# Gone for Good? Determinants of School Dropout in Southern Italy

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*Abstract*

Dropping out of school has recently become a major issue of policy concern in Italy. A series of reforms of secondary school objectives, programmes and organizational design have been proposed to adapt the public school system to evolutions in the labour market and to increase overall educational attainment. The aim of our work is to gain some understanding of the causes of dropping out of school and, more generally, of the factors that induce parents to review their choices about their child's schooling careers. To this end we make use of data from the "school dropout survey" undertaken in Salerno Province by the Centre for Labour Economics and Economic Policy (CELPE). The survey collected a range of information on adolescent young people and their families over the period 2004-06.

The paper proposes a model of sequential decision making by parents where the decision can be reviewed in the light of new information emerging about the ability and opportunities of the child in profiting from education relative to her outside (in the unskilled market). The model allows interpretation of such dropout and return behaviour and emphasises both the role of economic capacity (opportunity costs) as well as cultural capacity (ability to disentangle signals about future opportunities) for equilibrium decision making.

Analysis of the data confirms the role of both economic and cultural capacity of the family of origin in shaping observed choices about drop-out and return to school by individuals in our sample. Interestingly we find that whilst poor performance at, and low attachment to, school – measured by repetition of the school year through end of year failure and attendance records - is a key determinant of initial dropping out, the former is also strongly positively associated with a subsequent return to education. An important implication of this finding is that "initial" dropping out behaviour is often determined by a mismatch between school and student rather than poor performance per se. The answer to the question in the title of this paper, interpreted in its normative sense, therefore is no: the process of allocation of talents to school tracks is subject to many trial errors and revisions by families and many of those who live school return to it.

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## *1. Introduction*

In this paper, data from the "school dropout survey" undertaken in Salerno Province by the Centre for Labour Economics and Economic Policy (CELPE) are analysed. A key feature of our sample is that a substantial proportion of school "dropouts" subsequently return to some form of education. Abandoning school for a period and then possibly returning to education in a different school is obviously an indication of distress and suggests that education choices are subject to several kind of errors and mistakes. A few aspects may be relevant in what seems to be an important characteristics of school careers of many students: mistakes parents make about the kids ability to pursue a specific education career, changes in the child's attitudes towards school in a period of their life (adolescence) when her character, social skills and specific capacity to adapt to learning and education evolve and are subject to shocks somewhat not perfectly controlled or forecasted by families. These social and psychological aspects make the study of these problems from the economic point of view quite entangled. From a pure choice theoretic perspective, parental aspirations and their choices about their child's educational career involve subtle psychological and sociological aspects not easily squared with a simple investment approach to education choice. Such choices may be reviewed in the light of the new information about opportunities and abilities that unravels when the child grows as an adolescent. This new information may arise from parental experience about the cultural evolution of the young man as a student, about the quality of the match between a specific child and a specific school or teacher, or simply about the opportunity cost of education given what parents see as the return to have their child educated. However, even if it is a hard task to square decisions made by adolescents and their parent during this period of the child's life with a choice theoretical framework, studying the economic implications of these decisions is important from an economic perspective. As is well known, these choices have important effects later in life and shape the destiny faced by the young man in the future both in terms of social status and of economic returns of investment in human capital made during adolescence. More generally, the presence of mistakes and errors maybe an indication of an inefficient allocation of talents to school tracks during adolescence and therefore, given the large involvement of public resources in the education systems, the study of these problems is quite relevant from the policy design perspective as well.

The aim of our work is to gain some understanding of the causes of dropping out of school and, more generally, of the causes that induce parents to review their choices about their child's schooling careers. The paper proposes a model of sequential decision making by parents where the decision can be

reviewed in the light of new information emerging about the ability and opportunities of the child in profiting from education relative to her outside (in the unskilled market). The model allows interpretation of such dropout and return behaviour and emphasises both the role of economic capacity (opportunity costs) as well as cultural capacity (ability to disentangle signals about future opportunities) for equilibrium decision making. On the other hand, being a partial equilibrium model, we do not tackle efficiency issues that obviously arise, and use the model as a guide for the implementation of the analysis of the data and as a theoretical framework to interpret empirical results. Specifically, the nature of the theoretical model leads fairly naturally to the implementation of a selected bivariate probit model of initial dropout and return to school by young people.

The rest of the paper is organized as follows: in section 2 we present some stylized facts and some related literature, in section 3 we present the model, in section 4 we present the empirical results; section 5 concludes.

## *2. Some Stylised facts and a glance at the literature*

The Lisbon agenda includes several quantitative targets for education and training systems in Europe. One specific goal is halving the share of early school leavers – i.e. 18-24 years-old with at most a lower secondary education qualification and not in further education – to less than 10% by 2010. (Commission of the European Communities, 2002). The reason is that rising skill demand requires at least the completion of upper secondary education for successful labour market entry and for further participation in lifelong learning (see OECD, 2000). Even though present trends show, in general, clearly decreasing levels of early school-leavers in the Member States - especially in Spain, Italy, Greece, France, Belgium and Finland - (Quintini and Martin, 2006), further efforts are required to enable the EU to reach the target, as the loss of stock of human capital is still unacceptably high.

A recent analysis carried out by the Ministry of Public Education (Ministero della Pubblica Istruzione, 2006, pp. 12-13, tab.7) points out some peculiarities of the drop out phenomenon in Italy, underlining that:

- both failure at school and dropout are so widespread that about a third young men and more than one-in-five young women enrolled in upper secondary school do not obtain the “diploma”;
- female educational performance is better than males, particularly in technical and vocational schools;

- students attending classical and scientific schools have the highest probability of completing their studies in all the geographical areas of Italy while those attending technical schools in the North of Italy have a lower probability of completing their studies than in other areas. This may plausibly be explained by the, at times opposing, motivations for dropping out related to the opportunity cost of, and expected (employment and income) returns to education. Thus, dropping out is a characteristic of both depressed and developed areas. The early entry into the labour market in Lombardia and other areas in the North-East where the labour demand is high can cause a crowding effect of the schooling and training system, raising the risk of lower qualified occupations in the future (table 1).

**Table 1: Probability of obtaining final diploma by gender, geographical area and type of school (graduates from the school per 100 enrolled at the first year 5 years before) – Upper secondary school public and private - year 2004-05**

| | Total | Scientific and classical | Psycho-pedagogical | Technical | Vocational | Arts |
|---|---|---|---|---|---|---|
| TOTAL | 72,3 | 85,6 | 82,3 | 79,0 | 47,8 | 62,9 |
| North | 71,1 | 85,3 | 84,7 | 73,4 | 51,3 | 68,5 |
| Centre | 74,4 | 86,7 | 78,5 | 82,3 | 48,4 | 61,2 |
| South and Islands | 72,4 | 85,4 | 82,1 | 82,6 | 44,8 | 59,5 |
| MALES | 67,1 | 84,7 | 87,5 | 74,5 | 41,5 | 56,7 |
| North | 64,7 | 83,5 | 90,7 | 67,9 | 43,8 | 59,5 |
| Centre | 69,7 | 88,7 | 69,9 | 75,9 | 42,2 | 55,8 |
| South and Islands | 67,9 | 83,8 | 91,5 | 79,6 | 39,7 | 55,2 |
| FEMALES | 78,1 | 86,3 | 81,5 | 87,6 | 56,5 | 66,0 |
| North | 78,1 | 86,8 | 83,8 | 83,2 | 60,3 | 72,6 |
| Centre | 79,5 | 85,3 | 80,1 | 95,5 | 56,5 | 63,8 |
| South and Islands | 77,5 | 86,5 | 80,6 | 88,6 | 52,9 | 61,8 |

**Source:** Ministero della Pubblica Istruzione (2006, table 7, p. 13)

Concerning the case under study, table 2 reports residents at the beginning of the years 2003-2005 by age in the Province of Salerno and students enrolled in the schooling year 2004-05. Each age group

counts 13.000-14.000 individuals with men in a higher proportion with respect to women. The number of the enrolled is about 10% lower than the residents pointing out a very rough number of individuals who leave the school after the end of the lower secondary school. Moreover, both the number of the enrolled and the weight of the public school decline from 15 to 18 years. The first phenomenon is an aspect of what is known "school dispersion" and the second signals that students shifts from public to private schools in order to become secondary school graduates.

