendance, suggesting that the former result may be driven by weaker students who are confident of finding a job in subsequent years, regardless of whether or not they had a degree.

For the probability of withdrawing from university, the most important theoretical models are those proposed by Tinto (1975), Bean (1980) and Bean and Metzner (1985), which identify attrition especially as the result of failed interaction between student and university. These types of models stress the influence of student's previous schooling, academic preparedness, personal characteristics, family background and institutional characteristics. There is empirical evidence on the relevance of prior education and

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[6] It should be noted that family income in this study refers to resources available at the time of transitions rather than parental income during the child's late adolescent years. It has been shown that children in financially well off families during their formative years have greater exposure to higher quality education and experience environments that foster cognitive and non-cognitive skills (Carneiro and Heckman 2002).

university performance indicating that there is a negative correlation with university dropout rates (Montmarquette et al. 2001; Smith and Naylor 2001; Arulampalam et al. 2004a, 2005; Boero et al. 2005; Belloc et al. 2010).[7]

For the role of parental background (proxied by parents' education or occupation), most studies conclude that there is significant positive correlation in economic explanations of dropout behaviour. Johnes and McNabb (2004) analyse the dropout phenomenon in the United Kingdom and find that parents' occupation is statistically significant for explaining both completion and voluntary dropout. Overall, they provide evidence that the category at higher risk of failure is composed by students with unskilled parents. Similarly, Ahlburg et al. (2002), using 1979 National Longitudinal Survey of Youth data (NLSY79) and implementing a two bivariate discrete-time hazard models with endogenous waiting time, confirm that a father with extended years of education or in a white-collar job decreases the dropout hazard rate. However, Arulampalam et al. (2004b, 2007) find a negligible effect of social class background for students enroled in medical schools, with the exception of having a parent who is a medical doctor, which reduces the probability of dropping out. In the Italian context, despite the various sources of data and the methodological differences, the evidence confirms the paramount importance of family background for academic success and higher dropout rates amongst students from the poorer socio-economic group (Checchi 2000; Di Pietro 2004; Cappellari and Lucifora 2008; Triventi and Trivellato 2009). University failure analysed by Cingano and Cipollone (2007) takes account of sample selection bias and suggests that the probability of dropping out of university decreases by about 14 % for an extra 10 years of education of the father.

Amongst the combination of the determinants that influence university failure, family income is positive correlated to academic success, although this finding is based on narrow information. Generally, higher family income is expected to increase college graduation. Checchi (2000) analyses the effect of household financial resources on performance and finds that students from well off families have a shorter time to degree than students from the poorest families. Family income can be seen as a proxy for more job opportunities and better job prospects based on parents' networks.

Finally, labour market conditions also have an effect on drop rates. However, the evidence in the literature on dropout behaviour of students based on unemployment rates is not conclusive. On the one hand, we can expect the effect of poor local job prospects to constrain liquidity and enhance the probability of non-completion. On the other hand, high rates of unemployment can reduce the risk of dropout since it is better to have a student status than be classed as unemployed, although this effect is more likely in higher education systems characterized by low tuition fees and free access (i.e. Italy). Confirmation of financial constraints is provided by Ahlburg et al. (2002) and Smith and Naylor (2001) for the United States and the United Kingdom, respectively. The empirical evidence for Italy is mixed. For instance, Di Pietro (2006) confirms the signalling hypothesis—a negative correlation between regional unemployment rates and university withdrawal. Becker (2001), testing a theoretical search model with education, suggests that students are at higher risk of failing if demand from high school graduates increases. Checchi (2000), Di Pietro (2004) and Cingano and Cipollone (2007) show that labour market prospects do not have statistically significant effects on academic failure.

Against this background, we exploit the spatial and the temporal dimensions of the ECHP data to analyse changes in individual status (i.e. at university or not) and the dynamics of respective household financial conditions, to understand whether family

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[7] These authors show that undergraduates with good final high school grades are more likely to dropout.

characteristics have a direct effect on the enrolment decision or dropout from the degree course. Capturing variations in the household's financial conditions over time contributes to the limited evidence provided by studies that use family income to explain dropout rates.

