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ABSTRACT

Private School Quality in Italy*

We discuss how a schooling system's structure may imply that private school enrolment leads to worse subsequent performance in further education or in the labour market, and we seek evidence of such phenomena in Italian data. If students differ not only in terms of their families' ability to pay but also in terms of their own ability to take advantage of educational opportunities ("talent" for short), theory predicts that private schools attract a worse pool of students when publicly funded schools are better suited to foster progress by more talented students. We analyze empirically three surveys of Italian secondary school graduates, interviewed 3 year after graduation. In these data, the impact of observable talent proxies on educational and labour market outcomes is indeed more positive for students who (endogenously) choose to attend public schools than for those who choose to pay for private education.

JEL Classification: I21 and J24
Keywords: ability, education and vouchers

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1. Introduction

Expensive private schools are supposed to be better than free public schools, because they would be priced out in equilibrium if they did not offer a better service to their students. In Italy and other countries, however, private schools do not always project a high-quality image, and the educational and labour market careers of private-school graduates are not as brilliant as one might expect. The "diploma no problem" advertising pitch of at least some Italian private schools motivates Brunello and Rocco (2004) to show that private schools endowed with degree-granting powers may indeed be worse than public schools when the latter enforce demanding standards, so that residual demand for private education comes from students who are financially well endowed but find it hard to meet the performance requirements of public schools. Bertola and Checchi (2004), finding empirically that university performance is worse in the case of students who attended private schools, similarly argue that at least some Italian private schools play a remedial role: they are attended by low achievers and, while improving their performance, cannot bring it up to the level of public school students.

This paper focuses on whether and how individual school choices may be driven by the different suitability of private and public schools to education of students who differ in their ability to make use of educational resources ("talent", for short, regardless of whether such ability is innate or determined by earlier life experiences). Theoretically, we outline how the choices of individuals endowed with heterogeneous and financial resources and heterogeneous talent may be shaped by the different relationship, across differently expensive schools, between individual talent and desirable outcomes. Empirically, we seek evidence of such heterogeneity and choices in data Italian youth who completed secondary education at public or private schools three years before being interviewed.

Section 2 briefly reviews theoretical insights and empirical results from previous studies of the determinants and effects of private schooling choices, and lays down a simple formal model of how students' may be sorted across private and public schooling along two theoretically relevant dimensions: their families' ability to pay, and their own "talent". When the two types of school offer different rewards to differently talented students, sorting of students along that dimension depends on whether the relationship between outcomes and talent is steeper at private or public schools. Section 3 discusses how empirical work may estimate such parameters, reviewing earlier work on Italian data. and focusing in particular on whether and how econometric procedures may let researchers disentangle the relevant notion of student talent from other innate and background influences on their schooling choices and achievements. Section 4 implements instrumental variable

and selection-controlled estimation techniques on datasets resulting from surveys of youth, three years after graduating from private or public schools, carried out by the national institute of statistics (ISTAT) between 1998 and 2004 in Italy. While estimation has to rely on unavoidably debatable identification assumptions, the results of a variety of regressions of study and work outcomes on measures of talent, family background, and school choice all suggest that Italy does have "low quality" private sector, which attracts relatively rich but difficult students, and offers relatively uniform returns to heterogeneously talented individuals. Section 5 concludes discussing briefly how this finding and further research may inform policy choices.

2. Previous literature and theoretical framework

In an economy where schooling choices can be based on the (observable) ability of youth to take advantage of educational resources, efficiency would call for more costly schools to be attended by students who are (in that sense) more "talented." Should financial markets be perfect and all education private, families could optimally choose their offspring's education. The resulting equilibrium would feature a larger aggregate amount (and a more efficient pattern) of investments in education, as well as higher inequality (Glomm and Ravikumar 1992), than a public education system of uniform quality chosen on the basis of the median voter's objectives (Stiglitz 1974).

Since in reality information about students' ability is asymmetric and financial markets are imperfect and incomplete, the allocation of educational resources is not necessarily efficient. Publicly and privately funded schools coexist in all educational system, and the composition of their student bodies is heterogeneous for a variety of reasons and in different ways. As in De Fraja (2002), if individual human capital formation is increasing both in individual students' ability and in the amount of educational resources available to them, it is efficient to spend more in the education of more talented students: private markets tend to sort brighter and richer students in more expensive schools, and public policy may, under asymmetric information, subsidize high-quality schools more than lower-quality ones in order to coordinate efficiently the self-sorting of students along the relevant dimensions.[1] The equilibrium has broadly similar features if the quality of students itself drives schooling choices and outcomes, in that individual formation of human capital is positively affected by average ability in the school through "peer effects." Then, schools that admit the best students are more attractive to all students, and private schools' fee and admission policies result in an equilibrium hierarchy of school quality, with inexpensive public

[1] Stratification on ability and/or family income is also efficient in the model of Fernandez and Gali (1999), where individual ability and school quality (measured by average ability) are complements (*positive assortative mating*). On the optimality of school stratification by student ability see also Robertson and Symons (2003).

schools as the lowest layer and private schools attracting richer and more talented students (Epple and Romano, 1998).

In most models of this type, the public schooling chosen by the political process is low-cost, and low-quality. But this need not be fully realistic. As in Brunello and Rocco (2004), the public standard of quality can be high enough to exclude less talented students, some of whom are rich enough to pay a price to be admitted into less demanding private schools. In such a case, the private school gathers low ability students from richer families.

