University education in Italy†

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Abstract

Notwithstanding the low level of tuition fees and absence of other access barriers, Italy is characterised by low educational achievement at university level. We investigate possible reasons for this apparent puzzle and propose a formal model predicting that families invest more in their children the higher are (the expectations on) child's unobservable "ability". Since family income provides an incentive for better student performance, richer parents internalise this effect by investing more resources in the education of their children. Our empirical analysis does not contradict this theoretical model. Using the Bank of Italy's representative sample of the Italian population (1995), we observe that family income does not prevent enrolment at the university, whereas unobservable "ability" (proxied by cultural family background) is more relevant, especially as it shapes the secondary education choices. Using administrative data on students enrolled in some faculties of the State University of Milan in 1995-96, we show that students' performance is positively correlated with unobservable "ability" (proxied here by the marks obtained on leaving secondary school) and with family income. We take this last evidence as supporting the idea of family networking: students from richer families tend to go quicker because they have better prospects when they leave university.

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1. Introduction

When compared to other OECD countries, Italy is characterised by low investment in higher education.[1] While the ratio of tertiary graduates in university programmes to population at the typical age of graduation was 10.6% in Italy (1994 – entire population), the corresponding figure was 12.6% for Germany, 13.7% for France, 27.0% for the United Kingdom and 31.8 for the United States. If we adopt a larger definition of tertiary education (ranging from non-university tertiary programmes to Ph.D. programmes), matters are even worse: 22.2% for Italy compares with 24.8% for Germany, 44.4% for France, 61.1% for the United Kingdom and 65.6% for the United States.[2]

Various explanations can be put forward to explain these differences. The most intuitive one is the different stage of development. If higher education can be considered as a consumption good providing social status (as in Fersham et alt. 1996), then variations in gross domestic product per capita could account for differences in graduation rates. However, output differences are not so pronounced and country ranking correlation according the two variables is extremely low.[3] Thinking of education as a vertically integrated process, we could suspect that educational achievement is already lower at secondary level. The ratio of upper secondary graduates to corresponding population was 76.2% in Italy (1994 – entire population), and has to be contrasted with 73.6% for the United States, 88.5% for Germany and 80.8% for France.[4] Thus potential bottlenecks due to shortage of secondary school graduates cannot be invoked as a possible reason for low enrolment rates in Italian universities.

Leaving aside any explanation based on access barriers due to high admission fees, because Italian public universities charge very low fees (the Italian average in 1996 was 600 euros),[5] then we wonder about the relative returns to higher education. When compared to other OECD countries, the relative earnings of an Italian college graduate are rather low. Taking the earnings of an upper secondary graduate as a reference point (100), an Italian college graduate earns 141 if a man (112 if a woman). Corresponding figures are 187 (165) for France, 167 (162) for Germany, 164 (204) for the United Kingdom, and 168 (175) for the United States. Prima facie, low returns to education could represent a possible explanation of lower enrolment rates in Italy: even if attending a university course is relatively cheap, the expected future gain falls short of current costs, and families do not send their offspring to colleges. Though easy, this explanation neglects idiosyncratic differences among families. What are the salient characteristics of the population excluded from university education ? does it constitute a random sample of the entire population ? Since the answer is obviously negative, we are interested in studying the determinants at individual level of the choice of attending and completing a university course in Italy.

The present paper focuses on these questions: in a context of cheap access to and low returns for university education, what does govern the educational choices of Italian families ? We will show that human capital investment theory is not contradicted by our data: families plan the educational career of their children starting from the choice of secondary school, but their investment in higher education is more likely to be successful the higher the child's (perceived) ability. The paper is organised as follows. In section 2 we propose a standard model of human capital investment with liquidity constraints, that formalises the idea that families invest in children's education whenever the

[1] An account of the Italian educational system is in Brunello-Comi-Lucifora 1999.

[2] Data from OECD 1966 (Table R 12.1, p.181).

[3] The Spearman rank correlation coefficient between tertiary education enrolment and output per capita (converted in US 1987 dollars) for OECD countries in 1995 is equal to 0.28 (22 observations). Italian output per capita (15392 US dollars) is lower than US (20716) and France (18068), but exceeds UK (13444) (source: World Bank tables).

[4] Data from OECD 1966 (Table R 11.1, p.175).

[5] Table 1 in Brunello et alt. 1999. A broader discussion of (higher) education financing of Italy, contrasted with the US system, is in Checchi et alt. 1999.

child's expected ability is above a specified threshold. In section 3 we make use of a representative sample of the Italian population to estimate the determinants of sending a child to college. In section 4 we make use of another sample of administrative data on students from a specific university to estimate the determinants of their academic career. Section 5 concludes the paper.

2. A formal model of educational investment

Let us now introduce a formal model to study the interaction between the investment in children's education by parents and school performance by children. The model is intended to be applicable to the final stages of education, where individual students bear some responsibility in their performance (like going to college and obtaining a degree). We cast the choice in a single period framework, but extensions to overlapping generation contexts are straightforward.

Consider an altruistic parent that has to allocate part of her current income between consumption and investment in her child's education. Raising the investment reduces her own consumption but improves the income opportunity of her child. The parent choice solves the following problem

$$\max_S U(C, Y_c) = \max_S U(Y_f - S, Y_c), U_i' > 0, U_{ii}'' < 0, i = C, Y_c; U_{ij}'' > 0, i \neq j \quad (1)$$

where U is the parent utility, C is parent consumption, Y_f is her (family) income, S is the amount invested to finance the child's education (i.e. payment of admission fees, purchase of textbook, etc.), Y_c is the child's future income.

The child's income depends on academic performance P achieved during university career and (possibly) on family networking, here proxied by the effect of family income: children from richer families have access to better jobs, both in terms of earnings and quality of the job.[6] The academic performance can be thought as the amount of human capital obtained during the university career, which includes both elements of quantity (how many courses attended) and quality (what marks obtained in passing the exams).[7]

$$Y_c = Y(P, Y_f), Y_P' > 0, Y_{Y_f}' \geq 0, Y_{ii}'' < 0, i = P, Y_c; Y_{ij}'' > 0, i \neq j \quad (2)$$

The academic performance depends on several factors. First, it depends on student "ability" A that is assumed to be perfectly observable at the moment of undertaking the decision to proceed to tertiary education: other things held constant, abler students exhibit better performance.[8] But performance is also dependent on student effort E, which is optimally chosen by the student her-self, taking into account the disutility of effort and the benefit of higher future earnings. The presence of S captures the positive effect of the resources invested in education. In addition, if we want to take into account the social capital endowment (parents and neighbours educational achievements) that fosters the process of learning, we could proxy this variable with family income Y_f.[9]

[6] See for example Montgomery 1991.

[7] But it could also be interpreted as a signal of unobservable ability that firms take into account when setting their wage policy.

[8] We are not interested in going deeper into defining what we mean by "ability". We find convincing the definition provided by Rubinstein and Tsiddon 1998: ability is "everything that contributes to the child's income potential, is in the child at the time he takes his education decision, and cannot be purchased on the market" (p.19). Consequently, in their empirical analysis they proxy individual ability with their parents education.

[9] In Benabou 1996 family income drives locational choice, and as a consequence neighbourhood social composition and school financing.

$$P = P\left(A, E, S, Y_f\right) \tag{3}$$
$$P'_A > 0, \quad P'_E > 0, \quad P'_S > 0, \quad P'_{Y_f} \geq 0, \quad P''_{ii} < 0, \quad i = A, E, S, Y_f; \quad P''_{ij} > 0, \quad i \neq j$$

Each student maximises her own utility defined over effort E and future income Y_c subject to the constraint described by equation (3)

$$\max_E V(E, Y_c) = \max_E V\left(E, Y_c\left(P, Y_f\right)\right) = \max_E V\left[E, Y_c\left(P\left(A, E, S, Y_f\right), Y_f\right)\right] \tag{4}$$
$$V'_E < 0, \quad V'_Y > 0, \quad V''_{EE} \geq 0, \quad V''_{YY} < 0, \quad V''_{EY} < 0$$

The sequence of choices in the present model resembles a Stackelberg game, where the parent acts as a leader, choosing the optimal amount of investment S^* under the rational expectation of children behaviour in determining the optimal amount of effort E^*. Notice that when the parent makes her choice, her income is taken as predetermined, so that she links her investment on the "ability" of the child only.[10] Once this choice has been undertaken (that is, when a university has been chosen), the child takes the parent investment as predetermined, and in her turn she bases the optimal amount of effort onto her endowment of "ability". To study the sequence of optimal choices we have to start from the end, and we move to the solution of the problem described by equation (4).

Since we want to take into account the possibility of imperfections in financial markets, we could proceed in two ways: either we introduce a (possibly binding) constraint on the optimal amount of investment S^*, or we consider that students from poorer families are subject to stronger pressure to complete their curricula. In this case this constraint takes the following form

$$P \geq \overline{P}\left(Y_f\right), \overline{P}' < 0 \tag{5}$$

where $\overline{P}$ represent the minimum level of performance a student has to achieve in order to fulfil parents' expectations. Obviously, the richer the family, the lighter this type of pressure.[11] If we solve problem (4) under the constraints represented by equation (3) and (5) we obtain

$$\begin{cases} \hat{E} = \hat{E}\left(A, S, Y_f\right) if\ P\left(A, \hat{E}, S, Y_f\right) \geq \overline{P}\left(Y_f\right) \\ \tilde{E} = P^{-1}\left(\overline{P}\left(Y_f\right)\right) if\ P\left(A, \hat{E}, S, Y_f\right) < \overline{P}\left(Y_f\right) \end{cases} \tag{6}$$

The signs of the partial derivatives can be studied using the implicit function theorem. For example, it is possible to show that

$$\frac{\partial E^*}{\partial A} > 0 \qquad if \qquad V''_{EY} P'_A + V'_Y P''_{EA} > -P'_E \left(V''_{YY} + V'_Y \frac{Y''_{PP}}{Y'_P} \right)$$

Thus in general it is impossible to sign these derivatives with certainty, unless choosing specific functional forms. Equation (6) can be re-expressed in a more compact form as

$$E^* = \max\left[\hat{E}, \tilde{E}\right] = E^*\left(A, S, Y_f\right) \tag{7}$$

[10] Owen and Veil 1997 obtain similar conclusions.