**Table 2: Number of the residents and enrolled in the Province of Salerno by age**

| Age | Total residents at 01/01/2003 | Men | Total residents at 01/01/2004 | Men | Total residents at 01/01/2005 | Men | Enrolled to schools (A) | Enrolled to public schools (B) | Enrolled to public school/ enrolled to schools (A/B) (%) |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 13390 | 6825 | 13954 | 7056 | 13474 | 6971 | 12885 | 12616 | 97.9 |
| 16 | 13723 | 7002 | 13447 | 6845 | 14030 | 7101 | 13025 | 12645 | 97.1 |
| 17 | 13937 | 7177 | 13769 | 7009 | 13482 | 6879 | 12211 | 11749 | 96.2 |
| 18 | 14329 | 7317 | 13980 | 7209 | 13801 | 7031 | 10370 | 9844 | 94.3 |
| Total | 55379 | 28321 | 55150 | 28119 | 54787 | 27982 | 48491 | 46854 | 96.6 |

**Source:** Istat (2003-2005) and Ministry of Public Education (year 2004-05)

Data taken from the 2001 Census of Population and reported in Table 3 confirm that the number of residents 15-18 aged in the Province of Salerno not enrolled to a regular course of study increases as the age increases.

**Table 3. Number of the residents and enrolled/not enrolled in the Province of Salerno**

| Age | Residents (A) | Enrolled in a regular course of study (B) | B(%) | Not enrolled in a regular corse of study(C) | C(%) | (C/A)% |
|---|---|---|---|---|---|---|
| 15 | 13867 | 11914 | 27.4 | 1953 | 14.8 | 14 |
| 16 | 13881 | 11131 | 25.6 | 2750 | 20.9 | 19.81 |
| 17 | 14482 | 10858 | 25.00 | 3624 | 27.5 | 25 |
| 18 | 14383 | 9528 | 22.00 | 4855 | 36.8 | 33.75 |
| Totale | 56613 | 43431 | 100 | 13182 | 100 | 23.28 |

**Source** : ISTAT(2001)

In the last decade the Italian authorities, aiming at reducing drop out rates, have opted to change the minimum school-leaving age introducing compulsory schooling and training up to age 18 (Law n.144/1999 “obbligo formativo” and Law n.53/2003 “diritto dovere all’istruzione e alla formazione”). The institutional actors, public or private, involved in the realization of such obligation are manifold (Schools, Training Centres, Employment Agencies) and at different level of governance: central (Ministry of Education) and local (Regions, Provinces, Local Employment Agencies). The duty of all of them is to follow the students in pursuing their studies and to make easier the school-to-work transitions, developing broad-based community partnerships aimed at helping at-risk youth.

Students who drop out face a lot of economic and social difficulties. Several studies find that adult earnings are higher when students are compelled to take an extra year of school (Oreopoulos 2007; Angrist and Krueger 1991; Acemoglu and Angrist 2001; Blundell, Sianesi and Dearden, 2003). On the other hand, the social externalities are considerable. Drop outs are more likely to be unemployed, reporting poor health, being depressed, being in a low skilled manual occupation, drawing on social assistance and other welfare programs, to end up in jail (Lochner and Moretti 2004).

Many factors have been identified as influencing dropping out. Some are school-related: a drop out does not like school in general or the school he/she is attending, he is failing, getting poor grades, or cannot keep up with school work, he does not get along with teachers and/or students. Other factors are student-related: a drop out has disciplinary problems, is suspended, or expelled, he does not feel safe in school, he has different traits than those who graduate (Eckstein and Wolpin, 1999) for example: low ability and/or motivation, low expected returns to graduation, better market opportunities for the jobs

that don't require graduation, lower consumption value of school attendance. Reasons for dropping out may be related to personal problems as well: drug and alcohol abuse, obesity or health problems (Celpe 2006). Other factors are family-related: stressful/unstable home life, low family support, socioeconomic status, single-parent households, poor education of parents, desires to get married and/or getting pregnant (Cardoso and Verner, 200). Besides there are also some categories of youth that are more at risk of dropping out: certain ethnic groups, students living in large cities or in a poor areas, or attending schools whose structure or academic and social organization may not favour the holding in of students at risk (Lee and Burkam 2003).

The standard human capital model assumes that students are rational and time consistent, so the choice of the optimal education attainment level may be treated as an investment decision (Becker 1964; Card 1999). That level is defined by the point where the opportunity costs from additional schooling outweigh the benefits. Students who decide to drop out because of psychological or motivational problems, are simply evaluating that forgone earnings and effort costs from attending school are higher than the estimated expected benefits.

However, it is widely recognized that the standard model can not totally explain drop out behaviour. Policymakers want to update compulsory school laws and to introduce restrictions on the choice of students because they are persuaded that leaving secondary school before graduation is a sub-optimal outcome. Oreopoulos (2007) finds "significant lifetime rewards to wealth, health, and overall happiness from having to take another year of school" and monetary benefits between 5 to 7 times greater than expected average income when leaving school one year before, so the disutility from not attending school is very high.

There are other reasons that may be considered to account for the decision to leave the school. The credit constraint hypothesis states that students, especially those from low income families, cannot borrow from the expected higher outcomes to support the low present consumption (Carneiro and Heckman 2002). Similar to the credit constraints hypothesis is the myopic behaviour of drop outs. Students may give greater emphasis on the present, because they mispredict the future returns or underestimate the real gains from school or have negative expectations about the future, so they weight more the non pecuniary or monetary costs in calculating the school attainment decisions. Sociological and psychological research points to the importance of a student's social group in determining their active involvement in school. This literature (for a review see Akerlof and Kranton 2002) considers schools as institutions, with social goals besides imparting skill, and highlights that educational outcome of students depends on their identification with the *school's social category* and its *ideal*

student. A further aspect that has been investigated is the role that schools –their structures, their academic organisation and their social organisation- play in students' decisions to stay in school or leave before graduating (Lee and Burkam 2003). Factors related to school quality are also important in determining whether students who leave their high schools either transfer to another school (and thus stay in school) or leave school altogether (Rumberger and Thomas 2000; Hanushek, Lavy and Hitomi 2006).

Different dropping out explanations, obviously, call for different policy designs. Compulsory school legislation may be effective when staying in school has significant benefits in term of future rewards to wealth and well being. On the contrary, policies aimed at forcing students to remain in school until they graduate may have little impact if the reasons for leaving school are related to the individual characteristics: the lack of motivation, low ability, higher preference for low skill jobs. In this case, it becomes necessary to alter the traits with which youths come to high school. Policy options, aiming at reducing costs of school (both direct and indirect) or offsetting immediate costs with immediate benefits, may improve the student's skill upgrading when drop outs do not rightly evaluate the future revenues of schooling because of a myopic behaviour or because of the family background, credit constraints, extremely poor economic and social environment, as well. As said, psychologists and ethnographers often point at the importance of a student's attitude towards school, rooted in their social and cultural background, in influencing their school choice decision, so it becomes important that schools reinforce the social inclusion and the social identity of their students. Finally, sociological theory stresses also the relevance of organizational and structural characteristics of school -i.e size and sector, curricula offered, the character of relationship between students and teachers, etc.- in the decision of students, implying that policymakers have to pay a special attention to strengthen the quality of schools.

## *3. A framework for the analysis. A simple model of parental sequential choices about their children's schooling careers.*

In this section we build up a framework for the analysis of school careers to evaluate the main determinants of the decision to quit school, and possibly return to it, after having spent a period out. The model is based on a simple idea of repeated learning by parents about their children's abilities and (future) job market opportunities. Sending the child to school allows parents to assess their ability in the labour market and formulate expectations about the child's wage on the skilled labour market

relative to the unskilled one. The main building blocks of the model are as follows: parent use school signals to extract information about their child's ability as a skilled worker based on their prior and on the evidence provided by school grading. If the signal at school is bad, parents re-assess the value of investment in human capital depending on their private signal on the child's ability. After balancing the private with the public signal (the relative precision is key for the assessment) parents make a decision about school enrolment in subsequent grades. If the child instead leaves school, he spends a period outside and further information accrues to his parents about his specific ability in the unskilled job market. Conditional on this information, parents may decide to leave the child outside school or to give her a second chance to proceed in the education curriculum. This latter hypothesis, i.e. that some information about future alternative opportunities to the child is collected when he spends a period out of school, is the key hypothesis for understanding the process of re-entry.

Parental capacity to assess their child's quality and use the public signal at school, along with the opportunity cost of education and some form of irreversibility of education choices will determine the equilibrium choices in this model: parental culture (precision of the signal about their children's ability), school quality (the precision of the public signal provided in grading the child's performance at school), and economic status (the opportunity costs of education investment) matter in our framework. As for irreversibility we will assume that high school can only be completed when the child is adolescent and stays with her parents. We will also assume that after completing high school the decision about future career (university versus unskilled labour market) is irreversible.