Empirical evidence, in fact, is mixed as regards performance differences across public and private segments of school systems. Vendenberghe and Robin (2004) estimate the impact of private schooling on competences of 15-year-old students in PISA 2000 survey, and find that selection into private schools (as determined by location) has very heterogeneous effects across countries. Private attendance is associated to better competences in Brazil, Belgium, France, to worse competences the Netherlands and Austria, and has no statistical effects in all other countries. On the same dataset Dronkers and Robert (2003) compare competences across private "independent" (less than 50% of funds from private sources) and "government-dependent" schools, finding a positive partial correlation (after controlling for a comprehensive set of OLS covariates) between student performance and private government-dependent school enrolment; and Woessman (2006) studies the impact of private-public partnership onto student performance, finding that different level of aggregations offer different information inasmuch as they are differently affected by selection bias.

2.1 A simple formal framework

We proceed to formulate a potentially estimable formal specification of the process by which heterogeneous students are sorted across private and publicly-funded schools. Since our data will only allow us to consider choices and outcomes at the level of individual students, we disregard the issue of whether differences in returns to education reflect peer effects (as in Epple and Romano, 1998), or the amount of resources invested in education (as in De Fraja, 2002), or perhaps their composition. All that matters to students is the private cost of education, which of course is lower than its social cost in the case of free or subsidized public education, and its private payoff in terms of further school achievement or labour market performance. It is similarly immaterial, for our purposes, whether students' ability to learn (or "talent") reflects innate or background influences.

Crucially, we let the payoffs of interest to students' families (in terms of educational attainment, employment probability, or expected future income) depend not only on the type (and cost) of school and on talent, but also on the interaction between the two. Formally, supposing that the payoff of education Y is a linear function of talent (denoted θ) of children indexed by i,

$$Y_i = \alpha_j + \beta_j \theta_i , \tag{1}$$

we let the parameters of this relationship differ across schools indexed by j.

Denoting the tuition fee charged by school j with φ_j, we allow its relevance to school choice to differ across families: family i's welfare is decreased by $-(1+r_i)\,\varphi_j$ if its offspring is enrolled in school j. This type of heterogeneity represents the implications of wealth inequality under borrowing constraints, which generally imply that the consumption impact of educational investments is heavier for poorer families (in the absence of financial market imperfections, conversely, the allocation of students to different schools would be the socially optimal one, hence independent of wealth distribution).

Suppose for simplicity that only two types of schools are available. Choices aimed at maximizing each child's achievement, net of costs, lead individual i to attend school 2 when

$$\alpha_2 + \beta_2 \theta_i - (1+r_i)\varphi_2 > \alpha_1 + \beta_1 \theta_i - (1+r_i)\varphi_1 , \tag{2}$$

and school 1 otherwise. Let public schools have index 1, so that $\varphi_2 > \varphi_1$ (private schools charge higher fees): as long as

$$\beta_2 \neq \beta_1 , \tag{3}$$

condition (2) identifies the talent and discount rate combinations that lead students to the two schools. The indifference condition for a family with discount rates r_i identifies a lower bound on the talent level for enrolment in the school with the steeper influence of talent on outcomes:

$$\theta^*(r_i) = \frac{\alpha_1 - \alpha_2}{\beta_2 - \beta_1} + (1+r_i)\frac{(\varphi_2 - \varphi_1)}{(\beta_2 - \beta_1)} \tag{4}$$

When the public school indexed by 1 offers the smaller reward to talent, then highly talented students self-sort into private, as in panel (a) of Figure 1. For given talent, however, enrolment in (expensive) private schools is a more attractive choice for richer families which (in the presence of financial market imperfections) apply a smaller discount rate to future returns. By equation (4), when $\beta_1 < \beta_2$ the indifference locus of families' choices is positively sloped in the space of talent and discount rates, as shown in panel (a) of Figure 2.In this case, as in Epple and Romano (1998) or De Fraja (2002), more talented and richer students choose the schools where talent has better returns, and the model unambiguously predicts better outcomes for private-school students.[2]

[2] The indifference condition segments the population only if it is satisfied in the interior of the variables' support. If the measure of 'talent' can only be positive in the relevant population, parameter configurations such that $\beta_2 > \beta_1 \cup \alpha_2 > \alpha_1$ or $\beta_1 > \beta_2 \cup \alpha_1 > \alpha_2$ imply that one schooling technology completely dominates the other, which is never chosen.

If instead the less expensive public school rewards talent more strongly ($\beta_2 < \beta_1$) then, as in panel (b) of figure 1, it attracts better students than private schools (which continue to be more likely to be attended by richer students, for given talent). Then, the indifference condition (4) implies a positively sloped dividing line in talent and interest rate space, as shown in panel (b) of figure 2. While it remains true that private schools attract richer students, the pool of students attracted by private schools is of lower quality. Expensive schools are indeed better suited to making the best of their students' relatively low talent. But it is no longer the case that private school attendance tends to produce better outcomes, because public school students are better endowed with "talent" and their educational experience makes better use of their ability.