[11] It is worth recalling that in Italy student grants (*assegno di studio*) and fee exemption are conditional on a similar requirement (a minimum number of passed exams per year and a minimum average mark obtained in passing them).

Given the fact that students' effort is unobservable, if we reinsert equation (7) into equation (3) we obtain a testable prediction

$$P^* = P^*\left(A, E^*, S, Y_f\right) = P^*\left(A, S, Y_f\right) \tag{8}$$

Student performance must be correlated with his/her "ability", his/her family income (encompassing the effects of possible liquidity constraints, family networks and social capital) and the amount of resources invested in education. Equation (7) can be taken as the reaction function of the follower (the child), and is taken into full account by the leader (the parent), when choosing the optimal amount of investment in education

$$\max_S U\left[Y_f - S, Y\left(P^*\left(A, S, Y_f\right), Y_f\right)\right] \tag{9}$$

Her optimal choice is therefore given by

$$S^* = S^*\left(A, Y_f\right) \tag{10}$$

Thus a parent finances a child's educational choice based on her perceived "ability" and present current (family) income. But these results are too general to provide an intuitive idea of underlying relationships. In order to see how the present model works, let us consider specific functional forms. We express equation (3) as

$$P = A^{\alpha} S^{\sigma} E^{\varepsilon} Y_f^{\beta} \tag{11}$$

where β measures the intensity of neighbourhood effects in cultural education; setting $\beta = 0$ is equivalent to exclude this phenomenon. This formulation considers individual "ability", educational resources, individual effort and social capital (proxied by family income) as partial substitutes. Equation (2) is re-expressed as

$$Y_c = \pi P Y_f^{\theta} = \pi A^{\alpha} S^{\sigma} E^{\varepsilon} Y_f^{\beta+\theta} \tag{12}$$

where θ measures the intensity of the family networking effect.[12] Taking a linear utility function for the child yields

$$\max_E V\left(E, Y_c\right) = \max_E Y_c - \eta E = \max_E \pi A^{\alpha} S^{\sigma} E^{\varepsilon} Y_f^{\beta+\theta} - \eta E \tag{13}$$

under the following constraint

$$P \geq \overline{P}\left(Y_f\right) = Y_f^{-\delta} \tag{14}$$

Solving the problem (13) yields the following result

$$E^* = \max\left[\hat{E}, \tilde{E}\right] = \max\left[\left(\frac{\pi\varepsilon}{\eta} A^{\alpha} S^{\sigma} Y_f^{\beta+\theta}\right)^{\frac{1}{1-\varepsilon}}, \left(A^{-\alpha} S^{-\sigma} Y_f^{-\delta-\beta}\right)^{\frac{1}{\varepsilon}}\right] = E^*\left(\underset{+}{A}, \underset{+}{S}, \underset{\pm}{Y_f}\right) \tag{15}$$

[12] Notice that under the exponential formulation of equation (11) and (12), the possible impact of neighbourhood effects (during schooling age) is indistinguishable from social networking (during working age).

By equating $\hat{E}$ and $\tilde{E}$ we obtain the family income threshold $\hat{Y}_f$ above which the performance constraint is no longer binding

$$\hat{Y}_f = \left(\frac{\eta}{\pi \varepsilon A^{\alpha} S^{\sigma}} \right)^{\frac{1}{\beta + \theta\varepsilon + \delta(1-\varepsilon)}} = \hat{Y}_f \left(\underset{-}{A}, \underset{-}{S} \right) \tag{16}$$

which can be represented in figure 1. When $\hat{Y}_f < Y_f$ the *performance constraint* (14) dominates, and therefore the student relaxes and reduces her effort with rising family income. As soon as the constraint stops biting (at $\hat{Y}_f = Y_f$), the *networking effect* introduces a positive correlation: a richer family provides better prospects for future employment, and therefore induces greater effort in its offspring.

[insert figure 1 about here]

The threshold $\hat{Y}_f$ is lower the higher is the student's "ability" and the investment in her education, to be determined at the first stage of the model. By replacing equation (15) in equation (11), we obtain an observable behaviour in student performance

$$P = \begin{cases} \left(A^{\alpha} S^{\sigma} Y_f^{\beta + \theta\varepsilon} \left(\frac{\pi\varepsilon}{\eta} \right)^{\varepsilon} \right)^{\frac{1}{1-\varepsilon}} & \text{if} \quad Y_f \geq \hat{Y}_f \\ Y_f^{-\delta} & \text{if} \quad Y_f \leq \hat{Y}_f \end{cases} \tag{17}$$

Moving now to the parent choice, we make use of a Cobb-Douglas utility function

$$\max_S U(C, Y_c) = \max_S (Y_f - S)^{\omega} (Y_c)^{1-\omega} \tag{18}$$

When the performance constraint is binding $\left(Y_f \leq \hat{Y}_f\right)$, we get

$$\arg\max_S (Y_f - S)^{\omega} \left(\pi Y_f^{-\delta} Y_f^{\theta} \right)^{1-\omega} = \tilde{S} = 0 \tag{19}$$

whereas when it is not binding $\left(Y_f \geq \hat{Y}_f\right)$ we obtain

$$\arg\max_S (Y_f - S)^{\omega} \left(\pi \left(A^{\alpha} S^{\sigma} Y_f^{\beta + \theta\varepsilon} \left(\frac{\pi\varepsilon}{\eta} \right)^{\varepsilon} \right)^{\frac{1}{1-\varepsilon}} Y_f^{\theta} \right)^{1-\omega} = \hat{S} = \frac{\sigma(1-\omega)}{(1-\varepsilon)\omega + \sigma(1-\omega)} Y_f = \Omega Y_f \tag{20}$$

The optimal amount of investment in a child's education is therefore zero if the family income is lower than a given threshold and/or the student "ability" is sufficiently low; otherwise it is a constant

fraction of family income.[13] By taking into account that the income threshold is conditional upon the optimal amount of education, if we replace equation (20) into equation (16) we obtain

$$\hat{Y}_f = \left(\frac{\eta}{\pi \varepsilon A^{\alpha} \Omega^{\sigma}} \right)^{\frac{1}{\beta+\theta\varepsilon+\delta(1-\varepsilon)+\sigma}} \tag{21}$$

This result tells us that as long as a student is sufficiently endowed in terms of "ability", her family will always invest a fraction of income in her education. Otherwise, they will not invest any amount because the student's performance will be insufficient to overcome the *performance constraint*. This situation is depicted in figure 2. Notice that the optimal amount of education obtained in equation (20) is independent of student ability. This is strictly due to the specific technology assumed for student performance; however if one takes into account that the income threshold is negatively related to student "ability" by means of equation (21), this final result confirms the general formulation indicated in equation (10).

[insert figure 2 about here]

Notice that when we replace the results of equation (19) into equation (17) we do not observe university performance for students insufficiently endowed with "ability" (i.e. students that either performed poorly at previous stage of education or with low educated parents), because their parents anticipate that they will be unable to over-step the threshold, and in consequently do not invest in them (i.e. they to not pay for their enrolment at the university). Thus our model offers two testable predictions:

i) families invest more resources in the education of their children the higher is their income, provided that their children are sufficiently endowed with "ability";

ii) children perform better at the university the higher their "ability", the quality/quantity of resources invested in their education and their family income (for cultural inheritance and/or networking reasons).

Both predictions are not rejected by our empirical analysis, where we now move.

3. The college choice

We can study the choice of higher education as a sequential process, characterised by at least four steps:

i) the successful completion of a 5-year secondary school (preliminary condition)

ii) the decision about whether to enrol at the university;

iii) the choice of a university faculty;[14]

iv) the subsequent performance of a student once enrolled at the university.

We do not have in Italy longitudinal files that allow us to trace the school career of a representative cohort of youngsters (like the British National Child Development Survey). Thus we are forced to infer indirect information from resorting to representative samples of the entire population. Among the few publicly available, we have chosen the Italian population sample provided by the Survey on Household Incomes and Wealth (SHIW) conducted biannually by the Bank of Italy. Using the most recent wave available (referring to 1995) we can trace out families with children aged between 19 and

[13] This is an unavoidable consequence of assuming Cobb-Douglas utility function in equation (18).

[14] Once the choice of sending a child to college has been undertaken, and a desired faculty has been selected, there is an additional choice between a public and a private university (if available). Given the limited number of private universities in Italy, we abstract from this effect.

26, among which some are enrolled at the university. Studying the differences between the two sub-samples, we are able to identify some conditioning variables in the college choice.

The 1995 survey contains information regarding 23924 individuals and 8135 families. 4907 families have cohabiting children, whereas we do not have information about children that live elsewhere. Our analysis will be biased whenever the individuals that left cohabitation are significantly different from remaining ones with respect to the process under analysis. However we know from other sources that Italy is characterised by late leaving of family cohabitation,[15] due to high costs of living and absence of unemployment benefits. Looking at our data, we can infer information by looking at family composition. In a constant population with children not leaving family cohabitation we should observe a constant number of children at any (average) age of children themselves. Under this assumption when we record a sharp decline, we can take it as evidence of the (average) family leaving age. By observing figure 3, we notice that this sharp decline occurs in our data set around an average age of children of 29. Therefore we feel justified in restricting our analysis to families with children in an age comprised between 19 and 26, extremes included, and we expect a reduced bias in the sample of these children.

[insert figure 3 about here]

We have 2022 families that include 2748 individuals aged 19-26, 907 of which are recorded as "student" and have completed a secondary school, and can plausibly be taken as university students; among the remaining 1841 youngsters, 1041 did not achieve a secondary school degree, and therefore have already dropped out of the educational system. Thus we are left with 1707 people that potentially could enrol at the university (they have the right educational credentials), but only a fraction (corresponding to 53.1%) that actually did it.[16] In addition to demographic variables (age, gender, number of siblings, region of residence), we know the type of secondary school attained (but unfortunately not the final marks obtained at exit), and we also have some information on the family background (education and occupation of both parents, family income[17]).