Specifically, we consider two careers leading the child to being prepared, as an adult, either for the skilled labour force (say university enrolment) or for the unskilled labour force. We assume decisions are made by altruistic parents. These choices are based on parental assessment of benefits of the child's schooling career, given their expectation about wages in the skilled and unskilled labour market. These assessments regard the child's ability in the two labour markets. School is assumed not to add skills valuable on the job market, this is a strong simplification but a richer role for school could be easily be considered within the model[1].

Choices are made sequentially, conditional on the signals parents get about their children's ability and their market opportunities. In making their sequential choices, parents trade-off these benefits with their opportunity costs of having their children educated. Sequentiality of choices reviewed in the light of the new information is modelled as follows. We divide the child's time horizon (call it adolescence)

[1] For a richer view of child's identity and education see Akerlof and Kranton (2002). Assuming education was productive would increase incentive to stay in school and eventually to return after dropping out but would not change the results of the model.

for the family decisions into three periods. There exists basic compulsory education, therefore parents have to send children to school for at least one period at the end of which a signal is collected about the child's ability. At the beginning of period two, parents make a choice about the child's future career: either they withdraw him from school or they have him complete his education. This choice is made conditional on the signal being collected at school in the first period (educational score at school in period one) balancing it with their priors about the child's ability. If parents choose to leave the child at school he completes his schooling career in period two and has to decide whether to enrol at a higher level (university, say) or get back to the unskilled labour market.

Conditional on parental choice to withdraw the child from school at the beginning of the second period, we assume the child spends a period out learning his alternative opportunities on the unskilled labour market[2]. Again, after having spent a period out of school and having obtained a signal about her child's opportunities on the (unskilled) labour market they make their decision again: they can leave the child in the unskilled labour market or have him return to school.

At equilibrium, in each family, choices about their children's careers will depend on the skill premium expected given the signals (i.e. the relative expected benefits from the two alternative careers), the opportunity cost of education, and on the precision of the signal about child's ability as a potential skilled worker (at school) and child's opportunities on the unskilled job market.

To analyze the model we make a bunch of simplifying assumptions none of which will affect our main results whose economics will turn out to be quite intuitive. We assume that there is one parent and one child, the decision is made by parents, leaving the child with no meaningful decision. Our model is a partial equilibrium model, i.e. we do not derive the equilibrium level of the skill premium as a function of family choices. Learning occurs optimally given the information accruing to parents as time unravels. We will assume risk neutrality in parental utility and normal distribution of all the signals used for parental decisions and the parameters on which the decision making is made

[2] The description of a period out of school during adolescence has to be interpreted in quite broad terms. It may vary depending on the actual socio-economic contexts in which the family investment in educating their children is cast. For example in less developed countries or areas, where agriculture or small scale family business play important role, failing at school will likely involve for the kid a period of actual training in the traditional occupation. In more developed countries or regions kids' failing at school may only involve further information acquisition by parents about alternative opportunities (this information acquisition by parents may range from a more careful investment in the parent-child relationship entrusting a psychologist or a private tutor, discussing the issue with friends and relatives to better assess the child's talents for alternative occupations. We do not enter into such details- which can be quite important- since our working hypothesis is meant to deal with several specific socioeconomic environments: after the kid is perceived to have failed at school parents have incentives to review their prior about the kids talents in different occupations and condition their education investment upon this new information.

contingent on[3]. We also assume no discounting by parents and, just for simplicity, no tuition fees for high school enrolment with anticipated tuition fees for university enrolment equal to $T_s$, a measure of the opportunity cost for the parents to provide the child with a schooling career leading to the skilled labour market.

As already discussed, once children complete high school, the choice between going to university and working in the unskilled labour market becomes irreversible. Analogously, after two periods in the unskilled labour market children are not allowed to get back to school. This is equivalent to make the cost of switching back to education after a certain age sufficiently large. A less drastic assumption would have been to provide parents and children with the option to switch across education career for a longer horizon at a smoothly increasing costs. This assumption is only made to avoid recursive formulation of the more general dynamic programming problem that would arise in the absence of complete irreversibility. This richer formulation would not change the main results, however. Finally we assume that the children's abilities are relevant on the skilled labour market but are not on the unskilled labour market[4]. This will simplify the derivation for the formula of the information updating process by parents quite a bit, but again, most of the results would go unchanged with a more general role of ability in both markets. More specific comments about these assumptions will be provided in the following.

Now we present the details of the decision making process and the time line faced by parents.

At time *t=0* parents enrol child at school. Children's ability is denoted $\alpha$, which is equal to the child's value (productivity) expected on the skilled labour market (denoted $\alpha w_s$), and is determined following the process

(1) $$\alpha = \theta + \varepsilon,$$

where $\theta$ is the parents initial assessment, $\varepsilon$ is the noise affecting parental judgement. We assume the signal $\theta$ is unbiased[5] i.e., $\varepsilon$ follows a normal distribution with mean 0 and variance $\sigma_\varepsilon^2$. This latter can

[3] Both these assumptions can be dispensed with the results going almost unchanged if we assume risk aversion on the child's benefits and risk neutrality with respect the parents' income and i.i.d properties of the shocks accruing to parents' information set.

[4] Equivalently the assumption is that child's ability index valuable in the skilled labour market is independent of the ability index that defines the childs' market opportunities in the unskilled labour market.

[5] Unbiased signal is not necessarily a realistic assumption ("every little beatle is beheld a beauty to his parents" as the saying goes) however it avoids to eliminate inefficient schooling decisions and forms of segregation of dynasties into jobs based upon social confidence by upper classes. As we will see the model already allows for the role of cultural bias in education decisions with an unbiased signal: (if the parent is a skilled worker is likely to exhibit low $\sigma_\varepsilon^2$ and therefore

be family specific and reflect cultural heterogeneity among families in their capacity to assess child's ability valuable for the skilled sector. Having assumed it is unbiased, the prior assessment about the child's value on the skilled labour market is $\theta$. Parents' unconditional expectation about the child's ability is therefore:

(2) $E[\alpha] = \theta$

Sending the child to school provides a signal on his ability level

(3) $z_t = \alpha + s_t$

Where $s_t$ follows a normal distribution with mean 0[6] and variance $\sigma_s^2$. The precision $1/\sigma_s^2$ can be interpreted as a quality index for the assessment process at school.

At time *t=1* the school assessment of the child's ability is revealed $z_1 = \alpha + s_1$. Parents observe it and make their first decision about the child's career: either they withdraw him from school or they leave him continuing. Perceived benefits from continuing education are measured by the conditional expectation of the child's ability :

(4) $\hat{\alpha}_{t+1} w_s$ where $\hat{\alpha}_{t+1} = E[\alpha | I_t]$

It is a measure of the expected wage in the skilled labour market as a function of the estimated ability of the child's conditional on parent's information set. Specifically $I_t$ is the parents information set at time *t* including all the signals received until then. In the first period, $I_1 = \{\theta, z_1\}$.

Benefits from withdrawing the child from the school is given by the expected wage on the labour market plus the option value of returning to school next period.

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weight his own assessment compared to school grading relatively more than a parent with high $\sigma_\varepsilon^2$) leading to the result that skilled parents are less likely to withdraw their children from school conditional on a bad grade.

[6] Again, we do not consider another important source of segregation into occupations, i.e. the impact of cultural homogeneity among skilled families and school teachers on education choices.

At time *t=2* further information is released to parents. If the child was in school a second signal about his ability in the skilled sector $z_2 = \alpha + s_2$ is revealed and a decision about his future is made: either he continues his career towards the skilled labour market (by joining a university career) or he gets back to the unskilled labour market. Benefits from continuation are therefore measured by

(5) $\hat{\alpha}_3 = E[\alpha | I_2]$

The information set after two periods in school is $I_2 = \{\theta, z_1, z_2\}$.

If the child is withdrawn from school after the first period, he spends a period out of school (say working), a signal is collected about the child's opportunities in the unskilled labour market. Define

(6) $w_t^u = w^0 + u_t$

the wage that the child is expected to gain in the unskilled labour market. Where $w^0$ is the average wage in that market and $u$ is the specific talent of the child in this job. $u$ follows a normal distribution with mean 0 and variance $\sigma_u^2$. Parents they do not observe $w_t^u$, but an unbiased signal of child's opportunities in the unskilled labour market (say the child's current wage provided he is paid one), defined as

(7) $\phi_t = w^u + \delta_t$

where $\delta_t$ follows a normal distribution with mean 0 and variance $\sigma_\delta^2$. The information set after one period in school and one period out of school is $I_2^D = \{\theta, z_1, \phi_2\}$.