This simple framework suggests that private schools are always attended by richer students if financial markets are imperfect, but are "better" (in terms of their students' outcomes) than public schools only if private funding is spent on resources that complement student talent, so that private schools attract a better student population. If instead public schools are configured so as to attract the higher quality segment of the student population, the model can explain the worse performance of students who attended private schools (as found, for example, by Bertola and Checchi, 2004): even though paying more for education must be beneficial to those students, attending private schools need not lift relatively untalented students to the level of those who attended "good" public schools.

3. Empirical specification

It is important to assess more precisely the empirical realism of lower sensitivity to "talent" of more expensive private schools, because whether private schools are indeed "worse" in that sense has potentially very important implications for the distributional impact of public school design and funding policies, as well as of voucher programs, across differently well-endowed students. To find out whether private schooling complements or substitutes students' talent in determining life outcomes, one might estimate the empirical equivalent of equation (1) on data from different school types, and compare the estimated slope coefficients to see whether talent is rewarded more by private or public education. This is not easy in practice, however, both because it is necessary to account for selection of students into different school types, and because available data need not correspond closely to the theory's variables.

If selection of students into private schools were only based on their talent, it would be possible to assess their "quality" by simply comparing the composition of private schools' student pools to that of public schools. But selection is also driven in the model by households' financial conditions and in the real world by additional heterogeneity along religious, ideological, geographical, and other

dimensions that need not bear on students' outcomes. The relevant variables may or may not be observable, and even when they are it is difficult to detect in available data information about the theoretically relevant notions of schooling-relevant talent and schooling-related outcomes. Parental education, household income and wealth, and other student background information influence a child's ability to learn as well as the family's ability to pay to for private schooling Strong identifying assumptions are needed, in the absence of experimental variation, in order to disentangle the two relevant dimensions in background and earlier outcome data.

Formally, an empirical selection equation relates an individual's propensity p_i^* of attending a private school to an observable talent indicator θ and to a vector Z of observable covariates,

$$p_i^* = Z_i\gamma_S + \theta_i\delta + \varepsilon_{pi} \tag{5}$$

where γ_S and δ are coefficients to be estimated and ε the error term. Only actual attendance is observed, so the dependent variable of any empirical estimation procedure is a dummy variable $p_i = I(p_i^* > 0)$ that equals one when individual i attends private school, zero otherwise. To implement estimation, it is necessary to specify the functional form both of the observable selection mechanism and of the (unobservable) error term's distribution, and to have information about individual talent θ_i, available financial resources, and other determinants of school choices.

The outcome equation, in the second stage of the estimation procedure, relates individual performance to observables:

$$Y_i^* = [\alpha + p_i\tilde{\alpha}] + [\beta + p_i\tilde{\beta}]\theta_i + Z_i\gamma_O + \varepsilon_{yi}, \tag{6}$$

where the dummy variable p_i equals unity when private school 2 is attended, and allows both the intercept and the intensity of talent's effect to differ in that case. What is interesting, from our theoretical perspective, is whether the interaction of talent and private school attendance is negative ($\tilde{\beta}$ <0), to imply that private schooling offers smaller rewards to talent but, as the intercept is higher at private schools ($\tilde{\alpha}$ >0), it may still be preferred to public schools by low-talent students.

To identify the parameters of interest without excessive reliance on functional forms, it is necessary to bring structural considerations to bear on which of the covariates collected in the vector Z_i belong in each of the selection and outcome equations (5) and (6), i.e., to impose prior restrictions on the γ_S and γ_O coefficient vectors. We discuss this difficult issue below, in the context of a discussion of the available Italian dataset's suitability to our purposes.

3.1. Data

Students and their families are of course highly heterogeneous along a variety of dimensions, and public and private also differ in important respects highlighted by several other recent studies of Italian evidence. Checchi and Jappelli (2007) find in the 1993 Survey of Household Income and Wealth, administered by the Bank of Italy to a representative sample of the Italian population, that the probability of enrolling children in private schools is higher in localities where public schools supply low-quality education, on the basis of subjective or objective (such as student/teacher ratios) measures. Private schools may attract students for reasons other than their educational quality, as shown by the data tabulated in Table 1 from a representative sample of Italian families in a survey conducted in 1998 (*indagine Multiscopo*). Geographical proximity, services (such as sporting facilities), and ideology all play a role in generating demand for private education. Using the same dataset, Brunello and Checchi (2005) show that students enrolled private schools are significantly more likely to use expensive (and usually remedial) individual private tutoring, and characterize their background and aspirations using the PISA 2000 survey data: among other factors, private schooling is motivated by better standards of education as well as by parents who are busy enough to appreciate not having to help their children with homework.

In this paper, we analyze the information contained in surveys conducted by the national institute for statistics (ISTAT) in 1998, 2001 and 2004 on a sample of individuals who had completed secondary school three years before being interviewed (1995, 1998 and 2001 respectively).