Before moving to direct estimates on representative samples, we want to examine the indirect aggregate evidence. Table 1 compares the gross family incomes for the entire SHIW sample, for the subsample of families with children who are university student and for the administrative sample from the University of Milan. Additional information is also reported on final marks at exit of secondary schools. We notice that families with children at the university are on average richer by 10 millions of Italian liras (slightly above 5000 euros). In addition students enrolled in the State University of Milan (at least in the faculties under consideration) are indistinguishable from the rest of the population, especially when looking at the final marks at exit. If we take this latter variable as a proxy for unobservable "ability", we are induced to assume that family income is a more important determinant of the educational choice, while "ability" is not.

A second aggregate indication is reported in Table 2, where we estimate the returns to different types of schools. Since students' families form expectations about future earnings attached to a specific degree by looking at actual returns in the labour market, looking at the table we notice that completing a generalist secondary school *(liceo)* without going on with enrolment at the university

[15] In 1996 the 98.1% of young people aged 18-19 was cohabiting with the family of origin. The same percentage declines to 88.4% for people aged 20-24, 54.1% for people aged 25-29 and 21.6% for people aged 30-34. See Istat 1997, pg.224 ss.

[16] Translating into a representative cohort, these figure imply that in a cohort of 100 individuals, 37.8 do not complete a secondary school (which in Italy is not yet compulsory), and 33.3 enrolled the university. Corresponding figures for the Italian population are 39 droppers and 40.1 enrolees (see ISTAT 1999). The lower figure for the SHIW sample could be due to children enrolled at the university and not cohabithing with the family.

[17] The SHIW collect information about net incomes, whereas for fiscal purposes (and for university tuition) people declare gross incomes. Thus we have converted net income into gross incomes using the available information on tax intervals, tax marginal rates and tax deduction based on family composition.

yields a very limited return. For example, if we annualise the rate of returns reported in the first column, we find that attending a professional (*istituto tecnico*) or a vocational (*istituto professionale*) yields a yearly rate of return of about 6%, whereas attending a generalist school (*liceo classico* or *liceo scientifico*) generates a lower return of 5%.[18] However, if a student decides to proceed to the university, the yearly rate of return raises significantly, from the lowest 7.3% for Literature and Philosophy, passing through 11.7% for Economics and Political Sciences up to 13.9% for Law.[19]

This situation suggests that the educational career is significantly predetermined by the choice of the secondary school undertaken at the age of 14, mainly by the family. In fact, those parents able to finance a college education for their children and/or expecting them to be above a minimum threshold of performance tend to push them to enrol in generalist schools (*licei*) *even if* these schools offer a *lower* rate of return per se. When their children reach the end of a generalist secondary school, the expected gain of continuing in schooling will be higher than the corresponding gain facing a student leaving technical or vocational secondary school. Thus, the mere existence of a "dual" curricula[20] in secondary education tends to self-select the students according to their perceived "ability" and/or availability of family financial resources.

If we consider the choice of secondary school attended and completed by children in our sample (see Table 3), we use multinomial logit analysis to ascertain the determinants among the different types of secondary school. The only significant evidence we are able find relates to family educational background: having both parents with a secondary school diploma raises the probability of enrolling at high school, which in turn raises the probability of enrolling at the university. On the contrary, we are unable to detect any significant effect of family income and occupations[21] in conditioning the educational choices of children. Notice however that the sample is biased, because we are considering only students that completed the secondary school, whereas it is common knowledge that dropout rates vary considerably among different types of schools.[22] Unfortunately we are unable to correct for this bias, since the dataset does not report information about students who attended without completing any order of school: as a consequence, among the youngsters without a secondary school diploma we are unable to detect whether they enrolled at any type of secondary school, and which one. We also lack direct information about the educational record of these students. Nevertheless, if we accept a wider definition of unobservable "ability", controlling for parents' education provides a rough indication of the direction of this selection.

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[18] Altonji 1993 explains the lower rate of return *before* entering college as a result of ex-ante uncertainty on the possibility to complete if.

[19] Annualisation is obtained by taking the $\frac{1}{n}$ root of (1+coefficient reported in Table 2), where *n* is the expected number of years necessary to achieve the degree. While legal duration is 4 years, effective duration exceeds this amount: for this reason we have taken $n = 5$. Even if they use net incomes (while here gross incomes are adopted), Brunello et alt. 1999, table 11, report similar values for males (6.5% for any secondary school and 10.6% for any university degree). However, we know that OLS estimates are biased because we cannot control for unobservable ability. When using IV estimates, Brunello et alt. 1999 find higher returns (8.6% for secondary education and 13.2% for university education).

[20] The Italian secondary education was designed in parallel and non-communicating tracks the fascist period, taking the German system as a reference model. Additional tracks were subsequently added in the 60's, but a clear distinction between high schools and the remaining still persist nowadays.

[21] In estimating Table 3, we also tested the significance of father and mother occupations, but none of them resulted significant, and therefore we have not reported them.

[22] In 1992-93 the percentage of boys (girls) failing during the secondary school was 27.8% (17.3%) in vocational schools, 21.5% (13.0%) in technical schools, 25.3% (12.3%) in teacher training school and 12.5% (6.7%) in high schools. See Gasperoni 1997.

Table 1 **- Income and marks comparisons between entire population and university samples**

	Italian population *	Italian population with a son enrolled at the University **	Enrolled at State University of Milan***
gross family income (1995 millions)			
average family income (1995 millions)	63.034	76.664	71.572
median family income (1995 millions)	52.340	62.774	62.465
standard deviation	55.115	74.873	69.576
final marks at exit of secondary school			
average marks (max 60)	44.52	n.a.	43.93
standard deviation	7.16	n.a.	6.55

* Data on incomes from Bank of Italy sample (1995), referred to the population with at least one child in the age between 19 and 26. Data on marks from Gasperoni 1997, tab.4; they are referred to the academic year 1994-95.

** Data from Bank of Italy sample (1995), referred to the population with at least one child in the age between 19 and 26 recorded as student.

*** Data from administrative sources, referred to the faculties of Economics, Law, political Sciences and Mathematics only: See the Appendix. For comparability, data on marks are restricted to students firstly matriculated in 1995-96.

Table 2 **- Differentials in (gross) return for different educational degrees (secondary school and university) - percentage increase – OLS estimates**

Completed secondary school:			
High school (*liceo classico* or *scientifico*)	0.281 (4.75)	0.176 (3.08)	0.094 (1.68)
High school (*liceo artistico*)	0.133 (1.35)	0.066 (0.69)	0.020 (0.21)
Teacher training (*istituto magistrale*)	0.320 (5.82)	0.184 (3.46)	0.102 (1.93)
Professional (*istituto tecnico*)	0.342 (7.35)	0.257 (5.75)	0.170 (3.87)
Vocational (*istituto professionale*)	0.328 (5.53)	0.237 (4.18)	0.203 (3.66)
University degree (BA/BS):			
Economics and statistics	0.746 (9.10)	0.596 (7.54)	0.372 (4.78)
Law	0.924 (10.5)	0.752 (8.85)	0.542 (6.47)
Political Sciences	0.740 (5.90)	0.520 (4.35)	0.291 (2.49)
Mathematics	0.573 (7.78)	0.429 (6.09)	0.264 (3.78)
Agriculture and veterinary science	0.603 (4.15)	0.547 (3.96)	0.279 (2.06)
Medicine and surgery	0.972 (11.1)	0.785 (9.39)	0.481 (5.68)
Engineering	0.627 (7.34)	0.576 (7.00)	0.320 (3.95)
Architecture and planning	0.475 (3.68)	0.461 (3.65)	0.161 (1.29)
Literature and philosophy	0.426 (6.90)	0.247 (4.14)	0.108 (1.77)
for comparison: return to one year of education	0.074 (34.76)	0.059 (25.27)	0.030 (10.68)
Sector of activity	no	yes	yes
Job position	no	no	yes
R^2	0.28	0.32	0.35

Controls: experience, experience squared, gender, region of residence, self-employment, educational dummies for less than secondary education. Excluded case: male, blue collar, without formal education, working in agriculture, resident in islands. T-statistics in brackets.

We can now move to a direct analysis of the determinants of the choice of enrolment at a college. Table 4 reports the maximum likelihood probit estimates of the relative contribution of each variable (evaluated at sample means) in determining the probability of being observed as a student (necessarily a "university" student) in our sample, conditional on having completed a secondary school. We start by noticing that the most relevant variable seems to be the secondary school of origin: thus sending a child to a high school, if successfully completed, almost ensures continuation at university level (contribution in probability between 0.472 and 0.519). Quite surprisingly, there is no evidence of gender discrimination, even if belonging to a numerous family reduces the probability of access

(probably because of limited resources). Finally North-eastern and central regions seem characterised by lower enrolment rates.[23]

When we introduce variables measuring the family background (second column of Table 4), we find that family total (gross) income exerts a statistically significant positive effect only when we omit any variable measuring unobserved "ability" of the student (here again captured by the human capital available within the family). When we add the educational attainment of both parents (third column of Table 4), we find that having parents that went beyond compulsory education (lower secondary since 1962) helps in accessing the university. As already found with respect to other countries, having a graduate mother provides great pressure in the children to repeat the university experience. This obviously translates into higher persistence in intergenerational transmission of education.[24]

Table 3 **- Choice among different secondary schools - family with a student aged 19-26 in 1995 who has completed a secondary school – multinomial logit estimates**

	vocational	technical	high school	art school	teacher train.
gender (1=female)	0.458**	0.332***	0.676	1.776	9.084***
age	0.833**	0.841**	0.814***	0.827*	0.926
resident Northeast	0.236***	1.089	0.888	0.977	0.65
resident Centre	0.565	0.726	0.657	0.719	0.593
resident South	0.801	1.616	1.486	0.949	2.345
family background					
(log) family income	1.289	1.257	1.253	1.336	1.155
number of children	1.016	0.957	0.858	0.956	0.777
single parent family	0.97	1.393	1.806	0.88	1.954
father with compl.lower secondary/vocational	1.545	1.642	2.244**	1.026	1.521
father with compl.higher secondary	0.987	1.285	3.266**	1.403	1.377
father with university degree	0.226*	0.33	1.690	0.363	0.112**
mother with compl.lower secondary/vocational	0.523	1.021	1.078	0.487	1.328
mother with compl.higher secondary	0.753	1.920	3.602**	1.182	3.210*
mother with university degree	0.334	1.593	6.626*	4.567	2.125
head of household self-employed	0.924	1.982	0.887	1.491	2.107
Pseudo R^2			0.12		
χ^2			517.46		
Number of cases			1615		

Estimated coefficients are transformed to relative risk ratios.
*** 99% significance ** 95% significance * 90% significance.
Comparison group: other type of diploma.