Summarizing we model the period of adolescence as a learning process by parents about children's abilities and opportunities in the presence of some degree of irreversibility of choices about education careers. Parents make sequential decisions about their child's educational career based on their attainment and grades $z_t$. We will show that a good signal at school ($z_1$) about the child's ability $\alpha$ increases parental expectations about what the child's utility will be as a skilled worker and will increase the chance that the parent will keep financing the child's (who is by now a man) education. If this signal is relatively bad the parent will try the unskilled labour market where a signal about the child's opportunities will be collected ($\phi_t$). If this latter signal will turn out to be bad the parent may be willing to reconsider his choice and enrol the child again at school.

All of this is quite intuitive, the advantage of laying down the model is to derive precise predictions about career's choices as a function of the parameters of the problem, i.e. the priors, the average skill premium in the market, the opportunity costs of children's education for the families and the precision of different signals about abilities and market opportunities. Notice that, as simple as the model is, it can allow for economic and cultural heterogeneity at the family level. Economic heterogeneity is captured by the opportunity cost faced by parents who bear the full economic cost of education, $T_s$. Cultural heterogeneity is caught by the precision of the signal the parent have about their children ability in the skilled sector $\sigma_\varepsilon^2$ and in the unskilled sector $\sigma_\delta^2$. The time line, the evolution of information sets and the decision tree is summarized in the following figure:

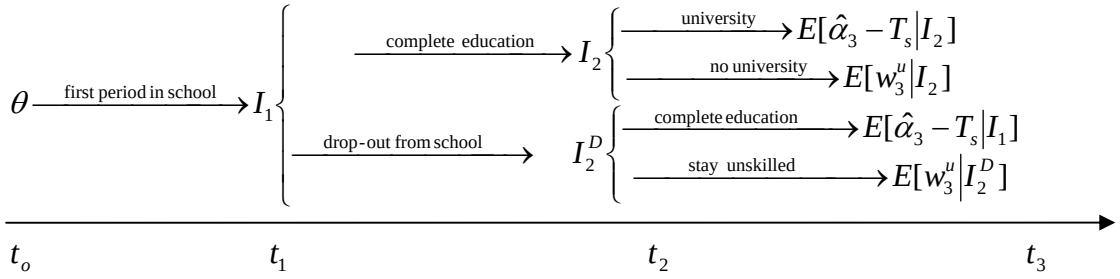


**Figure 1: Parental choice**

*3.1 Updating information about the child's abilities and opportunities*

The updating formulas are iteration on the conditional expectation operator where conditioning occurs on the signal recovered (this is a version of the Kalman Filter, see Sargent 1987, pp.230-231). Define the optimal weight parents give to signals at school as

(8) $$K_t = \frac{\Sigma_{t-1}}{\Sigma_{t-1} + \sigma_s^2}$$

Where $\Sigma_t = E(\alpha - \hat{\alpha}_t)^2$, therefore the updating formula on the child's ability during his school career under the assumption of the present model is given by

(9) $$\hat{\alpha}_t = (1 - K_t)\hat{\alpha}_{t-1} + K_t z_t$$

Notice that *K* is a measure for the relative precision of the signal at school relative to the precision of the signal that parents collect on their own.

Define the weight parents give to the signal about their child's opportunity in the unskilled labour market as

(10) $$H = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_\delta^2}$$

Notice that *H* is a measure for the relative precision of the signal in the unskilled labour market relative to the precision of the signal that parents have on their child's opportunities on the unskilled labour market. Notice that, since the child can only re-enter after one period out of school, we do not need for iterative formulas for updating signals on the unskilled labour market opportunities. Therefore the formula for the expected wage in the unskilled labour market is given by

(11) $$\hat{w} = E[w|\phi_1] = (1 - H)w_0 + H\phi_1 .$$

We are able now to compute expected benefits in both sectors conditional on the relevant information set.

Consider the expected productivity in the skilled sector after one year at school when the score $z_1$ is obtained :

(12) $$\begin{aligned} \hat{\alpha}_1 &= (1 - K_1)\hat{\alpha}_0 + K_1 z_1 \\ &= (1 - K_1)\theta + K_1 z_1 \end{aligned}$$

Where, $\hat{\alpha}_0 = \theta$, $\Sigma_0 = \sigma_\varepsilon^2$ and $K_1 = \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_s^2}$.

After two years of schooling the expected productivity in the skilled sector will be given by

(13) $$\hat{\alpha}_2 = (1-K_2)\hat{\alpha}_1 + K_2 z_2$$

Where $\Sigma_1 = E[\alpha - \hat{\alpha}_1]^2 = (1-K_1)^2\sigma_\varepsilon^2 + K_1^2\sigma_s^2$ and $K_2 = \dfrac{\Sigma_1}{\Sigma_1 + \sigma_s}$.

After one year at school (compulsory) the expected wage in the unskilled sector will be given the unconditional expectation $w_0$. After one period at school and one period out of school the expected productivity in the unskilled wage is given by

(14) $$\hat{w} = E[w|\phi_1] = (1-H)w_0 + H\phi_1$$

Having defined the information updating process for the decision maker we can solve now for the equilibrium choices.

*3.2 Equilibrium decision making about children's careers*

This is a sequential parental choice model about educational careers of children. Choice at each point in time is made optimally, in the light of the current information set, given choices made in the past. An equilibrium of the decision making problem will be a set of thresholds for the scores obtained at school and for the signals obtained conditional on being drop out defining, in period 1, the choice to withdraw the child from school and, in period 2, to enrol or not in the university conditional on being at school and to re-enter or not education provided one period was spent out of school. To obtain equilibrium decisions we work backward from the final period.

After two periods at school the child, by now a young man, has produced two signals $z_1$ and $z_2$ about his productivity in the skilled labour market and no signals on the unskilled labour market. Therefore[7] a university career will be chosen if

[7] Remember that after completing high school we assume that the choice between university and unskilled labour market becomes irreversible. This hypothesis is made mainly to simplify the model and is equivalent to make the cost of switching back to education after a certain age sufficiently large. However, the idea that irreversibility of choices about occupational careers is a realistic feature of the model. A less drastic assumption would give a longer horizon to agents maintaining the option to go back and forth different education choices for a larger number of periods at increasing costs, until it is no more worthwhile to gather information about different alternatives.

(15) $$\underbrace{\hat{\alpha}_3 w_s - T_s}_{\text{conditional expected productivity in the skilled labor market net of tuition fees}} \geq \underbrace{w_0}_{\text{unconditional expected productivity in the unskilled labor market}}$$

After some trivial algebra this can be written as

(16) $$(1-K_2)(1-K_1)\theta + K_1(1-K_2)z_1 + K_2 z_2 \geq \frac{w_o + T_s}{w_s}$$

Which gives the cut off value of $z_2, \tilde{z}_2(z_1)$ such that, for any value of $z_1$ consistent with continuation, if $z_2 > \tilde{z}_2(z_1)$ a university career leading to a skilled job will be chosen i.e.

(17) $$z_2 \geq \tilde{z}_2(.) = \frac{w_0 + T_s - (1-K_2)(1-K_1)\theta - K_1(1-K_2)z_1}{K_2 w_s}.$$

This characterizes family decisions in the third period as a function of the history of scores at school, their relative precision and other parameters of the model.

After the first period of schooling, i.e. conditioning on $z_1$ alone, with no discounting, the net benefits from continuation at school have to be traded off against benefits from switching to the alternative of dropping out. In the Appendix, using the iterated expectation law, we show that the choice of dropping out reduces to the following inequality

(18) $$\underbrace{\mathrm{E}[\hat{\alpha}_2 | I_1] w_s - T_s}_{\text{conditional expected productivity in the skilled labor market net of tuition fees}} \geq \underbrace{w_0}_{\text{unconditional expected productivity in the unskilled labor market}}$$

That is:

(19) $$[1 - K_1(1-K_2)]\theta + K_1(1-K_2)z_1 \geq \frac{w_0 + T_s}{w_s}$$

Therefore a parent will choose to have the child to continue in school for the second period if the signal in the first period is good enough

(20) $$z_1 \geq \tilde{z}_1(.) = \frac{w_0 + T_s}{K_1(1-K_2)w_s} - \frac{[1-(1-K_2)K_1]\theta}{K_1(1-K_2)}$$

and drop out otherwise. This characterize family decisions as a function of first period signal at school.