A first difficult problem is that of finding in the data a counterpart to the theoretical model's "talent" variable (defined as students' ability to make use of educational resources, regardless of whether it is innate or determined by their early life experiences). The available dataset, unlike those available to Harmon and Walker (2000), Blau and Kahn (2005), or Green and Riddell (2003), does not include IQ or competence test results, which would arguably be more relevant to labour market outcomes. What is available is information about the respondent's previous school career: marks at the end of compulsory education and at the end of secondary school, and number of grade repetitions (see Table 2 for descriptive statistics in the sample).[3] These variables convey information about individual-specific innate or background-based ability to learn in secondary school, which is a crucial determinant of private vs. public school choice in our framework. They may or may not be relevant to individual ability to do well in further stages of life independently of schooling experiences. This is not a problem as we aim to explain further educational and labour

[3] This is by construction a self-selected sample, since it includes only students who have completed upper secondary school at the age of 19; in Italy, education was only compulsory up to age 15 when the survey data were collected.

market outcomes with estimation procedures that attempt to use instrumental variables to disentangle the determinants of previous school choices. As a summary observable counterpart to model's "talent" variable, we construct from the three school-career variables a single-dimensional indicator, whose coefficient will correspond to the theoretical model's slope, using factor analysis (principal component method, see Table 3 for the results). The indicator accounts for more than half of the total variance of the three variables.

As to the outcomes, the only available information regards the survey respondents' status three years after completing secondary school. Each individual may be enrolled in a university, may be employed or searching for a job, or may be out of the labour market (military service, housewife, apprenticeship in liberal professions, scholarship). Table 4 reports sample frequencies.[4] A sizeable fraction of respondents is enrolled at university and working at the same time. This may indicate that household liquidity constraints prevent them from studying full-time, or that uncertainty about their own willingness and ability to study towards a university degree induces them to keep open multiple options. While these and other possible rationales for part-time study are not easy to relate to our simple theoretical perspective on talent, financial resources, and schooling choices, the results reported here include part-time study outcomes in the sample (their exclusion has very minor impact on the results).

Our regressions' outcome variables are the (discrete) university enrolment status, and the (continuous) amount of earnings when employed. The former is a good predictor of college graduation, because while university dropout is frequent in Italy (at a rate of some 13% in the population our sample represents) it mostly tends to occur in the first two years of enrolment. Those who report being enrolled after three years are very likely, sooner or later, to obtain a degree. The earnings amount is only observed conditionally on (endogenous) labour market participation and positive earnings (26% of the interviewees who declare to be employed does not report positive earnings; a small 1.5% proportion reports earnings without declaring to be employed). We estimate below regressions in the form of (6) for each of these outcomes.

Household financial resources are not observed in our data, but their role in determining school choice and/or subsequent outcomes may be proxied by information on the parents' education and

[4] The regression results reported in the next Section are rather different across the survey waves, possibly for structural reasons. In Table 4, the incidence of working status is sharply lower in 2001, perhaps reflecting the impact of the "Bologna process" degree reorganization that occurred that year. The shorter degrees offered after the reform may have proved attractive enough to shift some individuals away from the labor market into tertiary education, leaving in the labor market individuals whose lower talent implied a higher likelihood of private school attendance, and lower likelihood of university enrolment.

occupational status. To identify the determinants and outcome effects of school choice, at least two variables are needed to instrument the two endogenous variables on the right-hand side of specifications in the form of (6): the private schooling dummy, and its interaction with talent. Suitable variables should affect the choice of private secondary schooling, but should not directly influence each individual's situation three years after leaving secondary school.

The survey data include a potentially suitable instrument, as respondents were asked whether at least one grandfather or grandmother had completed secondary school or college. Since grandchildren of graduate grandparents are more likely to be rich, this instrument can influence school choices through a relaxation of financing constraints as well as by making school performance more important for a well-educated family. This variable has already been used to instrument school choices by Cappellari (2004) in the 1998 survey, and is also present in the 2001 survey. The question was not asked in 2004 survey, which however asked whether the respondent's family had paid for individual tutoring lessons during secondary school (question 8.1). A "yes" reply (which is possible by both public and private school students) is arguably a reflection of the same forces (academic performance problems, and financial resources availability) that may trigger private school enrolment in our theory. To the extent that neither is likely to influence labour market and university performances directly, availability of private lessons provides a dummy instrumental variable for that choice.[5]

Regional dummies may also be suitable instruments (as in DiPietro and Cutillo 2006). As predictors of private school choices, they may capture relevant factors such as local availability of schools, or religious and political attitudes. They may also reflect factors that influence outcomes directly, however. For this reason we will also test the results' robustness to use of family background information, and to replacement of regional dummies with region-level indicators of private school enrolment.

4. Estimation results

The first three columns of Table 5 report marginal effect estimates from simple probit models of university enrolment three years after secondary school. Talent is positively correlated with the college enrolment probability and with private school attendance. The interaction between talent

[5] If family background directly influences the outcomes of interest, these and essentially any other non-experimental identification strategies are invalid. For example, network connections may play an important role in a stratified job market. In the data we analyze, however, only about a quarter of the self-selected sample of individuals who are already working three years after upper secondary school graduation report that they found a job through family connections (26.0% in the 1998 survey, 26.7% in the 2001 survey, 25.2% in the 2004 survey).

and private schooling (parameter $\tilde{\beta}$ in the specification introduced above) is estimated to be negative, but is not significantly different from zero in the two earlier surveys, and is only significant at 10% in the most recent survey. The regression, which also controls for the parents' occupation and education, is estimated in the next three columns of Table 5 by instrumental variables, treating the private schooling dummy and its interaction with talent as endogenous variables. The estimated coefficients of the endogenous variables are larger in the IV specification, suggesting that regional and private-tutoring dummies contain useful information (over and above "talent" as observed in our data) regarding private school choices. The marginal effects reported in the table are computed at the sample mean of the regressors, however, and the interaction's size and sign may be very different elsewhere. To address this concern we compute and report in Figure 3 the interaction effects implied by the IV probit estimates for each observation in the three surveys. These are uniformly negative: in our data, private secondary schooling makes talent less relevant to university enrolment, consistently with he $\tilde{\alpha} > 0$, $\tilde{\beta} < 0$ configuration whereby private schools are "worse" (in terms of the rewards they offer to "good" students) than public ones, as in panel (b) of figure 2.