The introduction of some proxy for unobservable "ability" reduces the explanatory power of family income. How can we interpret this result ? We are tempted to take this as evidence that liquidity constraints do not prevent access to university education, whereas individual "ability" is more important.[25] But this conclusion seems contradicted by the significant (negative) effect of the number of siblings and by the similarly negative effect of having a father and/or a mother unemployed (fifth column of Table 4). Still additional factors play a role in the college choice. In accordance with the theoretical model presented in the previous section, family financial resources and unobservable ability are the main determinants. Therefore we would not expect that parental occupations could influence this choice any further, since we are controlling for both parental income and education.

[23] This is not confirmed by aggregate data: in 1995-96 the percentage of enrolment on student ending the secondary school the previous year was 65.0% in Northwest, 74.3% in Northeast, 84.5% in Centre and 59.7% in South and Islands. See Istat 1997, p.181.

[24] See the regressions reported in Checchi at alt 1999.

[25] As long as parental education and parental incomes are correlated, multi-collinearity could be responsible of the decline in significance for "family income". However, taken at face value, our results imply that parental education is a stronger determinant of a child's schooling than parental income. Our interpretation is also strengthened by the fact that the choice of a secondary school (especially in the case of "high school") was conditioned by parental education but not by family income (see Table 3).

However, we find that having a household head holding a managerial or entrepreneurial job ensures the highest probability of enrolling at the university,[26] and having parents with clerical jobs also has an effect, if less powerful.[27] This result cannot be accounted for in the present framework, and suggests that to a certain extent status attainment could affect college choice.

We would have liked to introduce a measure of opportunity costs in attending the university. However, the very same variables that may raise individual employability (and therefore expected forgone income) are potential regressors in determining college choice. Therefore adopting a probit estimate of employment probability within the same sample and inserting the estimated scores in current regression would have produced the same set of regressors. Indirect evidence of the importance of opportunity costs can be obtained by noticing that living in a family whose household head is self-employed (where therefore work opportunities are higher) halves the probability of attending the university.

On the whole, attending a university in Italy is more likely for students from educated families and/or where the parents hold occupations with some prestige in society. Evidence about potential existence of liquidity constraints is mixed, and some additional role can be played by opportunity costs due to alternative employment availability.

[26] The fifth column of Table 4 reports the coefficients on father and mother occupations that survive a stepwise elimination with a p-value threshold of 0.20.

[27] When education becomes a status symbol, it enters the children utility function directly, and previous conclusions have to be modified. See Fershtman et alt. 1996.

Table 4 **- Determinants of enrolment at the university - ML probit estimates**

(t-statistics in parentheses - constant included - coefficients report the probability effect a discrete change of a dummy variable from 0 to 1 or one point increase in a continuous variable)

# obs :	1615	1615	1615	1615	1615
Depvar:	sonuni	sonuni	sonuni	sonuni	sonuni
Demographic					
gender	-0.035	-0.033	-0.017	-0.020	-0.007
female=1	(-1.22)	(-1.18)	(-0.61)	(-0.70)	(-0.26)
age	-0.048	-0.051	-0.049	-0.048	-0.048
	(-7.66)	(-7.98)	(-7.51)	(-7.23)	(-7.02)
regio2	-0.071	-0.074	-0.050	-0.042	-0.054
North-east	(-1.59)	(-1.66)	(-1.11)	(-0.91)	(-1.18)
regio3	-0.095	-0.089	-0.087	-0.089	-0.089
Centre	(-2.23)	(-2.08)	(-2.01)	(-2.01)	(-2.02)
regio4	-0.039	0.009	-0.012	-0.020	-0.014
South	(-0.97)	(0.22)	(-0.28)	(-0.47)	(-0.31)
regio5	0.012	0.051	0.026	0.023	0.022
Islands	(0.24)	(0.95)	(0.49)	(0.42)	(0.40)
Secondary school degree					
vocational	-0.088	-0.091	-0.062	-0.063	-0.067
	(-0.95)	(-0.98)	(-0.67)	(-0.67)	(-0.71)
technical	0.054	0.048	0.051	0.059	0.048
	(0.66)	(0.58)	(0.62)	(0.71)	(0.58)
high school	0.519	0.509	0.472	0.479	0.473
(liceo)	(7.16)	(6.95)	(6.34)	(6.39)	(6.32)
art school	0.206	0.199	0.182	0.189	0.167
(lic.art.)	(2.18)	(2.08)	(1.88)	(1.94)	(1.70)
teach.trng	0.124	0.144	0.103	0.113	0.073
(magistr)	(1.37)	(1.26)	(1.13)	(1.23)	(0.79)
Family background (income and parental education)					
log family		0.044	-0.028	-0.024	-0.066
income		(2.12)	(-1.22)	(-1.02)	(-2.66)
n.children		-0.044	-0.046	-0.048	-0.042
		(-2.69)	(-2.78)	(-2.83)	(-2.46)
single parent		0.001	0.026	0.037	-0.041
		(0.03)	(0.55)	(0.76)	(-0.70)
father lwr.			-0.022	-0.017	-0.014
sec./vocat.			(-0.64)	(-0.48)	(-0.40)

father high	0.110	0.122	0.114
sec./shrt dgr	(2.60)	(2.85)	(2.48)
father college	0.076	0.088	0.052
	(1.12)	(1.29)	(0.68)
mother lwr.	0.015	0.010	0.004
sec./vocat.	(0.42)	(0.28)	(0.12)
mother high	0.171	0.159	0.123
sec./shrt dgr	(3.69)	(3.38)	(2.42)
mother college	0.306	0.364	0.311
	(4.83)	(4.75)	(3.51)
household head		-0.494	
selfemployed		(-5.10)	
Family status (parental occupations)			
fth white			0.064
collar low			(1.51)
fth teacher			0.130
			(1.49)
fth manager			0.283
			(2.83)
fth entrepr			0.335
			(3.09)
fth selfempl			0.138
			(2.93)
fth fam.firm			0.104
			(1.62)
fth unemployed			-0.193
			(-1.94)
fth retired			0.082
but working			(2.12)
mth white			0.113
collar low			(1.37)
mth unemployed			-0.310
			(-2.32)
mth housewife			-0.115
			(-3.06)
mth retired			-0.067
but working			(-1.19)
mth retired			-0.140
no working			(-1.06)
R^2	0.198	0.203	0.237	0.254	0.259

Excluded case: male student, living in north-western Italy , with other type of diploma obtained from secondary school, with both parents with primary or without formal education, and with both parents employed as blue collars.

Once a family has reached the decision to send a child to the university, the next step is to choose among available faculties and universities.[28] From this stage on, we move to an administrative sample of students enrolled at the State University of Milan, attending certain faculties: Law, Economics, Political Sciences and Mathematics.[29] Since administrative reasons prevented us from analysing the entire population, we have chosen these faculties to include all social disciplines available in the city (a Faculty of Sociology opened in 1998), adding a scientific faculty which has some overlap in research areas. Going back to Table 2 (referring to the entire Italian population), expected earnings are highest for the Faculty of Law, whereas a degree in Economics and/or in Political Science provide similar pay, leaving the Faculty of Mathematics at the bottom of the distribution. Having said that, it is not clear according to what criterion students are sorted to more profitable degrees. Even without information on the entire university population, we try to infer some information from available data. We start by noticing that, according to the marks obtained at the completion of the secondary school taken as a proxy of unobserved "ability", the "above the average marks" students enrol in the faculties of Economics and Mathematics, whereas "below the average marks" students tend to attend the Faculty of Political Science. With a national average mark of 44.5 (expressed in sixties), students first enrolled in 1995-96 in the Faculty of Mathematics exceeded that average by 9.6%, followed by the Faculty of Economics (+6.6%)[30], the Faculty of Law (-1.9%) and the Faculty of Political Science (-2.8%). If we resort to multinomial logit analysis and take our data set as the universe of available choices within the State University of Milan (as it is shown in Table 5), we discover that family financial resources (as measured by total income and self-employment of household head) are almost irrelevant in the choice among these faculties. Previous schooling performance seems more important: as already remarked from simple descriptive statistics, students with better marks tend to go to the faculties of Economics and Mathematics; there is also a clear preference from students exiting the high school (*liceo classico*) for the faculty of Law. Age does not seem to identify a precise pattern of choice, whereas women tend to go to the faculty of Law. Even if this evidence is limited, since we are not including other choices available within the city of Milan, it strengthens the previous result that previous educational choices at the secondary level and unobservable "ability" are more important determinants than ease of access to financial resources in shaping the educational career of prospective graduates.

[28] The reader has to keep in mind that each university does not contain all faculties, and sometimes to choose a specific university implies to move (or to commute) to a different city. We do not have aggregate information about this phenomenon, but we believe that the local availability of given faculties may condition the final choice of faculty.