Data, sample selection criteria and variables

The data

The data are drawn from the ECHP survey, conducted by the Statistical Office of the European Community (Eurostat), at European Union level. They include information on demographics, labour force behaviour, income, health, education and training, housing and migration. We have data for eight years of the ECHP survey, from 1994 to 2001.[8] The longitudinal design of the ECHP makes it possible to follow the same set of private households and individuals over several consecutive years. For instance, individuals who move to another location or form or join a different household can be identified at their new location. Children who reached the age of 16 during the sample period qualify for detailed personal interviews, and children born to women in the sample are included automatically in the survey population. This means that our sample reflects demographic changes to the population and, except for losses due to sample attrition, continues to be representative of the population over time. At any point in time, the detailed survey covers anyone cohabiting with one of the individuals in the original sample, enabling the former to be studied in the context of their complete household.

The advantages of ECHP data are that they provide information on university students and allow investigation of university dropout and length of time spent at university, which allows us to conduct a survival analysis. Since the analysis in this paper focuses on Italy, we extract the Italian components; the first wave of the survey is excluded because it does not include information on education. ECHP data were collected annually, thus interviewees answer the same questions each year.

Sample selection criteria

The age range considered is restricted to 18–30 years since the research questions refer to high school leavers and undergraduates and include only individuals for whom it was possible to obtain information on parents, at least for one wave, since this is crucial to test the link between parental background and university success. The observation window starts at age 18 because, according to Italian law on minimum years of high school education, completion cannot be before the age of 18 or 19. The ECHP does not provide information on type of secondary school attended, final high school grade or academic performance, but does provide information on demographic and family characteristics. Estimates are based on parental background and financial conditions to analyse university enrolment and dropout behaviour. In principle, we have information on the families of all respondents aged between 18 and 30, because most are either still living with their parents or, if they have moved out of the parental home or formed a new household, we can recover information on their original family for at least one wave.

For each research question investigated, we define a specific sub-sample. For the probability of enroling at university, we consider only individuals with a high school

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[8] The ECHP survey was discontinued after 2001.

diploma since they are at risk of enroling or not for a university degree course programme. The cross-sectional dimension accounts for this outcome and the final sample—*sample A*—is comprised of 1,158 individuals (554 men and 604 women). The dropout decision sub-sample is composed of respondents aged 18–30, who were enroled at university as full-time students for at least one year. This provides a panel of 5,034 observations—*sample B*—comprised of 1,439 people (728 males and 816 females).

Variables

Dependent variables

The analysis is in two parts, each with a specifically defined dependent variable. Investigation of which determinants affect the probability of enroling at university or not is based on the dummy variable *uni*, which takes the value 1 if a high school graduate enrols at university and 0 otherwise. Concerning all the individuals in *sample A*, about 54 % make the transition from high school to a degree programme.

Regarding the probability of dropping out of university, using *sample B*, we look at year-to-year changes in higher education status using the dependent variable *failure*, which is a dummy variable that takes the value 0 if the student is still enroled at university and 1 if he or she leaves before completion.

Explanatory variables

Human capital investment varies from person to person; we are interested in what affects the choice to invest. The existence of a positive correlation between earnings and education has been confirmed (Card and Krueger 1992; Topel 2005). Based on this, we would expect the individual to invest as much as possible in education. However, there are other factors that explain why not everyone achieves the same level of education. These have been identified as family background, family income, personal characteristics, quality of school environment and local social conditions. Unfortunately, there are no data sets that provide all this information. Although the ECHP allows us to follow people over several years and to detect changes, we do not have information on education ability, such as high school marks or university results, but we do have information on parents, which we use to proxy for individual education background—generally, children of parents with low levels of education tend to follow a less academically oriented high school education.