In Table 6 we pursue an alternative estimation strategy. To assess the realism of our model's framework of analysis, we compare the return to "talent" in terms of college enrolment probability in separate subsamples of private and public upper secondary school students. We account for sample selection by modelling self-selection on the basis of observables (such as age and gender) that are also allowed to influence outcomes, and of the background variables that served as instruments in Table 5 and now play the role of exclusion restriction in the Heckman procedure's first stage. Talent's association with college enrolment is estimated to be positive; consistently with the previous table's interaction effects, the coefficient is more positive in the subsample of students from public secondary schools. In the first stage, our measure of talent is positively associated with public school enrolment, and negatively associated with private school enrolment. While the estimates are statistically significant only in the 1998 and 2004 surveys, the evidence is again consistent with a "remedial" role for a private school sector offering relatively low rewards to talent and, therefore, attracting relatively low-talent students.

In Italy, as in other countries, student "quality" is likely very different and differently rewarded in terms across academic and vocational secondary school tracks.[6] Table 7 allows the private-school

[6] When the public sector already sorts students by talent into different tracks (academic, technical or vocational), which may be different in terms of peers, teachers' quality, and resource availability, we expect a lower return to paying a positive price to self-selection into a private school. However,

interaction effects to differ across school tracks. The strongest interactions are estimated in the case of private academic high schools (*licei*), which seem to be quite effective in fostering high college enrolment probabilities despite low individual talent. The estimated marginal effects suggest a net contribution in probability of almost one third (two thirds in the IV estimates). This suggests that, given that secondary schools, an important portion of talent-based sorting takes place along the academic/vocational divide, as witnessed by the sign and the statistical significance of the interaction coefficients, rather than along the public/private dimension. Interestingly, and consistently with our theoretical perspective, there is negative interaction between private school attendance and talent.

As a robustness check for the results reported in Table 5, in Table 8 we exclude regional dummies from the instrument set while including parental occupation (whether father and mother were self-employed when the student was 14-year-old), grandparents graduation (in 1998 and 2001), use of individual tutoring lessons (in 2004), and the regional share of students attending private secondary school.[7] The results in the first three columns indicate that these variables do predict private school attendance. Self-employment of parents is positively associated with private schooling, which is not surprising since families of self-employed workers may be richer, and/or more interested in educational status, and may also appreciate the longer hours and higher flexibility of private schools' schedules. Grandparents' education and use of individual tutoring lessons also raise the probability of private enrolment. Finally, the student share in private schools at regional level exhibits a positive correlation in the data. Thus the first requirement for a good instrument (correlation with the endogenous variable) is passed. Columns 4 to 6 of Table 8 detect little correlation with the dependent variable. Parental self-employment and share of students in private display almost no correlation with college enrolment, while the variable related to the cultural capital of the family (grandparental education, use of private individual tutoring) preserve their statistical significance, despite the inclusion of father and mother university education. In the final three columns of Table 8 we show the results of IV probit estimation, where all proposed instruments are included. The results are qualitatively similar to those in Table 5, and quantitatively stronger. Graduating from a private secondary school is associated with a premium in the probability of college attendance (in 2001 sample), but the marginal return to talent in private

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given that school tracks differ in terms of labor market prospects, within each track our general model continues to apply.

[7] In order to capture the role of local private school availability at the beginning of the schooling career, one should measure it five years before graduation (plus years of repetition). To make things simpler we have chosen an intermediate year (1992-93), which is identical across surveys. Since the finest identifier is the region, we matched the information on a regional base. The student share in private schools ranges from 2.16% in Sardinia to 14.7% of Liguria.

schooling is lower than in public schools (in the 1998 and 2004 surveys this effect is significant at the 10% level). Remarkably, in this case the point estimate of the interaction coefficient is so large as to imply a negative return to talent in private schools.

Since individuals are only surveyed very soon after exiting secondary school, the available data are poorly suited to estimating the effectiveness of private and public schooling in determining labour market success. It is still interesting, however, to estimate a (log)wage function, correcting for selection into employment using Heckman's two-step procedure. Unlike those meant to assess the role of secondary schooling in determining university enrolment, the estimation procedure treats private school attendance as an exogenous variable rather than an endogenous choice. The data are generated by a double self-selection (first between public and private and then between paid employment and other labour market status), but neglecting the former may not bias strongly our estimates of returns to talent, because high-talent individuals tend to be sorted into public schools and to be engaged in further study (even when they attended private schools) three years after graduation. According to our earlier estimates, high talent is not as likely to lead to University for students who attended private schools as for students who attended public schools. Thus, the sample available for estimation of wage-terms returns to talent certainly over-represents low-talent students, but may well be representative in terms of the interaction of talent with the private/public dimension.