Finally we need to characterize the decision about re-entering school after one period out. To this aim we define the expected benefits for continuing in the unskilled labour market conditioned on two signals: $\phi_2$ ($z_1$ is assumed to be irrelevant to review priors about child's ability in the unskilled labour

markets) and the expected benefits from re-entry conditioning on $z_1$ alone (since $\phi_2$ is assumed to be irrelevant to assess opportunities in the skilled labour market). This latter is equal to the left hand side of equation (18). The former is given by:

$$V_2^R = (1-H)w_0 + H\phi_2 \tag{21}$$

Therefore re-entry will occur if and only if

$$(1-H)w_0 + H\phi_2 \leq \{[1-K_1(1-K_2)]\theta + K_1(1-K_2)z_1\}w_s - T_s \tag{22}$$

i.e.

$$\phi_2 \leq \tilde{\phi}_2(.) = \frac{\{[1-K_1(1-K_2)]\theta + K_1(1-K_2)z_1\}w_s - T_s - (1-H)w_0}{H} \tag{23}$$

At equilibrium, conditional on having dropped out of school, the probability of re-entry is negatively related to the signal parents obtain about the child's opportunities in the unskilled labour market. The intuition for the result is quite straightforward: the child is given a second chance at school if the signal about alternative opportunities is even worse than the signal obtained at school. What is of interests for the empirical part is the analysis of the determinants of the thresholds in equation (20) and (23).

*3.3 Comparative statics and predictions for the empirical results*

The main conclusion we draw from the theoretical framework described in the present section is that during school periods families *learn* about their child's talent in alternative occupations and *react* to this information in terms of education investments. We identifies a set of parameters that characterize the family's socio economic status as main determinants of drop-out behaviour. The model also shows that there is the possibility that parents may rationally decide to have their child return to school after spending a period outside as a reaction to new information about their kids talent. The next section will investigate whether this is empirically relevant and whether the determinants of dropping out and re-entry reflect the determinants highlighted in the model we presented. Importantly for the discussion of our empirical results we consider the comparative statics for the equilibrium threshold for dropping out of school and the equilibrium threshold for re-entry. Results can be stated about the effect of relative

precision of the signals in the parent's information sets, providing some characterization of the effect of cultural heterogeneity on educational choices.

Dropping out after the first period signal was characterized by the threshold $\tilde{z}_1(.)$ defined in eq. (20). By using the definition for $K_1$ and $K_2$, this latter expression can be rewritten as:

$$\tilde{z}_1(.) = \frac{w_0 + T_s}{w_s} + (1 + \frac{\sigma_s^2}{\sigma_\varepsilon^2})(\frac{w_0 + T_s}{w_s} - \theta) \tag{24}$$

We immediately obtain the following comparative statics results:

$$\frac{\partial \tilde{z}_1(.)}{\partial w_s} < 0, \quad \frac{\partial \tilde{z}_1(.)}{\partial w_0} > 0, \quad \frac{\partial \tilde{z}_1(.)}{\partial T_s} > 0, \quad \frac{\partial \tilde{z}_1(.)}{\partial \theta} < 0. \tag{25}$$

A larger perceived skill premium (larger $w_s$ or lower $w_0$) intuitively make families' choice less selective, reducing the threshold and allowing their kids to continue even in the faces of a bad school grading[8]. Larger opportunity costs $T_s$ make families more selective and increase the probability of school abandonment. A larger $\theta$ i.e. a better prior about the child's talents in the skilled sector makes families less selective and reduces the probability of dropping out.

Those results are quite intuitive and will be used extensively in the interpretation of our empirical results. More subtle and interesting issues arise when it comes to the results about $\sigma_\varepsilon$ and $\sigma_s$. Remember that $\sigma_\varepsilon$ is the (inverse) precision of the family in assessing the kid's talents and perspectives in the skilled labour market, whereas $\sigma_s$ is the (inverse) precision parents attach on the school grading process in the assessment of the same index.

Define $\rho = \frac{\sigma_s^2}{\sigma_\varepsilon^2}$ as a measure for the relative weight parents assign to the first period signal at school, given the option to recover a second signal at school relative to the prior. It is a measure of the cultural

[8] Though intuitive, this results is interesting: raising trends (as recently observed in Oecd countries) in the skill premiums induce families to be more pushy in the career choice of their kids diluting talent allocation in the skilled sector, see D'Amato and Mookherjee, (2007).

confidence of parents have in making their decision based on the public assessment at school relative to their private assessment. We obtain

$$(25) \qquad \frac{\partial \tilde{z}_1(.)}{\partial \rho} = \frac{w_0 + T_s}{w_s} - \theta$$

Therefore the derivative above is signed according to the sign of $w_0 + T_s - \theta w_s$, i.e. the effect of the relative precision of the signals depends on parameters configuration. To interpret the result above notice that $w_0 + T_s < \theta w_s$ implies that from the point of view of the family it is *ex-ante efficient* [9] to send the child to school (remember that $\theta$ is an unbiased estimate for $\alpha$). As a consequence the model predicts that, ceteris paribus (i.e. with given perceived skill premiums and opportunity costs of education), families with larger cultural capacity (larger $\rho$) will be less selective with respect to kids for whom education is ex ante efficient (assessment based on $\theta$). In other words dropping-out from school is less likely to occur in more educated families, conditional on the kid's talent being ex-ante assessed valuable for a skilled occupation[10]. Also notice that for given $\theta$ and perceived skill premium, the larger the opportunity cost of education the more selective is the family.[11]

Therefore both the quality of the public signal (lower quality of the grading process at school z) and the private one (quality of the parental assessment $\theta$) affect drop-out rates. Summarizing, the implication of the model for our empirical specification of the probability of dropping out of school is that both the impact of school quality and the impact of parental cultural capacity has a non linear effect on drop-out rates, interestingly the model captures different channels through which the family cultural capacity and the family economic capacity influence the education investment decision. This feature will allow us to introduce parental education level and measures of families permanent income as different determinants of the investment choice.

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[9] With risk neutrality sending the kid to school is ex-ante efficient when, conditioning on the prior information $\theta$, the expected return of education is above its opportunity costs (equal to the sum of direct education costs and foregone returns in the alternative occupation).

[10] One implication of the model is that less precise school signals (larger $\sigma_s$) make families less strict and dilutes the ability level of kids continuing education.

[11] Importantly notice that in a more imperfect (less intergenerationally mobile) world than the one considered in the model kids in educated families would have better perspectives in the skilled sector, ex ante and independently of their school attainment, due for example to inheritance of (skilled) jobs. In the terms of our model we can capture this effect by noticing in more educated families kids would start their school career with a larger $\theta$: the effect of cultural capacity would reinforce the standard economic argument based on wealth constraint: the sign of equation (25) is more likely to be negative in more educated families, i.e. given $z_1$ kids in more educated families would be less likely to drop out.

As for the decision of re-entry after a period out of school was characterized by the threshold in eq. (23). Straightforward algebra shows that

(26) $$\frac{\partial \tilde{\phi}_2(.)}{\partial w_0} < 0, \quad \frac{\partial \tilde{\phi}_2(.)}{\partial T_s} < 0, \quad \frac{\partial \tilde{\phi}_2(.)}{\partial \theta} > 0, \quad \frac{\partial \tilde{\phi}_2(.)}{\partial z_1} > 0.$$

In words, re-entry is less likely when the family expects to face a better opportunity in the unskilled labour market (larger $w_0$) and larger opportunity costs of education (larger $T_s$). A larger prior about the child's opportunity on the skilled market ($\theta$) and a better grade $z_1$ in the first period at school increase the probability of re-entry. One conclusion so far is that children from richer families are more likely to re-enter conditional on drop-out.

This conclusion is reinforced when we consider the comparative statics with respect to the precision of the signals. To compute $\frac{\partial \tilde{\phi}_2(.)}{\partial H}$ rewrite equation (23) using the definition of $\tilde{z}_1$ from equation (20), we get:

(26) $$\tilde{\phi}_2(.) = w_0 + (z_1 - \tilde{z}_1) w_s \frac{K_1(1-K_2)}{H}$$

evaluated at $z_1 \leq \tilde{z}_1(.)$. Since *H* does not enter into (20) we get

(27) $$\frac{\partial \tilde{\phi}_2(.)}{\partial H} > 0$$

Remember that by equation (10), *H* measures the relative weight placed on the signal received about perspectives on the unskilled labour market relative to the weight placed on the prior by each family. To derive empirical predictions from this latter comparative statics result consider that in the case of opportunities in the unskilled market, the weight put on the prior (relative to a signal) is likely to be larger for a parent working in the unskilled sector: there is less to learn about the perspective of his child in the unskilled labour market for an unskilled worker than for a skilled one. We can conclude that, conditional on school abandonment, the probability to decide for re-entry is larger for skilled families than for unskilled ones. In a specific sense the link between parental status and children's educational choice exhibit persistence driven not only by wealth constraints and financial market imperfections (larger opportunity costs of education in less well to do families) but also by cultural and

social ability of different families to process signals about their children's abilities in two alternative occupations[12].