For *sample B,* we calculate the number of years spent at university before dropout, if the event occurred. The integer interval range is 1–12 since we censor students' observations at age 30. The length of the student's academic career is easily defined for students observed since the start of their university experience, that is, transition from high school to college. For the remaining university students, first interviewed when enroled at university, we assume that they started at age 19 when they could be supposed to have achieved their high school diploma. We include in the analysis the logarithm of this variable.

We define a set of variables for family characteristics, to test, in particular, for the effect of household financial conditions on investment in higher education. Equivalent family income is constructed as total net household income divided by the OECD equivalence scale—which takes account of economies of scale due to family composition[9]—and by the 2001 consumer price index (ISTAT 2010) to make household incomes comparable across

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[9] In this manner, we control for the resources available given family characteristics.

Table 1 Variables definition by sub-sample

Variable	Sample A Mean	Sample B Mean
Female	0.522	0.529
Age	19.854	
North-east	0.137	0.107
North-west	0.164	0.142
Centre	0.240	0.254
South	0.459	0.497
Father with compulsory schooling	0.588	0.514
Mother with compulsory schooling	0.594	0.524
Both parents with compulsory schooling	0.464	0.386
Household equivalent income	8.981	9.000
1st quartile household eq. income	0.256	0.218
2nd quartile household eq. income	0.271	0.251
3rd quartile household eq. income	0.268	0.275
4th quartile household eq. income	0.205	0.256
Lndurata		1.077
Number of individuals	1,158	1,439

waves. Family income should provide a fairly good measure of the level of resources on which the student can rely when at university. This variable is included in the regressions as a logarithm and as a dummy to describe the family's position with respect to the total distribution of household income (i.e. defined in quartiles) in each year. To capture the effects of parents on decision and academic success, we define two dummy variables for father's and mother's levels of schooling (compulsory schooling), and a dummy variable for two parents with only compulsory schooling level of education, to test whether a poor cultural background has a direct negative effect on university choice and success. We control also for student's gender and age. Finally, to investigate potential labour market effects on the decision to enrol or withdraw from higher education, we include dummies for geographical macro-area, namely north-east, north-west, centre and south. For Italy, Italian regional unemployment disparities can be accounted for by grouping the regions as described above. The use of dummy variables rather than rate of unemployment is driven by the lack of information provided in the survey, as information is not available for all 20 regions.[10] Note that individuals living in the northern regions have better labour market prospects and the worst prospects apply to the southern regions.[11]

Table 1 summarizes the explanatory variables in the analysis, by sub-sample.

Figure 2 plots the Kaplan–Meier survivor function disaggregated by gender, parents' education and family income. The risk of dropping out of university (Fig. 2a), given survival up to the previous year, is always higher for males than for females. Low levels of education for parents (Fig. 2b) puts the student at higher risk of failure.

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[10] In ECHP, data individuals are already identified by grouping some regions—it includes 11 geographical areas.

[11] Average unemployment rates during the sample period were about 6.6 % in the north-west, 5.3 % in the north-east, 7.6 % in central Italy and 16 % in the south.
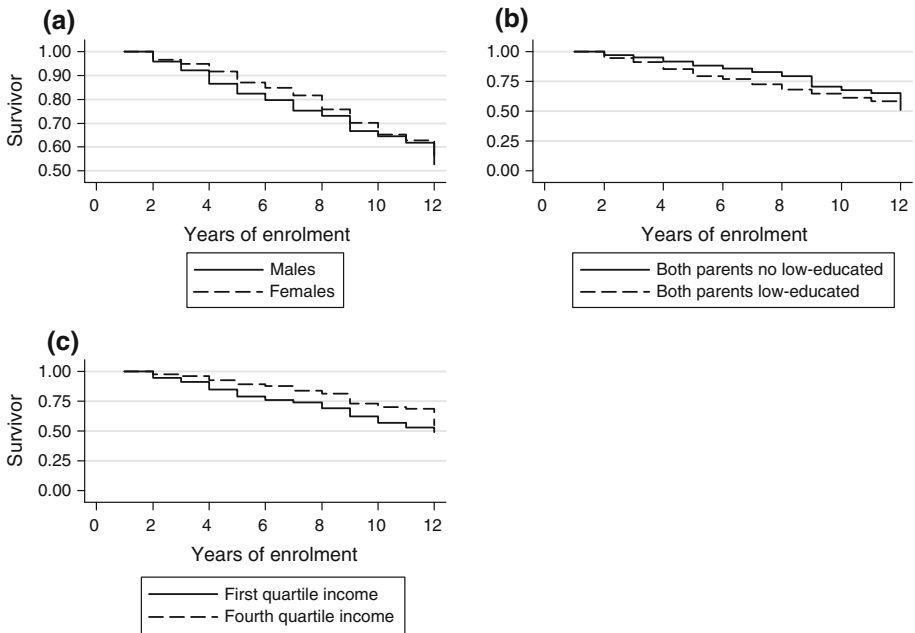
Fig. 2 Survivor functions by gender (**a**), by parents' education (**b**) and family income (**c**)