In Table 9, selection into employment is controlled by parental background and secondary school types, which identify the selection equation and are excluded from the wage-determination equation, which features gender, age, and talent. Young females suffer a wage differential in the order of 20%, while talent reduces the probability of being employed but increases the corresponding earnings. Having attended a private school is insignificantly correlated with the wage level, but the interaction of that dummy variable with talent is estimated to be negative (and significantly so in the most recent wave). To illustrate the qualitative consistency of these results with our theoretical perspective, we display the data from the most recent wave in the same format as our theoretical Figure 1 above. In Figure 4, along with the predicted probability of college enrolment by type of school attended. Figure 5 reports the corresponding information as regards earnings: the early schooling career summarized by the empirical "talent" proxy is almost irrelevant to earnings in the case of public school graduates, and has a negative slope point estimate among those who enrolled in private schools. These empirical diagrams are qualitatively similar to panel (b) of Figure 1, indicating that in the Italian secondary education system private schools are configured so as to attract students from the bottom end of the talent distribution.

5. Discussion and further research

Our theoretical perspective and empirical results suggest that in Italy private schools attract children who hail from relatively rich families but are difficult to educate, while public schools reward talent strongly enough to attract a better pool of students. As long as peer effects are relevant, the lower quality of private schools' student bodies implies a similarly low quality (for similar resources) of the education offered by this segment of the market.

Such a configuration contrasts sharply with standard views and evidence from Anglo-Saxon countries, where quality differentiation across schools reflects their private costs, and loans or targeted subsidies (rather than uniform public school funding) could allow talented poor students to attend private schools. By preventing borrowing constraints from distorting the allocation of students across schools that best reflects cost and efficiency considerations, school vouchers can increase the equality of opportunity, as long as they are correctly targeted to needy students.[8] But if private schools serve a remedial purpose, and in the light of informational and organizational failures of the private market for education, the efficiency properties of voucher schemes and other quasi-market arrangements are not obvious. Providing subsidized or free education to higher-quality students may be efficient, depending on how costly it is for the State to do so. And the political attractiveness of high-quality public schools depends on such subsidies' distributional implications, which are also ambiguous in general and depend on the relationship between what we call "talent" and the material well-being of households.

Both aspects deserve to be modelled in further work. Doing so would make it possible to explain through politico-economic mechanisms why in Italy (in contrast to the United States and other Anglo-Saxon countries) public schools have traditionally been demanding, selective, and productive as regards students' efforts and abilities, leaving a mostly remedial role to the private sector's supply of education. Further theoretical and empirical work would also offer insights on the distributional implications, across individuals with different financial and cultural endowments, of voucher programs, other forms of private school subsidization, and more general aspects of schooling systems' structure and reform.

[8] Brunello and Checchi (2005) review the current Italian experience with school vouchers, showing that in most cases they are offered unconditionally, thus actually reducing the equality of opportunity, since they work as a regressive subsidy.

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Table 1 – Fraction of students less than 18 years old enrolled in private schools by type of school and reason of parents' choice – Italy 1998

	Primary	*Lower secondary*	*Upper secondary*	*Total*
No specific reason	11.3	11.6	6.1	9.8
No choice (only school available)	7.6	4.8	27.4	12.7
Vicinity	14.8	12.8	11.7	13.5
Services offered	48.9	41.5	26.1	40.8
Cultural (ideological) reasons	14.0	13.4	13.5	13.7
Quality of teaching	36.8	43.4	39.4	38.9
Other reasons	12.5	9.5	5.8	9.9

The table reports the answer to reasons for choosing private schools in a sample of 20,153 households interviewed in June 1998. Source: ISTAT, 2000, *Indagine multiscopo sulle famiglie. Famiglia, soggetti sociali e condizione dell'infanzia*.

Table 2 – Descriptive statistics – weighted – ISTAT 1995-1998-2001

Survey date	1998 (graduate in 1995)		2001 (graduate in 1998)		2004 (graduate in 2001)	
observations	18843		23263		20408	
attended a private secondary school	0.134		0.075		0.096	
	public	private	public	private	public	private
	demographics					
female	0.517	0.570	0.535	0.496	0.525	0.461
22 years old	0.584	0.555	0.622	0.510	0.666	0.469
	family background					
father self-employed	0.291	0.399	0.294	0.419	0.284	0.394
mother self-employed	0.080	0.123	0.071	0.113	0.075	0.112
father college degree	0.077	0.126	0.080	0.159	0.112	0.162
mother college degree	0.058	0.079	0.065	0.116	0.093	0.127
	proxies for talent					
marks at end of lower secondary:						
sufficiente	0.323	0.400	0.308	0.468	0.238	0.361
buono	0.276	0.285	0.271	0.275	0.299	0.342
distinto	0.204	0.177	0.205	0.146	0.222	0.178
ottimo	0.198	0.137	0.216	0.111	0.241	0.119
marks at end of upper secondary:						
36 to 41/60 (or 60-69/100)	0.345	0.388	0.342	0.427	0.334	0.406
42 to 47/60 (or 70-79/100)	0.307	0.290	0.300	0.276	0.266	0.270
48 to 53/60 (or 80-89100)	0.195	0.188	0.190	0.159	0.185	0.159
54 to 60/60 (or 90 to100/100)	0.153	0.134	0.169	0.138	0.216	0.164
failed at first year of upper secondary school	0.100	0.084	0.074	0.116	0.179	0.401
secondary school track:						
vocational	0.158	0.070	0.1666	0.0298	0.1633	0.034
technical school	0.529	0.528	0.5021	0.534	0.4003	0.4693
academic	0.2682	0.375	0.2852	0.4266	0.3173	0.3318
others	0.0447	0.0267	0.0462	0.0096	0.1191	0.1649
	outcome variables					
currently enrolled in university	0.4266	0.4893	0.4597	0.5108	0.5436	0.5081
currently employed	0.4537	0.4221	0.5277	0.5225	0.4651	0.485
observations with positive wage	5382	598	10719	706	7739	976
net monthly wage (euro) - mean	739.95	706.13	786.55	805.81	862.08	941.17
net monthly wage (euro)- standard deviation	432.53	304.01	263.96	274.80	431.08	687.75