Summarizing, in this section we have laid out a simple model of parental decision making about schooling career when the process involves learning about the children's abilities and job opportunities in two alternative occupations (skilled and unskilled). The model shows that cultural capacity and economic status of the family affect the probability of being a drop out, along with traditional determinants such as the skill premium perceived by the decision maker. In adherence with the aim of the empirical analysis the model also shows that conditional on being a drop out the probability of returning back to school is affected by the same variables in an intuitive way. With this theoretical framework in mind we now move to the empirical analysis.

[12] As already noticed this does not mean that persistence is rooted on efficiency grounds in our model. Of course, along with financial market imperfections, cultural bias and other forms of intergenerational persistence of job allocation may have important social costs when we consider the problem of allocating talent to jobs. We do not address this point here.

### *4. Empirical Analysis: data and descriptive statistics*

On the basis of the theoretical model and general considerations offered on the likely causes of dropping out behaviour offered above, in this section we report the results of estimating an empirical model of school-leaving and permanent dropping out behaviour amongst young people from Salerno and province.

Data used in our analysis are drawn from a survey carried out in 2004 by CELPE (Centro Interdipartimentale di Economia del Lavoro e di Politica Economica, University of Salerno) on behalf of the Province of Salerno, and supplemented in 2005. The aim was to better understand the magnitude and determinants of the upper secondary school dropout phenomenon in the province of Salerno of those aged 15-18.

Table 4 reports some information, provided by the local CSA (Centro per i Servizi Amministrativi di Salerno), on the distribution of enrollment in the high secondary public school in the Province during the schooling year 2003-2004.

**Table 4: Number of enrolled in the school and students interviewed in the survey**

| Type of school | Number of enrolled | Enrolled(%) | Number of schools in the sample | Number of students interviewed |
|---|---|---|---|---|
| Scientific | 15000 | 23.2 | 5 | 135 |
| Vocational | 13100 | 20.3 | 4 | 125 |
| Technical- commercial | 11000 | 17.1 | 4 | 104 |
| Technical- industrial | 8.000 | 12.4 | 3 | 60 |
| Classical | 6000 | 9.3 | 2 | 56 |
| Psycho-pedagogical | 6000 | 9.3 | 2 | 56 |
| Others (ITG,LL,IA) | 5400 | 8.4 | 1 | 57 |
| Total | 64500 | 100 | 21 | 593 |

On the basis of this distribution of the students population we built up the sample. As regards students regularly attending school, we employed a two stage procedure in which first of all we extracted 21 of the total of 85 schools in the province. The schools sample has been chosen also taking

into account the 8 sub-areas(Costiera amalfitana, Agro-nocerino, Salerno, Valle dell'Irno, Piana del Sele, Alta Valle del Sele, Vallo di Diano, Cilento) in which the very wide provincial area can be divided. Secondly around 600 students were randomly drawn from the 21 schools' records.

As far as concerns individuals who has been considered as dropout by their school, the list of names was provided by the local CSA and contained information on around 900 individuals born between 1987 and 1989 inclusive. From these, 178 individuals were interviewed in June/July 2004 (126 "permanent" drop-outs and 52 "returnees")[13]. In early 2005, a refreshment sample of dropouts was added through renewed requests for dropout lists from all the schools and further attempts were made to contact the members of this enlarged group of dropouts (1326 as opposed to 900) including also dropouts born in 1990.

To summarize, the final sample consists of 918 individuals, 593 of which are students, 206 were permanent dropouts and 123 returnees. For the three groups in the sample, the distribution by gender and type of school has been reported in Table 5.

**Table 5: Sample characteristics by gender and type of initial school**

| | Dropout | Dropout re-entered in the school/ training system | Students |
|---|---|---|---|
| Sample Characteristics | n=206 | n=123 | n=593 |
| | | | |
| % females | 40,8 | 37,4 | 43,7 |
| % males | 59,2 | 62,6 | 56,3 |
| Total | 100 | 100 | 100 |
| | | | |
| Type of school (%) | | | |
| Liceo Classico or Artistico /Classical or Arts | 2,4 | 16,4 | 9,4 |
| Liceo Scientifico/ Scientific | 1,6 | 2,7 | 22,8 |
| Istituto Tecnico /Technical | 46,0 | 51,8 | 37,3 |
| Istituto Professionale/ Vocational | 23,8 | 25,5 | 21,1 |
| Liceo Psicopedagogico/ Psycho-pedagogical | 7,9 | 3,6 | 9,4 |
| Scuola media inferiore / Lower secondary school** | 18,3 | - | - |
| Total | 100 | 100 | 100 |

[13] The questionnaires for students and dropouts can be found at www.unisa.it/CELPE

**Source:** Saleno Province Dropout Survey

From Table 5 it is possible to observe that, even if women are slightly under-sampled, the dropout rate among women is lower than that among men of about 20%. As regards the rate of return to the school/training system, the percentage of girls is much lower than that of boys amongst the returnees implying that after having dropped out of school, a girl has a lower probability than a boy of re-entering the school/training system. This could be due to female decision taking, more secure and mature, or to the lower pressure made by the family and the social environment behaviour after the dropout decision.

About 32% of the students' sample attends classical or scientific studies while about 58% attend technical or vocational studies, the remaining 9% psycho-pedagogical studies. This distribution is in line with the national one but it is interesting here to observe that the rate of the enrolled to scientific studies at the provincial level is higher than that existent at the national level (24.6% vs 20.8%) while the rate of the enrolled both to technical and vocational studies is lower (respectively 33.3% vs 35.9% and 19.9% vs 21.8%) according to the data provided by the Ministry of Education for the schooling year 2004-05.

The sample underlines the key role played by the technical and vocational schools. With 37% and 21% respectively of students who regularly attend school, these types of school produce respectively the 46% and the 24% of dropouts and the 51% and 25% of dropouts re-entering the school/training system. From this rough information emerges that the difficulties found in the schooling careers and the dropout phenomenon root deeply in these type of school, confirming that in Italy, behind the choice of the type of school to attend at the age of 14, there are problems of social self-selection and intergenerational status transfers as emerges from previous papers by Checchi an Zollino (2001) and Checchi and Flabbi(2006).

### *5. Empirical Analysis: Model and Results*

The theoretical model considered above leads fairly naturally to the implementation of a selected bivariate probit model which implies normality in the error terms and allows for correlation between the decisions to leave school initially and to permanently dropout.

Specifically, the underlying two equation latent variable model is:

(30) $L^* = X_1\beta_1 + \varepsilon_1$ $\quad\quad$ $\varepsilon_1 \sim N(0,1)$

and, iff L*>0

(31) $D^* = X_2\beta_2 + \varepsilon_2$ $\quad\quad$ $\varepsilon_2 \sim N(0,1)$

with observed variables representing respectively:

leaving school - L = 1, iff L*>0 , L = 0 otherwise;

and, permanently dropping out: D = 1, iff D*>0, D=0 otherwise.

With correlation, $\rho_{12}$, between the two error terms.

Essentially equations (30) and (31) can be thought of as the empirical counterparts of the thresholds (with changed sign) given by equations (and expressed in logarithms).

Given the correspondence, both equations contain a similar set of explanatory variables. Variables are introduced to control separately for family (permanent) income and parental education, personal characteristics, early experiences, school 'characteristics' which include variables covering some of young people's experiences at school, the area in which the school is located to control for local labour market factors and, for the school-leavers, variables for the reasons given for dropping out are also included. Identification requires that at least one variable is included in (30) which is not in (31). This is achieved by the alternation of the variables representing parental education in the two equations and the exclusion of parental working status in equation (2). These exclusions were derived from single equation probits of the two decisions with a full set of explanatory variables. All continuous variables are included in natural logarithms.

The results are presented in table 6. Looking first at the school-leaving equation, as on would expect (and as predicted by the theoretical model) family permanent income is negatively correlated with

initial school-leaving. Several variables were included to capture this: living in an owner occupied home, the number of 'domestic appliances' (broadly defined) in the home, parental employment, and (inversely) the number of family member (parents plus children). Although not always statistically significant, these are correctly signed. One curiosity is the positive coefficient on the 'mother working' dummy. Note that this is measuring the difference is picking up the effect of only the mother working (since 'both parents working' is also included).

Parental education is also, net of the effect of family permanent income as measured here, is also important. Specifically, higher levels of mothers' education is negatively associated with school leaving. Two possibly connected reasons can be offered for the inclusion of mother's, rather than father's, education. First, mother's education is more clearly associated with school-leaving[14] than is father's education, and, second, mother's education is likely to be less closely related to family income. This could be interpreted in terms of the 'precision' effect on the initial school signal.