Figure 2c reports the survivor function based on family income; if we compare the lower and upper tails of the distribution, those in the former are more likely not to complete their university course.

Econometric approaches and models

We analyse two outcomes: university enrolment and university dropout, using slightly different samples and different methods. We use a *probit* model to show the effects of the explanatory variables on the probability of investing in tertiary education. Due to the nature of the Italian education system which imposes no specific restrictions on students enroling at college regardless of their high school diploma, this choice is governed by the individual and his or her family. Let y be a dependent variable, which for convenience and without loss of generality, can assume only two values: 1 if the event occurs, that is, the individual enrols at university and 0 if he/she does not. Thus, y_i* reflects the unobserved utility associated with the event of interest—college enrolment—for the individual i ($i = 1, …,N$), assuming that the previous probability is a linear function of a vector of the explanatory variables $X_i^{'}$ and a column vector of the coefficients β and the residual unobserved heterogeneity is captured by the vector of error term u_i we have:

$$y_i* = X_i'\beta + u_i$$

where $u_i = y_i * -X_i'\beta.$

Every coefficient reports the effect of the explanatory variables on the latent dependent variable. To facilitate interpretation of the results, we consider the marginal effects, which

indicate the effect of the explanatory variables on the probability of the event occurring or not.

Considering the variables available and the panel structure of the data, the best form specification to investigate dropout is to apply the survival analysis models. Binary dependent regression models are not appropriate because the analysis models time-to-event data and, also, they do not consider aspects such as censoring and time-varying covariates (Jenkins 2004) and do not account for the differences in time when each individual is at risk of experiencing the event. Since the time elapsing before the student drops out of university is provided in discrete-time intervals, a discrete hazard model is applied. Note that the sample is random and composed only of university students observed until the end of the time spell or until the end of the survey, which means that transition out of university is not observed for some students. Observations for those who do not experience transition are right censored, and it is assumed that the process that gives rise to the censoring is independent of survival time. After enroling at university, each student, at the end of every academic year, can decide whether to carry on his/her studies or to dropout of college. In order to study university dropout, we use a complementary logistic model (*cloglog*) where the dependent variable takes the value 0 if the individual is still at university or gets a degree over time and 1 if he or she drops out.

If T identifies time spent at university, which ends in one given interval of time $[t_{j-1}, t_j)$. The hazard rate, for a student i, is given by

$$h_{ij} = \Pr[T_i \in [t_{j-1}, t_j) | T_j \geq t_{j-1}]$$

which is the probability of dropping out of university in the interval $[t_{j-1}$ and $t_j)$, on condition of being university student at the time t_{j-1}.

Despite the nature of the data, the complementary log–log model specification for the hazard regression is consistent with a continuous time model and interval censored survival time data (Jenkins 2004). Based on the proportional hazard function shape, we can transform the coefficients of this analysis into hazard ratios to ease interpretation of results.[12] For any given covariate, the hazard ratio is:

$$HR = \frac{\chi(x = a)}{\chi(x = a - 1)} = \exp(\beta_x)$$

where χ is the continuous time hazard rate. This is the relative risk associated with a one unit change in the value of the corresponding explanatory variable, holding everything else constant.