Source: ISTAT 1999 - *Percorsi di studio e di lavoro dei diplomati - Indagine 1998* (file standard)
ISTAT 2002 - *Percorsi di studio e di lavoro dei diplomati - Indagine 2001* (file standard)
ISTAT 1995 - *Percorsi di studio e di lavoro dei diplomati - Indagine 2004* (file standard)

Table 3 – Principal component analysis – Proxy for talent – ISTAT 1995-1998-2001

	eigenvalue	% expl. variance
Factor1	1.59513	0.5317
Factor2	0.86718	0.2891
Factor3	0.53769	0.1792
	loading factors	uniqueness
marks at end of lower secondary	0.8109	0.3425
marks at end of upper secondary	0.8038	0.3539
failed at first year of upper secondary school	-0.5399	0.7085

Source: see note to Table 2

Table 4 – Status of secondary school graduates – ISTAT 1995-1998-2001

Survey	1998	2001	2004
just enrolled to college	36.00	34.02	44.77
enrolled to college and working	7.51	12.33	16.97
just working	37.43	40.40	30.15
not working nor studying	19.06	13.25	8.11

Source: see note to Table 2

Table 5 – Probability of college enrolment – probit and IV probit – marginal effects
ISTAT 1998-2001-2004

	1 dprobit 1998	2 dprobit 2001	3 dprobit 2004	4 divprobit 1998	5 divprobit 2001	6 divprobit 2004
female	0.004	0.0372	0.0064	0.0176	0.0434	0.0055
	[0.25]	[3.18]***	[0.52]	[1.60]	[5.51]***	[0.59]
22 year old	0.0676	0.0682	0.0355	0.0425	0.0392	0.0359
	[4.48]***	[5.47]***	[3.52]***	[4.48]***	[5.00]***	[3.46]***
talent (1st factor extracted from votes and repetition)	0.2208	0.2195	0.1978	0.2956	0.2352	0.2893
	[21.40]***	[23.46]***	[26.57]***	[11.12]***	[11.23]***	[10.94]***
attended private secondary	0.0911	0.0739	0.0407	0.2831	0.2335	0.3753
	[3.42]***	[1.79]*	[1.19]	[2.75]***	[2.73]***	[6.55]***
private x talent	0.0161	-0.0223	-0.0339	-0.7053	-0.4486	-0.6372
	[0.76]	[0.79]	[1.71]*	[2.90]***	[1.88]*	[3.32]***
father self-employed	0.3635	0.3786	0.2357	0.3639	0.3357	0.2538
	[11.17]***	[10.47]***	[14.30]***	[17.35]***	[15.10]***	[13.60]***
mother college degree	0.3058	0.2929	0.2445	0.2828	0.2747	0.2269
	[10.00]***	[10.17]***	[13.56]***	[11.31]***	[12.45]***	[10.11]***
Observations	17604	21362	20013	17604	21362	20013
Pseudo R-squared	0.19	0.19	0.19	0.18	0.17	0.16
Log likelihood	-9746.88	-11922.1	-10727.84	-9721.33	-11334.65	-11615.36

Robust z statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% - Weighed – errors clustered by regions.
Instruments: regional dummies; graduate grandfather (1995 and 1998) or individual tutoring lessons (2001) - Source: see note to Table 2.

Table 6 – Probability of college enrolment – Heckman probit - ISTAT 1998-2001-2004