As regards individual characteristics, it is curious that being male has a negative coefficient albeit not statistically significant, since a much higher proportion of young males leave school than young females. In line with findings in the literature, being the first born is negatively correlated with leaving school. Youthful obesity is clearly positively correlated with school leaving[15]. Parental attention to children is negatively associated with school leaving although again this is not statistically significant, as is the variable indicating whether the person had private lessons while at school – this may be explained by the likely duality in the motivation. On the one hand, children are more likely to have private lessons if their parents care more about their performance at school. On the other, private lessons are also likely to be associated with poor performance at school.

[14] See the single (full) probit estimations reported in the appendix.

[15] The objection might be raised here concerning possibly endogeneity of obesity. Young people leaving school may become depressed etc.. and so obese. We would argue that this is unlikely to be the case – one does not become obese overnight and secondly tests of the issue in a companion paper suggest this not to be the case.

**Table 6: Bivariate Probit Model of school leaving and permanent dropping out (non-return).**

| | School leaving n = 921 | | Permanent dropout n = 328 | |
|---|---|---|---|---|
| | Coefficient | Std error | Coefficient | Std error |
| ***Family Income*** | | | | |
| Own Home | -.19 | .14 | .26 | .20 |
| Log (n. HH members) | .21 | .25 | .49 | .39 |
| Log (n. electrodometici) | -.86*** | .24 | -.66 | .45 |
| Pa works | -.27 | .23 | - | |
| Ma works | .53 | .32 | - | |
| Pa & Ma work | -.40 | .34 | - | |
| Both parents home | .16 | .23 | .31 | .30 |
| ***Parental education*** | | | | |
| Dad | | | | |
| - incomplete secondary (incl. prof. qual.) | - | | -.42* | .22 |
| - complete secondary or tertiary | - | | -.57* | .34 |
| Mum | | | | |
| - incomplete secondary (incl. prof. qual.) | -.32** | .15 | - | |
| - complete secondary or tertiary | -.41** | .17 | - | |
| ***Personal Char.s*** | | | | |
| Male | -.17 | .12 | .05 | .18 |
| First born | -.21* | .12 | -.22 | .20 |
| Smoker | .02 | .14 | .47** | .22 |
| Obese | .43** | .18 | 1.02 | .31 |
| Log(n. of things had to renounce for lack of money) | -.03*** | .01 | .02 | .02 |
| ***Family background*** | | | | |
| Parents read to me | -.32 | .22 | .58 | .47 |
| Parents helped with homework | -.03 | .14 | .41* | .24 |
| ***School char.s*** | | | | |
| Failed a year | 1.80*** | .13 | -.93** | .38 |
| Discontinuous attendance | .58*** | .17 | .36 | .24 |
| Had private lessons | -.19 | .13 | -.12 | .20 |
| Liceo (classical or scientific) | -.64*** | .18 | -.52 | .53 |
| *Area of school* | | | | |
| - Costiera amalfitana | 1.04*** | .22 | -.38 | .30 |
| - Salerno | .54*** | .16 | -1.16*** | .25 |
| - Piana del sele | .05 | .20 | -.41 | .31 |
| - Vallo del Diano | .24 | .21 | -.81** | .33 |
| - Cilento | .38 | .21 | -.44 | .31 |
| *Reasons for dropout* | | | | |
| - Cost | | | .60 | .53 |
| - Mismatch | | | 1.27*** | .25 |
| | | | | |
| ρ | -.72 (.35) | | | |

**Note:** Statistical siginificance indicated by *** (p<1%), ** (p<5%), * (p<10%) respectively

Turning to experiences at school, it will be observed that failing a year is by far the most important variable in equation (30). It is very strongly related to school leaving and is highly statistically significant. This variable may be related to academic ability but also to the specific relationship the student has to a specific school. This is returned to below. Also discontinuous attendance is important in determining initial school leaving. This may indicate in part relatively low ability and/or low utility value of school.

Other explanatory variables include a variable intended as an inverse indicator of personal income, given by the number of specific items individuals responded that they had had to renounce for lack of funds – negatively related to initial school leaving, suggesting that personal income is positively related initial school leaving[16], dummy variables for local area intended to capture principally local labour market conditions and a variable indicating attendance at a (Classical or Scientific) Liceo which has a negative influence on initial school leaving.

Thus far, more or less the results conform to fairly standard expectations, however, some interesting patterns emerge when one turns to look at permanent dropping out vs. re-entry to school. In particular, **failing a year is negatively related to permanent drop out**. This may be interpreted in terms of a mismatch between schools and individuals. In reality, the theoretical model as it stands does not provide a very convincing explanation for this, precisely because the emphasis here is on the choice between levels of schooling rather than the relationship between individuals and specific schools. Differences in the equations (30) and (31) are strictly related to the labour market signal or more explicitly the degree to which the labour market signal $\phi$ differs from the 'average' wage $w_0$ (together with the relative precision of the signal, H). Thus, we would interpret this finding as indicating that adolescents are more likely to become discouraged and leave the school they are attending if they fail a year, but that this may or may not be directly related to their academic ability per se. To the extent that they may realise once on the labour market that actually that the problem lay with the school, as opposed to schools as a whole, they are ceteris paribus more likely to return to a different (type of) school, more adapted to their aptitudes.

A similar observation may be made with regard to the area in which the young person is located, although in this case it is more natural to interpret the results in line with the theoretical model. Specifically, those attending schools in Salerno are both more likely to leave school and also to return subsequently. This may reflect the greater range of schools available in Salerno city, in an analogous

[16] One may note then that this implies that higher personal income, in contrast to family income, leads to a greater tendency to leave school ceteris paribus. One would not want to put too much emphasis on this variable given its likely endogeneity.

way to the interpretation offered for failing a year, however it may also be due to the impact of labour market factors specific to the local area. In the 'permanent dropout' equation, variables were added to reflect the reasons given for leaving school in the first place[17]. These support the idea of a mismatch having an important role to play[18].

All in all, the theoretical model gives us a framework for interpreting the results particulalrly regarding the family income and culture variables, however, clearly the empiraical results suggest strongly that the model needs to incorporate also school specific effects.

[17] In practice, upto three reasons could be given, in order of importance. The dummy variables included here comprise all those giving each response at least once and therefore are not mutually exclusive.

[18] It might be added that also "labour market" motives were clearly very important, so much so that they perfectly predict permanent dropout and so their effect is not identified in this model and so were reluctantly excluded.

## *5. Conclusions*

Dropping out of school is at the centre of current debates in the EU concerning long growth and competitiveness. This paper has proposed a theoretical model and empirical analysis aimed at throwing greater light on this phenomena in Southern Italy.

In both theoretical model and empirical application, a two-stage decision process is hypothesised in line with observed behaviour which shows that many young people 'dropout' of school only to return subsequently. Such behaviour is not compatible with a standard full information human capital model.

The findings confirm the role of both economic and cultural capacity of the family of origin in shaping observed choices about drop-out and return to school by individuals in our sample. Interestingly we find that whilst poor performance at, and low attachment to, school – measured by repetition of the school year through end of year failure and attendance records - is a key determinant of initial dropping out, the former is also strongly positively associated with a subsequent return to education. An important implication of this finding is that "initial" dropping out behaviour is often determined by a mismatch between school and student rather than poor performance per se. The answer to the question in the title of this paper, interpreted in its normative sense, therefore is no: the process of allocation of talents to school tracks is subject to many trial errors and revisions by families and many of those who live school return to it. The point is whether this process of allocation of talents to school tracks is efficient and whether we should see review of family decisions as the natural outcome of the learning process. Specifically is return to school an indicator of allocative inefficiency? It is argued there that much depends on the determinants of school re-entry behaviour. We do not address normative aspects in the model (indeed every family equilibrium decision is individually rational, conditional on the information set they act upon so that the allocation of the child to the school track is interim Pareto-efficient) and can only base our judgment on suggestive empirical evidence. This latter however allow us to shape a judgment on this issue: a policy maker should not necessarily be happy after observing a large fraction of students return to school after a period out. Since cultural and economic capacity matter a lot for the actual review of the decision, the comparison of students' irregular careers among different education systems (across regions or across countries) should be used as an indication of the social cost of the mistakes associated to irregular careers. Moreover since there is evidence of a role for the mismatch between a child and the school in influencing the decision, indicators of irregular careers should be adopted by decision maker to assess the quality of education provision by public agencies and to allocate public resources in this area. Clearly further work is

needed on this point to assess public school intervention in education and to a more effective policy design.