Of course, it is questionable whether all students with the same set of observed covariates face the same expected hazard of dropping out of university. Due to unobservable factors, it is reasonable to assume that there are some students who are more or less likely to exit from university. To test for unobserved heterogeneity, we assume that the frailty term is normally distributed. If the likelihood ratio test of 'rho'[13] rejects the null hypothesis, frailty is negligible.

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[12] Under the assumption of 'proportional hazard', the duration profile of the hazard is the only function of the time variable and, therefore, is the same for all individuals where the profile is shifted upwards or downwards by the explanatory variables.

[13] 'Rho' is the ratio of the heterogeneity variance to 1 plus the heterogeneity variance.

Results

The four columns in Table 2 report the number of specifications applied, the coefficients, the standard errors, and the marginal effects, and the sign of each explanatory variable underlines its effect on the probability of enrolment.

Despite the specification considered, we see that transition from high school to university is decreasing over time. This result is in line with national statistics showing that university enrolment generally occurs immediately after high school completion at age 19. In the academic year 1995–1996 in Italy, 68.6 % of the total number of students enroled at a university had obtained their high school diploma in the previous year (ISTAT 1998).[14] Note also that there are no statistically significant differences between genders for college enrolment. Although most studies suggest overall higher performance of females compared to males (Brunello and Cappellari 2008), this could be interpreted as a result of accounting only for transition to college and not for academic success and university admission not based on pre-enrolment performance. Checchi (2000) also finds no evidence of gender discrimination on university participation rates. Geographical area of residence affects college enrolment. In line with previous studies and national statistics,[15] entry rates are positively correlated with labour market conditions. Lack of job opportunities particularly affects the decision to continue studies and enrol on a university degree course (Di Pietro 2006; Cingano and Cipollone 2007). For instance, students living in the centre and south of Italy have a higher probability of enrolment compared to those living in the north-east, of around 15 and 22 %, respectively. We can interpret this result in two ways. On the one hand, the small number of job opportunities increases university entry rates because students realize that more qualifications might facilitate better access to the labour market and will signal potential higher productivity to employers (Spence 1973). On the other hand, in a context of limited options, students may regard academic experience as similar to 'free parking' because of the relative low university tuition fees and the social norms that judge students more positively than unemployed young people (Becker 2001). Finally, parental background plays a role in the university decision—and particularly the low educational level of parents, which is always statistically significant with a negative sign. The results in Table 2, Columns (I) and (II) indicate that, whether household income is a continuous variable or a dummy variable, the effect of education of each parent is stable. A high school graduate whose father has achieved only compulsory schooling has around a 14 % lower chance of enroling in a degree course; if the mother has only compulsory level education, then the probability is even lower (19 %). Table 2 Columns (III) and (IV) show the effect of two parents with only compulsory level education: the likelihood of university attendance is 25 % less. Children whose parents are both poorly educated are definitely at more risk of not enroling compared to those who have only one parent with compulsory schooling. The decision process is definitely constrained by parental education, which reduces intergenerational educational mobility. The reduced opportunities for students from poor cultural backgrounds suggests that the Italian framework, of centralized and publicly financed tertiary education, is failing to provide more equal opportunities for

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[14] The highest percentage of university enrolment after high school completion is also due to the specific Italian situation, where there is a limited differentiation in higher education programmes. The situation changed slightly after the introduction of the new university reform '3 + 2', which also encouraged enrolment by individuals with less time to devote to study, such as workers and older individuals.

[15] For example in the academic year 1998–1999, according to geographical macro-area of residence, freshmen were about 19.64 % from the north-western, 15.37 % from the north-eastern, 20.83 % from the centre and 44.16 % from the southern Italy.