[29] The main difference with the previous SHIW sample is that, apart from demographic and secondary school information on students, we lack information about parental education. Conversely we know the average mark obtained at the end of secondary school: therefore we are forced to change our proxy of "unobserved" ability. As long as people with learned parents achieve better results at school (because educated parents value education more, put more pressure for schooling on their children, have more books available, and obtain more respect for their children from teachers), the two variables are related. Gramsci was well aware of the correlation between the two variables: "*In many families, especially among intellectuals, children receive from the family a training which integrates (formal) education. In other words they 'breath from the air' knowledge and model roles that facilitate their educational achievements."* (Gramsci 1975, p.131 - our translation). Analogously: "*Consequently selection in school favors children from those families that already possess dominant cultural advantages*" (Shavit-Blossfeld 1993, p.30).

[30] The reader has to keep in mind that students enrolled at the Faculty of Economics of State University could represent a self-selected sample, because of the existence of admission tests partially based on the marks obtained at the completion of the secondary school. However occasional information indicates that in several circumstances students that effectively enrolled belonged to the bottom of the admission list. This is due to refusal to accept an offer when accepted at the same by private universities offering courses in economics (Università Commerciale L.Bocconi and Università Cattolica del Sacro Cuore).

Table 5 **- Choice among some faculties within a state university - first enrolment in 1996-97 – multinomial logit estimates**

	Economics	Law	Mathematics
gender (1=female)	-0.185**	0.177***	-0.036
age	-0.079***	-0.012**	-0.054*
resident Northwest	0.323	-0.215	-0.443
resident Northeast	-0.740	-0.740**	-0.353
resident Centre	-0.435	-0.782	-30.137
Secondary school degree			
Completed high school (*liceo classico*)	-2.456***	0.572*	-1.219*
Completed high school (*liceo scientifico*)	-1.728***	-0.183	-0.305
Completed accounting school (*ragioneria*)	-1.000***	-0.325	2.201***
Completed vocational school (*tecnico/profess.*)	-2.092***	-0.493	-1.243**
final mark at exit secondary school	0.102***	0.015***	0.107***
family background			
(log) family income	0.044	-0.073*	-0.172*
head of household self-employed	0.245	-0.197	-0.608
(log) family income*household head self-employed	-0.061	-0.083*	0.125
Pseudo R^2		0.0634	
χ^2		1049.83	
Number of cases		7750	

Estimated coefficients are transformed to relative risk ratios.
*** 99% significance ** 95% significance * 90% significance.
Comparison group: Political Sciences.

4. Academic performance

Once the crucial decision to enrol at the university has been undertaken, the students open up to academic life. As expected from previous results about irrelevance of financial resources in attending a university course, enrolment fees for public universities in Milan are rather low and correlated with family income: in 1996-97 admission fees ranged between 1.330.000 Italian lire (687 euros for the lowest family income) and 3.650.000 lire (1885 euros for the highest family income). But enrolling is just the first step of a long ladder.

It is widely known that the Italian university is afflicted by two problems: the dropout rates and the excessive duration of a student's academic career. Table 6 estimates the extent of the first phenomenon in our sample by going back to the original number of new enrolments in each year and observing how many student have survived 2, 3 and 4 years later. The difference between original enrolment and actual enrolment can be taken only as a rough measure of drop-out rates, because a student could have changed faculty, or transfer from other universities to higher years is possible. We cannot go beyond 4 years because this is the minimum official time length to complete each course, and students could disappear from the sample just because they graduate. However this is an exception rather than the norm, as can be seen from official sources: the average length of time spent obtaining a degree in the State University (referring to the academic year 1995-96) is 6.8 years for the Faculty of Law, 7.5 for the Faculty of Political Sciences and 6.8 for the Faculty of Mathematics.[31] National surveys indicate that only one tenth of the students complete their undergraduate studies on time.

If more than half of the students enrolled does not complete their curricula, the surviving one constitutes a self-selected sample. The extent of self-selection can be judged by observing representative statistics for year of enrolment, as in Table 7. But no clear pattern emerges from descriptive statistics: potential self-selection does not appear based on family income nor on students'

[31] We do not have comparable figure for the Faculty of Economics of State University, since it opened in 1992-93 and by the time these data were collected (April 1997) no student has yet completed his/her career. A survey conducted at the national level in 1995 and referred to graduates in 1992 report an average duration for a degree in economics of 6.25 years (Istat 1996).

unobservable "ability" (here proxied by final mark at the exit of secondary school and by the average mark obtained in passing the university exams). Taking individual data on enrolment of two subsequent years, we trace out those students who did not re-enrol, and we can explore the determinants of this choice. Because of lack of data, this could be done only for the students enrolled in the Faculty of Economics with reference to students who enrolled in 1995-96 and did or did not in 1996-97. The probit model reported in Table 8 indicates that family income and secondary school education (both in terms of type and marks obtained at exit) are statistically non-significant with respect to this choice, whereas age and academic performance within the university are the only significant variables. When a student is getting older, is unable to pass a sufficient number of exams per year and/or is unsatisfied with the marks obtained, then she becomes more likely to drop out of the university. Given the fact that the self-selection of the sample is mainly due to poor performance, we think it appropriate to concentrate on the analysis of the determinants of academic performance.

Table 6 **- Estimated dropout rates for year of enrolment**

	Economics	Law	Pol.sciences	Mathematics
enrolment at 1° year	40.60%	44.63%	53.50%	62.91%
enrolment at 2° year	34.85%	35.99%	51.09%	61.56%
enrolment at 3° year	34.10%	25.62%	36.72%	53.04%
enrolment at 4° year	11.56%	3.89%	3.26%	10.81%

Note: it reports the ratio between students with "active enrolment" status and the first-year enrolment of the corresponding cohort.

Table 7 **- Descriptive statistics for year of enrolment**

	Economics	Law	Pol.sciences	Mathematics
family income (millions It.liras 1995)				
enrolment at 1° year	69.70	79.59	71.08	70.85
enrolment at 2° year	76.21	72.74	68.30	73.09
enrolment at 3° year	74.81	71.74	67.60	71.16
enrolment at 4° year	76.44	73.23	68.97	74.97
final marks at exit scnd school (max 60)				
enrolment at 1° year	47.27	43.60	42.95	47.63
enrolment at 2° year	47.46	43.71	43.36	49.39
enrolment at 3° year	47.52	44.44	43.40	50.62
enrolment at 4° year	46.01	44.80	43.85	51.40
Average marks at university (max 31)				
enrolment at 1° year	23.46	24.74	23.17	26.51
enrolment at 2° year	23.39	24.13	23.49	24.42
enrolment at 3° year	23.69	24.11	23.73	23.73
enrolment at 4° year	23.49	24.30	24.22	24.88

Table 8 **- Probability of dropout - State University – Faculty of Economics – ML probit estimates**

(t-statistics in parentheses - constant included - coefficients report the probability effect a discrete change of a dummy variable from 0 to 1 or one point increase in a continuous variable)

# obs :	2745	2745	2745
Depvar:	dropout	dropout	dropout
gender	-0.012	-0.013	-0.010
female=1	(-1.31)	(-1.33)	(-0.89)
log(age)	0.196	0.196	0.299
	(5.98)	(5.95)	(6.91)
regio2	0.056	0.057	0.035
North-east	(0.85)	(0.87)	(0.50)
regio4-5	0.035	0.031	0.059
South isld	(0.64)	(0.59)	(0.84)
Secondary school degree			
hgh school	-0.015	-0.013	-0.024
(lic.class)	(-0.38)	(-0.31)	(-0.45)
hgh school	0.003	0.006	-0.009
(lic.scien)	(0.09)	(0.16)	(-0.18)
technical	0.014	0.017	0.000
(ragion.)	(0.37)	(0.43)	(0.00)
vocational	0.024	0.027	0.005
(tecnica)	(0.58)	(0.63)	(0.10)
log(marks)	-0.024	-0.024	0.054
exit scnd	(-0.71)	(-0.71)	(1.23)
Family background (income)			
log family		-0.002	-0.001
total income		(-0.38)	(-0.22)
Academic performance			
log exams			-0.079
per year			(-9.77)
log average			-0.117
marks per exam			(-2.26)
R^2	0.031	0.031	0.140

The problem is how to define a precise measure of students' performance. According to the Italian tertiary education system, a student obtains a BA degree when she has passed a predetermined number of exams, obtaining in each of them at least a minimum mark of 18 (out of 30), and defending a final dissertation (*tesi di laurea*). There are a minimum number of years of enrolment, which are 4 for

most degrees (including the present under analysis), but not a maximum. If we take the number of exams corresponding to each degree course and we multiply them by either 18 or 31,[32] we obtain respectively the minimum or the maximum result a student can obtain through her academic career. By dividing the latter value with the minimum number of years of university attendance, we obtain the supremum in the range of an indicator of student performance, the infimum being zero (since potentially there is no time limit to complete the academic career). For each student it is therefore possible to define the *performance* by taking the sum of the marks obtained in passed exams and dividing it by the number of enrolment years, that is

$$performance = \frac{\sum_{i=1}^{p} m_i}{n} \tag{22}$$

where p is the number of passed exams, m_i is the mark obtained in the i-th exam and n is the number of years of active enrolment. Let us notice that the performance indicator can be obtained as the product of two other indicators of performance, namely the *average mark* obtained in passed exams and the *speed* at which a student is undertaking the exams. In symbols

$$performance = average\,mark \cdot speed = \frac{\sum_{i=1}^{p} m_i}{p} \cdot \frac{p}{n} \tag{23}$$

It is important to distinguish between the two components, because there is an implicit trade-off between the two. A student can decide to dedicate one year to prepare each exam, obtaining high marks (and consequently cumulating a high value of *average mark*), but this produces a very long stay at the university to complete the career (a very low value in *speed*). At the opposite extreme, a student can decide to devote the minimum amount of time required just to pass an exam with the minimum mark (a very low value in *average mark*), thus being able to get through a higher number of exams (a high value in *speed*).[33] The descriptive statistics for these variables are reported in Table 9. It can be noticed that students from different faculties exhibit similar values in *average mark*, but different values in *speed*: as a result of combining these two pieces of information, students from the Faculty of Law who experience the lowest cumulated drop-out rate also exhibit the highest performance index. They are then followed by students from the Faculties of Political Sciences, Mathematics and Economics.