In line with the Lisbon Strategy, in the last decade the Italian authorities have built up a complex institutional networking system aimed at reducing school drop out and increasing the duration of educational participation. Our findings, suggest that students' decision as whether to leave education definitively or to return back after a period in the 'real world' is also due to an information gathering process by parents about children's attitudes, expected wages in the unskilled market and school quality. In other words, to maximize the investment on education parents need to evaluate their options, in terms of the child's educational choices, on the basis of economic criteria. However, given that information is imperfect and costly to improve, mistakes are made and additional information collected may cause parents to revise their previous decisions. Consequently, one policy implication of our analysis is that efforts should be made to reduce these information costs. To help children make their best education and training choice, educational guidance and counselling services from primary school onward should be implemented. Programmes of career guidance –career orientation, academic and occupational orientation with high and post-secondary schooling, work-based learning and skills development- should enhance the capacity to evaluate work opportunities. In association with the reorganization of the vocational education and training system, this is likely to reduce the gap between formal education and training and the world of work. Ensuring school quality calls for a broader education system reform encompassing school structure, academic organization and social organization.

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**Appendix 1**

Here we show that after the first period of schooling, i.e. conditioning on $z_1$ alone and given that parents rationally anticipate $\tilde{z}_2$ and $\tilde{\phi}_2$, with no discounting, the choice between going on and dropping out is as given in the text.

The expected benefits from continuation at school is given by

$$V_2^s = \underbrace{[1 - F(\tilde{z}_2)]\{\mathrm{E}[\hat{\alpha}_2|\hat{\alpha}_1]w_s - T_s\}}_{\substack{\text{expected benefits from continuing at school} \\ \text{given success in the second period}}} + \underbrace{F(\tilde{z}_2)\mathrm{E}[w^u|z_1]}_{\substack{\text{expected benefits from continuing in the} \\ \text{at school given failure second period}}}$$

$$= [1 - F(\tilde{z}_2)]\{\mathrm{E}[\hat{\alpha}_2|\hat{\alpha}_1]w_s - T_s\} + F(\tilde{z}_2)w_0$$

The expected benefits from dropping out is given by

$$V_2^d = F(\tilde{\phi}_2)\underbrace{\{[1 - F(\tilde{z}_2)]\{\mathrm{E}[\hat{\alpha}_2|\hat{\alpha}_1]w_s - T_s\} + F(\tilde{z}_2)\mathrm{E}[w^u|z_1]\}}_{\substack{\text{expected benefits from dropping out} \\ \text{given re-entry in the future}}} + \underbrace{[1 - F(\tilde{\phi}_2)]\mathrm{E}[w^u|z_1]}_{\substack{\text{expected benefits from dropping out} \\ \text{given no re-entry in the future}}}$$

$$= F(\tilde{\phi}_2)\{[1 - F(\tilde{z}_2)]\{\mathrm{E}[\hat{\alpha}_2|\hat{\alpha}_1]w_s - T_s\} + F(\tilde{z}_2)w_0\} + [1 - F(\tilde{\phi}_2)]w_0$$

Simple algebra shows that the equilibrium choice satisfies

$$V_2^s \geq V_2^d$$

whenever

$$\mathrm{E}[\hat{\alpha}_2|\hat{\alpha}_1]w_s - T_s \geq w_0$$

That is:

$$[1 - K_1(1 - K_2)]\theta + K_1(1 - K_2)z_1 \geq \frac{w_0 + T_s}{w_s}$$

equivalently

$$z_1 \geq \tilde{z}_1(.)$$

Characterizes equilibrium parental choice conditional on $z_1$.

## Appendix 2: Single Equations – Full model

```
Probit regression, reporting marginal effects    Number of obs =    921
                                                 LR chi2(27)   = 582.24
                                                 Prob > chi2   = 0.0000
Log likelihood = -308.59993                      Pseudo R2     = 0.4854

------------------------------------------------------------------------------
schlve07 |      dF/dx   Std. Err.      z    P>|z|     x-bar
---------+--------------------------------------------------------------------
 ownhome*|  -.0690655   .0492377    -1.44   0.150   .786102
 lnncomp |    .088248   .0878307     1.00   0.315   1.47903
 lnnumed |  -.2804267   .0819017    -3.43   0.001    2.6677
  pawork*|  -.0897385   .0873187    -1.07   0.284   .884908
  mawork*|   .2231802   .1146163     1.96   0.050   .390879
pamawork*|  -.1388759   .1069269    -1.23   0.218   .343105
pamahome*|    .065327   .0694268     0.89   0.374   .904452
pa_med~f*|   .0538636   .0555213     0.97   0.332   .478827
pa_mat~u*|  -.1243834   .0644396    -1.82   0.068   .320304
ma_med~f*|  -.1303341   .0538004    -2.38   0.017   .461455
ma_mat~u*|  -.0898757    .063176    -1.39   0.166   .358306
 maschio*|   -.051588   .0417058    -1.24   0.214   .578719
primogen*|  -.0790759   .0396637    -1.95   0.051   .380022
  smoker*|   .0181167   .0470944     0.39   0.698   .245385
 obese07*|   .1547613   .0701785     2.33   0.020   .114007
 genlegg*|  -.0851051   .0659459    -1.19   0.235   .081433
 genaiut*|  -.0164075   .0485876    -0.33   0.738   .214984
 lezpdum*|  -.0528894   .0424367    -1.23   0.220   .340934
bocciato*|   .6148393   .0352002    14.60   0.000    .34202
freqdisc*|   .1997446    .069027     3.06   0.002   .122693
lnrinadj |  -.0096532   .0038889    -2.48   0.013  -4.16175
ist_li~l*|  -.1667464   .0500288    -2.89   0.004   .224756
area_c~o*|   .1314698   .0804828     1.72   0.085   .081433
area_d~o*|   .0660088   .0783257     0.87   0.383    .09772
area_p~e*|   .0139243   .0698455     0.20   0.841    .12595
area_s~o*|   .2038321   .0571584     3.67   0.000   .302932
area_a~i*|   .3943235   .0829335     4.62   0.000   .087948
---------+--------------------------------------------------------------------
  obs. P |   .3561346
 pred. P |   .2825216  (at x-bar)
------------------------------------------------------------------------------
```

```
Probit regression, reporting marginal effects    Number of obs =    328
                                                 LR chi2(29)   = 155.36
                                                 Prob > chi2   = 0.0000
Log likelihood = -131.55466                      Pseudo R2     = 0.3713

------------------------------------------------------------------------------
      dropt07 |      dF/dx   Std. Err.      z    P>|z|     x-bar
--------------+---------------------------------------------------------------
     ownhome*|   .0821493   .0750974     1.13   0.259   .743902
     lnncomp |   .1601133   .1356933     1.18   0.237   1.50092
     lnnumed |   -.318363   .1182302    -2.67   0.008   2.58494
      pawork*|  -.0509567   .1004397    -0.49   0.626    .82622
      mawork*|  -.0794986    .150099    -0.54   0.590   .365854
    pamawork*|  -.0340214   .1619848    -0.21   0.831   .283537
    pamahome*|   .1270621   .1241033     1.09   0.276   .881098
    pa_med~f*|  -.1544148   .0705215    -2.11   0.035   .554878
    pa_mat~u*|  -.2006219    .151845    -1.43   0.152   .106707
    ma_med~f*|  -.0363471   .0743324    -0.49   0.625   .496951
    ma_mat~u*|  -.1253307    .106145    -1.24   0.213   .192073
     maschio*|  -.0100697   .0630671    -0.16   0.873   .606707
    primogen*|  -.1189021   .0693629    -1.77   0.077   .307927
      smoker*|   .1772063     .05688     2.78   0.005   .304878
     obese07*|    .271089   .0443661     4.19   0.000   .170732
     genlegg*|   .1671572   .0898765     1.29   0.196   .039634
     genaiut*|   .1134103    .069153     1.45   0.147   .161585
     lezpdum*|  -.0694283   .0724161    -0.99   0.324   .265244
    bocciato*|  -.0820695    .064584    -1.19   0.233   .765244
    freqdisc*|   .1586499   .0581064     2.39   0.017       .25
    lnrinadj |   .0036063   .0059073     0.61   0.542  -4.41903
    ist_li~l*|  -.3576712   .1762347    -2.09   0.036    .04878
    area_c~o*|  -.1062299   .1250359    -0.90   0.367   .097561
    area_d~o*|  -.3027367    .144665    -2.22   0.027   .088415
    area_p~e*|  -.1457062   .1298496    -1.20   0.230   .131098
    area_s~o*|  -.3841608   .0965743    -4.02   0.000   .301829
    area_a~i*|  -.0472962   .1028522    -0.47   0.636   .170732
    motiv~to*|   .1613195   .1046533     1.10   0.273   .033537
    moti~tch*|   .3402928    .045119     5.28   0.000   .277439
-------------+----------------------------------------------------------------
      obs. P |   .6646341
     pred. P |   .7529792  (at x-bar)
------------------------------------------------------------------------------
(*) dF/dx is for discrete change of dummy variable from 0 to 1
    z and P>|z| correspond to the test of the underlying coefficient being 0
```