Table 2 Estimates of the probability of enroling at university (dependent variable: uni)

Variable	Coef. (I)	SE	Marg. Eff.	Coef. (II)	SE	Marg. Eff.	Coef. (III)	SE	Marg. Eff.	Coef. (IV)	SE	Marg. Eff.
Age	−0.216***	0.404	−0.085	−0.215***	0.040	−0.085	−0.216***	0.039	−0.085	−0.215***	0.040	−0.085
Female	0.128	0.081	0.051	0.127	0.081	0.049	0.130	0.081	0.051	0.132	0.081	0.052
North-west	0.055	0.147	0.022	0.049	0.147	0.019	0.048	0.147	0.018	0.046	0.147	0.018
Centre	0.391**	0.136	0.150	0.378**	0.137	0.146	0.390**	0.136	0.150	0.386**	0.136	0.149
South	0.554***	0.128	0.215	0.556***	0.127	0.216	0.588***	0.128	0.228	0.602***	0.127	0.233
Father with compulsory schooling	−0.356***	0.095	−0.139	−0.356***	0.096	−0.139						
Mother with compulsory schooling	−0.495***	0.094	−0.192	−0.492***	0.096	−0.191						
Both parents with compulsory schooling							−0.652***	0.085	−0.254	−0.634	0.086	−0.247
Household equivalent income	0.101*	0.063	0.040				0.129*	0.066	0.050			
1st quartile household eq. income				−0.229*	0.135	−0.091				−0.320**	0.130	−0.127
2nd quartile household eq. income				0.005	0.127	0.002				−0.092	0.123	−0.037
3rd quartile household eq. income				−0.003	0.120	−0.001				−0.018	0.118	−0.007
Constant	3.014**	1.115		3.975***	0.949		2.487**	1.149		3.729***	0.965	
Number of individuals	1,158			1,158			1,158			1,158		

***, ** and * significant at 1, 5 and 10 %, respectively. Reference category: males, north-east, father with more than compulsory education, mother with more than compulsory education, both parents with more than compulsory education, 4th quartile household equivalent income. Other variables are: trend time

disadvantaged individuals because the transmission of human capital is persistent across generations (Haveman and Wolfe 1995; Bowles and Gintis 2002). These estimates support again the huge importance of cultural constraints in determining individual's educational attainments and outcomes (see, e.g. Checchi et al. 2008; Cappellari and Lucifora 2008). It emerges also that long-term family factors (i.e. parental education) are quantitatively significant because they have direct effects on cognitive abilities, motivation, study habits, social environment and so on. In the Italian context, for instance, children from disadvantaged families are more likely to enrol in non-academic high school tracks, which reduces their chances of enroling at a university because they underestimate the economic benefits of higher education over a lifetime (Checchi and Flabbi 2006). It is plausible that financial constraints may be deterring university enrolment. Table 2 Columns (I) and (III) include the logarithm of equivalent household income and Columns (II) and (IV) show the dummy variables by quartiles. The latter specifications are included to show whether there might be a threshold to university attendance. The estimates indicate that household financial conditions are generally positively correlated with the probability of going to university and that family financial conditions have a negative effect only if the household income is within the first tail of the total distribution. In other words, very low-income families are not able to invest optimally in their children's human capital (Han and Mulligan 2001). In contrast to other empirical evidence for Italy (Checchi et al. 2000), this result confirms that household income prevents children from going to university only if the family has liquidity constraints, and that for all other groups—second and third quartile—there are no differences, *ceteris paribus*, with well off families. Overall, considering that only children from the poorest income distribution face a reduction in their probability of college attendance (i.e. 9 % and about 13 % when we control in the specification for both parents with compulsory schooling), we can claim that short-term financial barriers are relevant for this category, so if they encounter difficulties in finding the necessary resources to finance college education, higher education access will be determined solely by income level. Following Checchi et al. (2008), effective measures to reduce the persistence of inequalities of opportunities within this context have to facilitate: (a) household access to the credit market for Italian families with children in schooling age, (b) student financial aid such as scholarships and free accommodation also before enrolment.