Table 9 **- Descriptive statistics of student performance**

	Economics	Law	Pol.sciences	Mathematics
#exams required to complete the career	29	22	26	22
minimum # years to complete course	4	4	4	4
theoretical maximum of performance	224.75	170.5	201.5	170.5
average *performance* (last 5 years)	43.93	57.13	52.32	44.71
average *mark* (last 5 years)	23.61	24.33	23.85	24.74
average *speed* (last 5 years)	1.82	2.29	2.13	1.78

But what are the determinants of students' performance ? In Tables 10 we estimate ordinary least square models predicting performance in each faculty, based on previous student achievements and family financial resources.[34] Older students perform better, probably due to self-selection (they are

[32] It is possible to pass an exam with the mark "30 cum laude": we have coded this outcome as 31.

[33] An alternative way to look at the same concept is to think of *performance* as an index of productivity in the production of a vertically differentiated product, where *average mark* is the quality and *speed* is the quantity.

[34] Estimates of average mark and speed determinants are available from the author upon request.

the survivors of the process of dropping out). We also find corroboration of previous evidence on unobservable "ability": students with better educational records (higher marks at the exit of secondary school, attendance of high school) perform better, whereas they are at some disadvantage when they are resident in a region that is far away. But a more interesting result is the evidence on financial resources: family income influences performance positively in the case of attending the faculties of Law and Political Sciences,[35] whereas it is irrelevant in the other cases (Economics and Mathematics).[36] The effect of family income on *performance* is all due to the effect on *speed* and not on *average mark*, indicating that students from richer families tend to go faster in their academic career.[37]

It is not easy to provide interpretations of the evidence on financial resources. Prima facie, it seems that liquidity constraints do not bite, because otherwise we should have found that students from poorer families would have had a higher speed (even at the cost of a lower average mark). However, our theoretical model presented in section 2 offers a rationale for this evidence: whenever we introduce a performance threshold, we do not observe students below the threshold because families do not invest. If we consider the high size of dropout, we are left with self-selected students that "passed" the threshold. In the spirit of the model, when neighbourhood effects and/or social networking are present, the higher the family income the higher the investment in education, and the higher is student's performance (see equation (17)). Thus observing a positive correlation between family income and performance could be taken as evidence in support of either a *networking hypothesis* (students from richer families go quicker because they have better employment prospects) or a *neighbourhood hypothesis* (students from richer families go quicker because they live in a better educated environment).

An alternative way to frame the latter hypothesis is thinking of family income being correlated with parental education. Since students would receive more support from their families of origin the higher the educational achievements of their parents, which would be richer on average, the positive correlation of performance with income would be a case of spurious correlation in the absence of information on the educational achievements of parents. This interpretation is however contradicted by the evidence on *average grade*, where in no case do we find any positive effect of family income: had a cultural background played any role, we should have expected a positive effect of family support on the average marks obtained in passing exams. In addition, in previous interpretation we have considered the average marks at exit of secondary school as an alternative proxy to parental education for unobservable "ability" of students. Since in Table 10 we are controlling for the former variable, the family income effect can be taken as an independent effect.

Thus we are left with a networking explanation: other conditions being equal, students from richer families face better employment prospects, and therefore face a higher opportunity costs by protracting their university career. This creates an incentive to reach a higher speed in passing exams, irrespective of the marks obtained. This explanation is not contradicted by the absence of effect within two faculties. In the case of the Faculty of Economics we can argue that these students could represent a self-selected sample (see footnote 33), since students with better prospects have already

[35] In the case of the Faculty of Law this effect is lighter in the case of self-employment of the household head: parents seem to put less pressure on the shoulders of their off-springs when family income exceeds 66.52 millions of Italian liras (34.360 euros).

[36] A positive and significant effect of family income is found in a sample of students enrolled to a private university offering courses in economics. Thus the absence of effect for the students enrolled at the Faculty of Economics in the State University could be attributable to self-selection: students from poor families, who have chosen to enrol a faculty of economics, self-select into a State University.

[37] Unfortunately we do not have information on whether the students are full-time or part-time students. Anecdotal evidence tells us this phenomenon could be rather widespread: in a survey conducted among the students of the Faculty of Political Sciences during 1996 (910 cases), 18% of the sample self-declared "full-time worker", 19% "part-time worker" and an additional 34% "occasional worker". Had we had this information for our samples, we could have tested an alternative version of the liquidity constraint model: students from poorer family have to work in order to finance their studies, and therefore less time is devoted to the academic career. On the contrary, students from richer families are implicitly exempted from work and therefore dedicate more time to study activity.

chosen to attend a private university. In the case of the Faculty of Mathematics, the natural opening for its graduates is teaching, and the access to this occupation is regulated through nation-wide competition, where family networking is (almost) ineffective.[38]

We can now summarise our empirical findings with the help of figure 4. Previous papers found that Italy is characterised by low educational attainments at tertiary level, which is matched by low intergenerational mobility, especially when this is measured in terms of educational achievements.[39] Current findings give us a clue to understand this evidence. Our first finding is that the choice of sending a child to the university is taken well before the actual moment of choice, because the type of secondary school attended is crucial in shaping the future educational destiny of the child. Attending and successfully completing a high school raises the probability of enrolling and completing the university. In this choice, children from educated families have advantages over children from uneducated families, and family income does not play any role. Thus *cultural constraints* seem to be more important than *liquidity constraints* in reducing access to the university. Once students have enrolled in a faculty, their performance - on average - is in accordance with family expectations (better talented students perform better), but in such a case family income (possibly proxing family networking) provides an incentive to complete their courses. In fact, we find that children from richer families perform better because they are quicker than those from poorer families are. For lack of data, we are unable to discriminate between other competing explanations (for example, students from poorer families could be more likely to be part-time students because of work; alternatively, family income could be correlated to higher educational achievements of parents).

[insert figure 4 about here]

On the whole, the present working of the educational system in Italy discriminates against students from poor family backgrounds. If born in a family with poorly educated parents, a child has a high probability to end in a professional/vocational secondary school, which later reduces the probability to access the university. But high "innate" talent could offset the low cultural environment found in the family of origin: in such a case we would observe students from poor families enrolling at the university. But their academic career would be on average longer than other comparable students, either for lower incentives to complete it or for financial difficulties requiring part-time work. Thus the Italian public educational system is unable to compensate social differences, especially on the ground of cultural environments. If it could, the educational achievements of parents would be irrelevant in predicting the educational achievements of their children. On the contrary, we have seen that socially different families (in terms of education, income and occupations) choose different schooling curricula for their children. Since university degrees are highly rewarded by labour market earnings, the Italian social structure is reproduced from one generation to the next.

[38] Nevertheless, the networking explanation could be at odds with the evidence on families with a self-employed head. We would have expected a self-employed to engage in wider social networking, holding several personal contacts and having access to greater information. His/her children should benefit more from these opportunities, and this should have reflected in a positive coefficient for the dummy corresponding to the condition of "self-employment household head". This is actually the case for students of the Faculty of Law, where it is not infrequent to observe children of lawyers being aspirant lawyer. But the definition of self-employment is too wide (ranging from lawyer to plumber) to push this discussion further on.

[39] See Brunello et alt. 1999 and Checchi et alt. 1999.

Table 10 **- Determinants of student performance – last five years of enrolment – OLS estimates**

(t-statistics in parentheses)

Model :	Economics	Law	Pol.Scien.	Mathematics
# obs :	1786	14891	7802	510
Depvar:	lperform	lperform	lperform	lperform
intcpt	-5.317	-4.256	-2.929	-8.190
	(-6.46)	(-20.01)	(-9.44)	(-6.59)
gender	0.023	0.017	0.132	-0.083
female=1	(0.64)	(1.42)	(7.55)	(-1.41)
log(age)	1.073	0.453	0.243	1.022
	(5.49)	(10.34)	(3.96)	(3.78)
regio1	===	===	===	0.233
North-west				(0.99)
regio2	-0.285	-0.008	0.039	===
North-east	(-1.31)	(-0.17)	(0.62)	
regio3	0.152	-0.087	0.075	===
Centre	(0.30)	(-0.78)	(0.41)	
regio4-5	-0.021	-0.069	-0.213	-0.035
South isld	(-0.11)	(-1.32)	(-2.28)	(-0.10)
Secondary school degree				
fnl marks	1.511	1.706	1.540	2.196
exit scnd	(11.41)	(42.47)	(24.31)	(11.17)
hgh school	0.330	0.408	0.318	0.037
(lic.class)	(3.85)	(24.91)	(10.47)	(0.31)
hgh school	0.321	0.343	0.247	0.224
(lic.scien)	(6.13)	(21.90)	(11.51)	(2.90)
technical	0.104	0.099	0.026	-0.133
(ragion.)	(2.20)	(6.08)	(1.15)	(-1.00)
foreign	0.656	0.137	0.485	0.422
diploma	(3.76)	(1.70)	(5.30)	(1.43)
Family background (income)				
log family	-0.009	0.042	0.030	0.032
tot income	(-0.32)	(4.25)	(2.13)	(0.80)
househ.head	0.035	0.166	0.017	0.006
selfemploy.	(0.21)	(3.41)	(0.23)	(0.03)
hh self*	-0.003	-0.039	-0.015	-0.014
fam.income	(-0.08)	(-3.37)	(-0.84)	(-0.25)
R^2	0.091	0.147	0.099	0.242

5. Conclusions

We opened the paper by drawing attention to the lower educational achievement in Italy at university level. This represents a puzzle, given the low level of tuition fees and the absence of other access barriers (like closed number of enrolments, admission tests and the like). Then we proposed a formal model predicting that families invest more in their children the higher are the (expectations on) a child's unobservable "ability". Since family income provides an incentive for better student performance, richer parents internalise this effect by investing more resources in the education of their children. Once the investment is undertaken, the students fulfil parents' expectations performing better the higher the family income, because it raises the opportunity cost of poorer performance. When a family is compellingly liquidity constrained and/or the child is insufficiently endowed, we expect a zero investment in education, namely their children do not enrol at the university.