The four columns in Table 3 show the coefficients, standard errors and hazard ratios of the dropout probability.[16] The set of covariates is the same as above, except for the individual's age because the way that the number of years spent at university is defined is strongly correlated with the age variable.

For each specification, the risk of failure at university is not equally distributed between genders. The negative sign of the hazard ratio associated with women highlights a lower probability of withdrawal from university than for men, of about 28 %. There are several possible explanations. First, labour market conditions are less good for females compared to males, which may encourage the former to invest more in tertiary education to signal higher productivity and to enhance their opportunities to enter the labour market. Second, females invest in higher education as insurance against discrimination in the labour market. Third, they are more diligent at studying than males. Fourth, they are less likely to dropout because the returns from education for females are generally higher and positively correlated with the number of years spent in education (Brunello et al. 1999). Area of

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[16] The estimation results correspond to the model without unobserved heterogeneity as the hypothesis that rho is zero cannot be rejected (i.e. frailty is unimportant).

Table 3 Estimates of the probability of university dropout (dependent variable: failure)

Variable	Coef. (I)	SE	Hazard Ratios	Coef. (II)	SE	Hazard Ratios	Coef. (III)	SE	Hazard Ratios	Coef. (IV)	SE	Hazard Ratios
Lndurata	0.137	0.101	1.146	0.137	0.101	1.146	0.148	0.101	1.159	0.150	0.101	1.161
Female	−0.328**	0.114	0.720	−0.328**	0.114	0.720	−0.313**	0.114	0.731	−0.316**	0.114	0.729
North-west	0.124	0.252	1.132	0.125	0.252	1.133	0.140	0.252	1.150	0.139	0.252	1.150
Centre	0.251	0.222	1.285	0.259	0.223	1.129	0.248	0.222	1.281	0.253	0.222	1.288
South	0.212	0.210	1.236	0.219	0.211	1.244	0.195	0.209	1.215	0.189	0.211	1.207
Father with compulsory schooling	0.466***	0.137	1.593	0.467***	0.139	1.594						
Mother with compulsory schooling	0.162	0.135	1.175	0.171	0.140	1.186						
Both parents with compulsory schooling							0.410***	0.116	1.507	0.394***	0.122	1.483
Household equivalent income	−0.071	0.056	0.931				−0.095*	0.054	0.909			
1st quartile household eq. income				0.155	0.185	1.168				0.281	0.181	1.325
2nd quartile household eq. income				−0.025	0.180	0.975				0.077	0.176	1.080
3rd quartile household eq. income				0.079	0.168	1.083				0.146	0.166	1.158
Constant	−2.702***	0.604		−3.407***	0.280		−2.324***	0.572		−3.299***	0.277	
Number of individuals	1,439			1,439			1,439			1,439		

***, ** and * significant at 1, 5 and 10 per cent, respectively. Reference category: males, north-east, father with more than compulsory education, mother with more than compulsory education, both parents with more than compulsory education, 4th quartile household equivalent income

residence is not statistically significant. The fact that geographical dummies are not significant underlines that dropout behaviour, from a statistical point of view, is equally distributed across regions. Although this result appears to contrast with the evidence in Di Pietro (2006), it should be interpreted with caution since in this empirical exercise, we assume that students enroled at a university located in the region of residence. As a result, we ignore the fact that some students may have moved to another region and may be affected by the local labour market conditions there. Not surprisingly, for the enrolment decision, the effects of geographical characteristics are as expected since once individuals decide whether to enrol or not at university, they are positively influenced by the labour market conditions in their region of residence. The coefficients in Columns (I) and (II) indicate that only father's level of education affects the probability of university attrition and that dropout is some 60 % higher for undergraduates whose fathers completed only compulsory education. Columns (III) and (IV) show that the risk of dropout if both parents have only compulsory schooling is about 50 %. Estimates confirm that family background influences academic success as well as university enrolment. Household financial conditions proxy for the student's liquidity constraints. However, the hazard ratios for household equivalent income, both as a continuous variable or as a dummy, are generally not statistically significant, except in Column (III), which shows that a one-point increase in family income reduces the probability of withdrawal by 9 %. This result highlights that the lower tail income distribution may be a barrier to enrolment, but does not affect dropout. Tuition fees at Italian public universities are generally affordable because they are proportionate to the family's financial resources. Therefore, the statistical significance of family income, and its negative correlation with dropout probability in the specification controlling for having both parents with compulsory schooling, suggests the networking explanation (see Checchi 2000). In other words, students from better-off families have higher persistence rates because of the higher labour market prospects.

Conclusions and final remarks

This paper analysed the determinants of university enrolment and university dropout using ECHP data for Italy. The panel structure of our data allowed us to investigate the transition from high school to university and subsequent university success, since individuals are interviewed more than once. The objective was to test the effects of parental background and family financial conditions on the two outcomes under consideration. The main findings for the probability of enroling at college are that poor labour market prospects increase entry rates and that household background positively affects transition, namely children with better-educated parents are more likely to continue studies after high school. Finance is a barrier only for those students in the lower tail of the household income distribution. The hazard ratios of the dropout model highlight that gender and parents' education affect academic success. Undergraduates with fathers or with both parents with only compulsory schooling, and male students, are more likely to fail.

This paper contributes to existing work on this topic and, mainly because of the availability of information on family income, allows a better understanding of the mechanisms that drive Italian students' decisions to enrol at university and to dropout. It provides some insights for policy makers about interventions to enhance university participation and retention rates, that is, to enhance intergenerational education mobility.

Results indicate persistent intergenerational correlations in education, with cultural or financial constraints (or both) preventing children from making optimal investment in

human capital. Since 1969, reforms to the university system, aimed at increasing equal opportunities amongst individuals, and especially students from the lower social classes, have had no visible effects (Triventi and Trivellato 2009). The intergenerational transmission that emerges from this study cannot be changed through the implementation of social policies; changes to the university system and degree courses are not sufficient to promote optimal human capital investment by less privileged children. The 2001 reform increased the numbers of students from lower class backgrounds enroling for university, but not their chances of completion (Brunello and Cappellari 2008). Although the Italian university system has virtually no entry barriers, tuition fees are low and there are a large number of public universities, which, in principle, should give the same opportunities to children regardless of family background, the inequalities emerge both in the university attendance and in the likelihood of withdrawal. The fact that education, at any level, is still strongly related to parents' level of education and to their liquidity constraints (i.e. children where family income is in the lowest tail of the distribution) nullifies the positive characteristics of the Italian university framework. This would suggest the need for a different kind of intervention and measures to ensure that even children facing liquidity and/or cultural constraints may face the same opportunities as those living in families with better parental background and better financial conditions. Government policies should aim at reducing the constraints on borrowing to fund university attendance, for instance, by promoting equal access to credit for different income groups and changing the affordability for households. Interventions could also be aimed at increasing the total amount of public financial support for students from low-income families. However, removing short-run credit constraints is unlikely to be entirely effective in a context, such as in this exercise, where university attendance and persistence are strongly associated with long-run factors, such as parents' education, which produces the abilities required to benefit from participation in college education. Thus, the correlation between poor educated offspring and enrolment at vocational or technical high schools, which do not provide an academically oriented education (see, e.g. Checchi and Flabbi 2006), is responsible for the persistence of inequalities of opportunities in educational attainment for individuals from different socioeconomic status. Consequently, following the reforms in several European countries in the 1970 s, there should be similar reforms to the Italian secondary school system in the form of comprehensive high school education. It requires short-term and long-run factors to be tackled jointly by policy makers to experience a general increase in education attainment regardless of the students' socio-origins, otherwise policies will have only marginal effects—for example expansion of the higher education system during the 1990 s and reduction in the length of the degree courses, both of which increased university access, but not completion by less advantaged individuals (Checchi et al. 2008; Cappellari and Lucifora 2008).

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