Our empirical analysis does not contradict this theoretical model. Using the Bank of Italy's representative sample of the Italian population (1995), we observe that family income does not prevent enrolment at the university, whereas unobservable "ability" (proxied by cultural family background) is more relevant, especially as it shapes the secondary education choices. Using administrative data on students enrolled in some faculties of the State University of Milan in 1995-96, we show that students' performance is positively correlated with unobservable "ability" (proxied here by the marks obtained on leaving secondary school) and with family income, and we take this evidence as supporting the idea of family networking: students from richer families tend to go quicker because they have better prospects when they leave the university.

On the whole, we claim that liquidity constraints do not seem to play a significant role in preventing the enrolment in Italian public universities, whereas cultural constraints do. Students from better-educated families attend generalist schools at the secondary level, which favour ensuing university enrolment. Once enrolled they probably receive stronger pressure to complete their academic career, and this leads them to perform better and not to drop out during the initial years.

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Appendix - Data sources

Our data sets come from administrative sources and have been obtained from the Admission Office of Università degli Studi di Milano. They are referred to students enrolled in this university during the academic year 1996-97. Given the high number of students enrolled in this university, [40] we restrict ourselves to students from the faculties of Economics, Law, Political Sciences and Mathematics. The formal length of each curriculum is four years. Relevant information is contained in the following table.

Table A1. - Sample means for relevant variables - Academic year 1996-97

Faculty:		Economics	Law	Pol.Sciences	Mathematics
Variable:	Var.name:				
Female	gender	47.32%	56.20%	48.84%	64.60%
Age	age	19.96	20.25	20.83	19.88
Family income (millions of Italian lire - 1995)	faminc	74.44	72.94	68.80	72.11
Father self-employed	auton	37.40%	46.30%	43.09%	36.24%
Region of residence:					
North-West	regio1	98.44%	97.16%	96.98%	96.48%
North-East	regio2	0.53%	1.40%	1.84%	1.58%
Centre	regio3	0.15%	0.23%	0.32%	0.09%
South	regio4	0.87%	1.21%	0.86%	1.85%
Secondary school type:					
Liceo Classico (high school)	hstype1	4.29%	22.56%	10.25%	6.67%
Liceo Scientifico (high school)	hstype2	27.75%	28.32%	28.08%	62.65%
Ragioneria (accounting)	hstype3	46.07%	22.58%	23.31%	6.86%
Tecnico/profess. (vocational)	hstype4	20.52%	25.91%	37.44%	22.15%
Foreign secondary school	hstype5	1.37%	0.63%	0.92%	1.67%
Final marks sec.school(max 60)	hsg	47.11	44.07	43.56	48.93
Effective enrolment *	status1	94.68%	96.29%	95.62%	93.14%
Years of enrolment	numanno	2.39	4.35	4.72	4.74
Number of completed courses	numes	5.11	9.67	10.20	8.16
Average marks (max 31)**	media	23.60	24.29	24.16	24.50
Completed courses per year	speed	1.65	2.14	2.07	1.70
Number of observations	#	2631	24877	15183	1079

* Students that were not effectively enrolled could have either abandoned the university (without formally giving notice to the Admission Office), moved to other university, began the military service, or even died during the current academic year.

** Grades are in thirtieths; the minimum passing grade is 18; grade 31 corresponds to getting the honours.

Family income for the students enrolled in the State University comes from fiscal declarations (mod.740) exhibited at the moment of enrolment, and refer to gross labour incomes earned in 1995 by all the family members. Except from building rents, capital incomes are not included. Family income distributions according to each faulty are reported in figure A.1

Some additional information has to be recalled. The Faculty of Economics at the State University begun its activity on November 1st, 1992, and by the time that these data were collected we do not observe any graduation. This may explain why we do observe lower figures in the "years of enrolment" and in the "numbers of completed courses". In addition, when considering that the highest drop out rates are observed during the initial years, composition biases may explain the lower "number of completed courses".

[40] In 1996-97 the State University of Milan comprises the additional Faculties of Medicine (4681 students), Literature and Philosophy (17963 students), Natural Sciences and Physics (18017 students), Pharmacy (3922 students), Agriculture (3057 students) and Veterinary Science (2251 students). In addition to public universities, there were three private universities (Bocconi University, Catholic University and IULM).

Figure 1

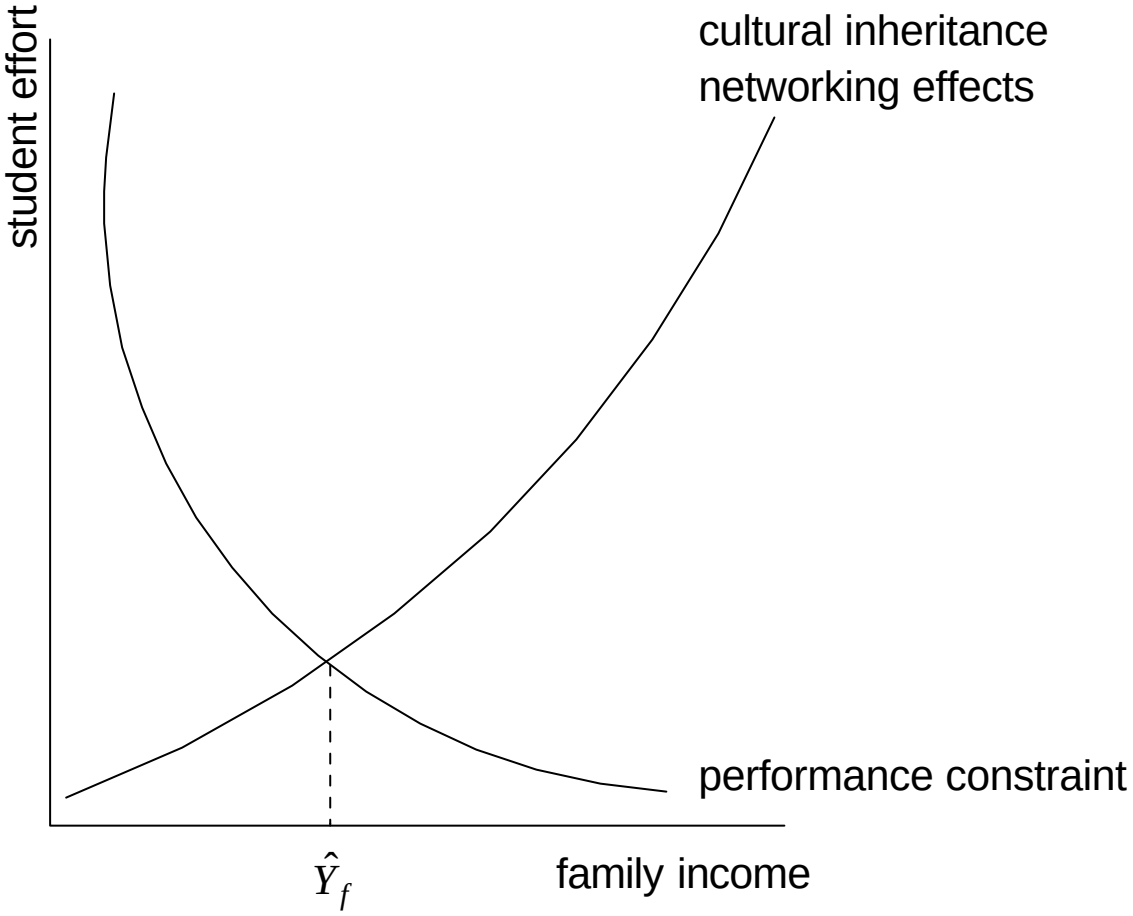

student effort
cultural inheritance
networking effects
performance constraint
$\hat{Y}_f$
family income

Figure 2

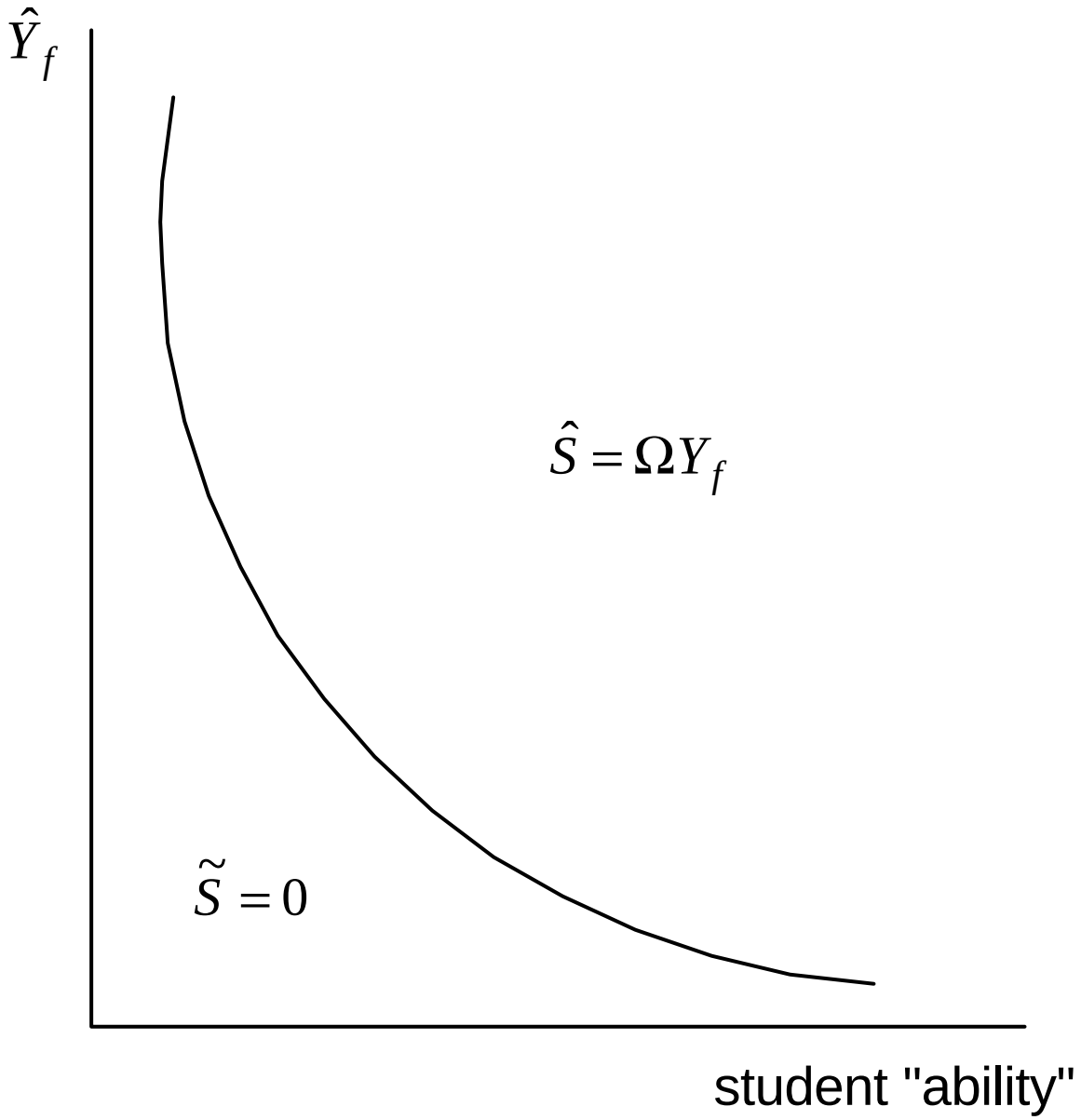


Figure 3

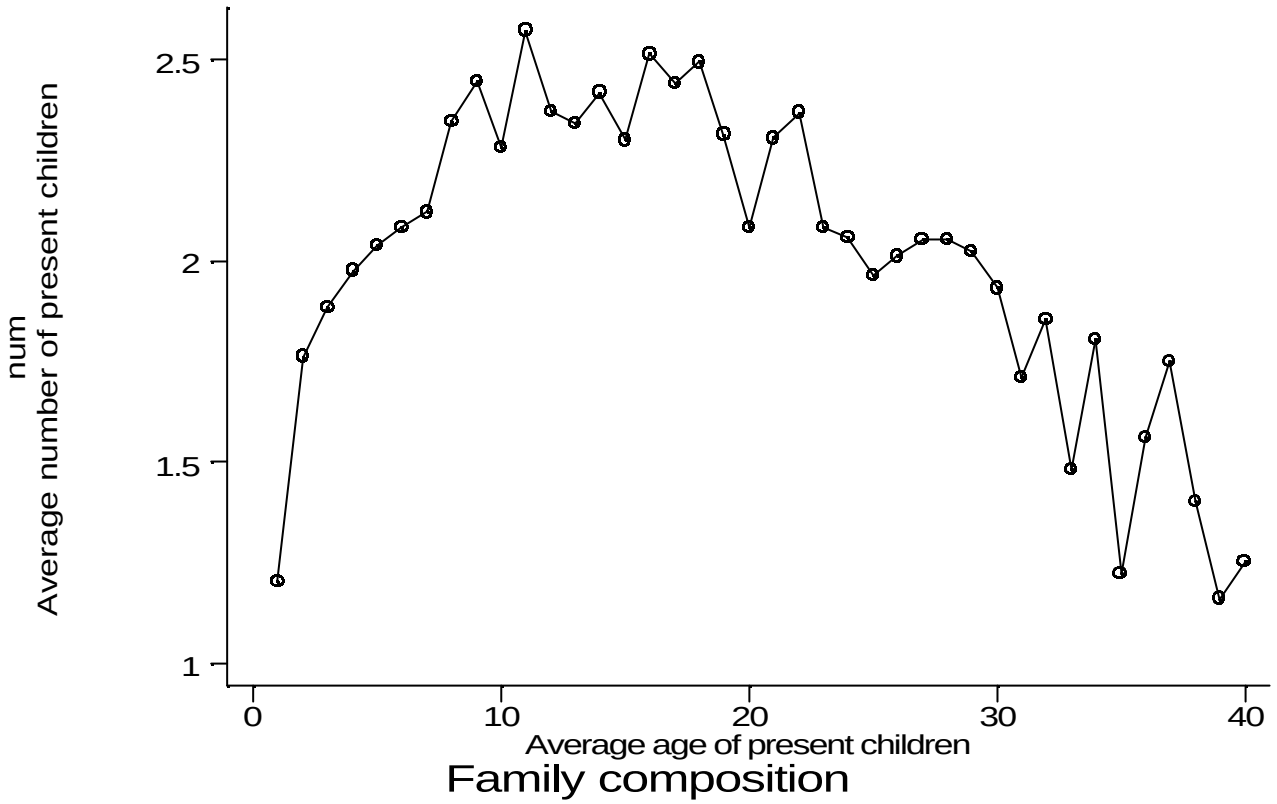

num
Average number of present children
2.5
2
1.5
1
0
10
20
30
40
Average age of present children
Family composition

Figure 4 - The empirical evidence

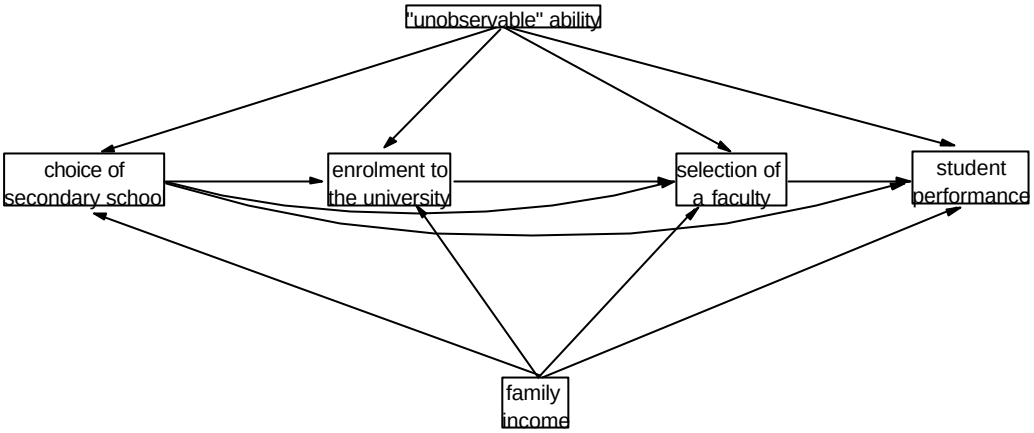
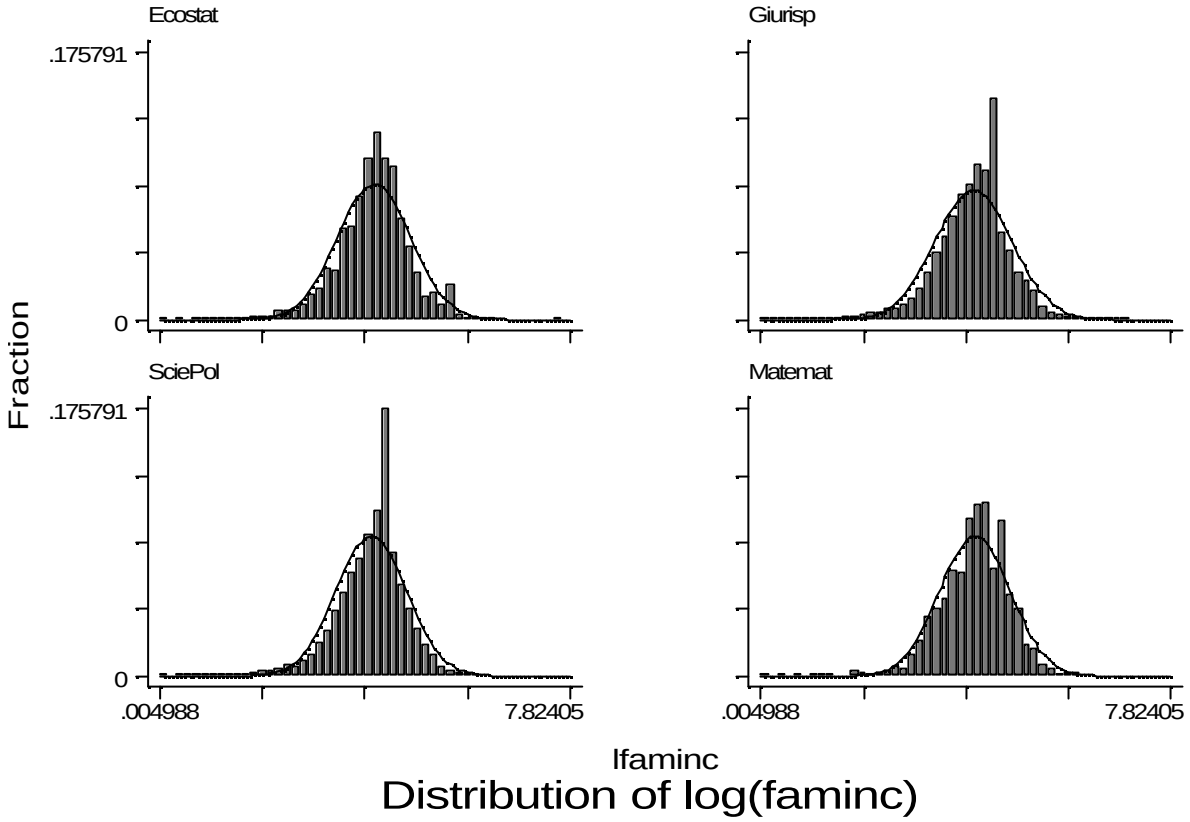


Figure A.1


Ecostat
Giurisp
SciePol
Matemat
.175791
0
.004988
7.82405
Fraction
lfaminc
Distribution of log(faminc)