	1	2	3	4	5	6	7	8	9	10	11	12
	1998 survey (graduate in 1995)				2001 survey (graduate in 1998)				2004 survey (graduate in 2001)			
	college probit if private	selected into private	college probit if public	selected into public	college probit if private	selected into private	college probit if public	selected into public	college probit if private	selected into private	college probit if public	selected into public
female	0.161	0.3022	0.0126	-0.3007	0.2368	0.2689	0.112	-0.2676	0.0771	0.2298	-0.0007	-0.226
	[2.06]**	[11.43]***	[0.48]	[11.29]***	[2.94]***	[9.70]***	[5.20]***	[9.66]***	[1.19]	[9.38]***	[0.03]	[9.18]***
22 year old	0.1058	-0.0129	0.114	0.0114	0.2491	-0.1381	0.0947	0.1356	0.3549	-0.2523	0.0291	0.2458
	[1.60]	[0.45]	[4.73]***	[0.40]	[3.49]***	[4.68]***	[4.27]***	[4.58]***	[5.64]***	[9.00]***	[1.17]	[8.79]***
talent (1st factor extracted from votes and repetition)	0.512	-0.0553	0.5715	0.0563	0.4569	-0.0071	0.5527	0.004	0.3281	-0.0742	0.5255	0.075
	[12.96]***	[3.76]***	[41.81]***	[3.80]***	[11.26]***	[0.43]	[42.27]***	[0.24]	[11.25]***	[5.59]***	[43.68]***	[5.65]***
father college degree	0.8307	0.1619	1.0224	-0.1538	0.5657	0.408	0.9772	-0.4238	0.6666	0.3599	0.7292	-0.3563
	[6.58]***	[2.93]***	[16.47]***	[2.74]***	[4.14]***	[7.43]***	[18.13]***	[7.72]***	[5.54]***	[8.42]***	[13.10]***	[8.26]***
mother college degree	0.5315	-0.0806	0.7782	0.0922	0.4497	0.2138	0.7589	-0.2286	0.517	0.2677	0.7187	-0.2622
	[3.34]***	[1.20]	[11.66]***	[1.32]	[3.11]***	[3.44]***	[12.75]***	[3.69]***	[4.28]***	[5.50]***	[11.75]***	[5.34]***
at least one graduate grandparent		0.2568		-0.2831		0.3987		-0.3482				
		[5.61]***		[5.21]***		[9.03]***		[6.68]***				
resorting to private tuitions										0.1333		-0.1607
										[3.06]***		[3.56]***
Observations	17604	17604	17604	17604	21370	21370	21362	21362	20013	20013	20013	20013
Log likelihood	-6951.6		-14393.2		-5965.9		-15421.3		-8281.2		-17036.5	

Robust z statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1%
Regional dummies included in the selection equation.

Table 7 – Probability of college enrolment – decomposition by school types
probit and IV probit – marginal effects - ISTAT 1998-2001-2004

	1 dprobit 1998	2 dprobit 2001	3 dprobit 2004	4 divprobit 1998	5 divprobit 2001	6 divprobit 2004
female	0.0048	0.0353	0.0006	-0.0177	0.0115	-0.0282
	[0.28]	[3.07]***	[0.05]	[1.12]	[0.94]	[1.43]
22 year old	0.0607	0.0669	0.0299	0.0113	0.0263	0.0184
	[3.89]***	[5.16]***	[3.10]***	[0.78]	[2.40]**	[1.43]
talent (1st factor extracted from votes and repetition)	0.222	0.2199	0.1989	0.338	0.3192	0.3124
	[21.65]***	[23.49]***	[26.28]***	[9.77]***	[9.65]***	[9.50]***
private x high school	0.3262	0.2981	0.2706	0.6771	0.7271	0.4968
	[10.46]***	[11.32]***	[10.42]***	[5.33]***	[5.48]***	[5.79]***
private x technical school	-0.0279	-0.0704	-0.1486	0.0319	-0.3399	-0.3424
	[0.75]	[1.17]	[3.65]***	[0.12]	[2.72]***	[1.01]
private x vocational school	-0.2618	-0.1354	-0.2682	-0.4285	-0.3354	0.1272
	[2.74]***	[3.76]***	[6.92]***	[3.30]***	[3.31]***	[0.33]
private x talent	-0.0229	-0.062	-0.0936	-1.3022	-1.6173	-0.8946
	[0.98]	[2.39]**	[4.45]***	[3.95]***	[4.00]***	[3.49]***
father college degree	0.3446	0.3722	0.2267	0.2698	0.2259	0.2344
	[9.09]***	[10.84]***	[13.71]***	[8.03]***	[5.99]***	[10.78]***
mother college degree	0.3018	0.2863	0.239	0.2459	0.2012	0.1931
	[10.29]***	[9.61]***	[13.42]***	[7.72]***	[6.37]***	[6.80]***
Observations	17604	21362	20013	17604	21362	20013
Pseudo R-squared	0.2	0.2	0.2	0.19	0.18	0.16
Log likelihood	-9607.7	-11842.86	-10588.14	-9692.29	-11310.81	-11610.57

Robust z statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% - Weighed - errors clustered by regions.

Instruments: regional dummies; graduate grandfather (1995 and 1998) individual tutoring lessons (2001) - Source: see note to Table 2.

Table 8 – Probability of college enrolment – alternative instruments - ISTAT 1998-2001-2004

	1 dprobit private 1998	2 dprobit private 2001	3 dprobit private 2004	4 dprobit college 1998	5 dprobit college 2001	6 dprobit college 2004	7 divprobit college 1998	8 divprobit college 2001	9 divprobit college 2004
father self-employed	0.0542	0.0353	0.0418	0.0058	-0.0038	0.0096			
	[5.35]***	[3.30]***	[3.28]***	[0.34]	[0.36]	[0.94]			
mother self-employed	0.0415	0.0245	0.0268	0.0124	0.0262	0.0445			
	[3.25]***	[3.21]***	[1.99]**	[0.62]	[0.82]	[3.33]***			
at least one graduate grandparent	0.074	0.0614		0.1326	0.1592				
	[3.43]***	[6.51]***		[6.32]***	[4.49]***				
share of students enrolled in private schools	1.134	0.8012	0.3388	-0.2084	-0.3307	-0.1512			
	[9.93]***	[7.86]***	[1.14]	[1.09]	[1.83]*	[0.66]			
resorting to private tuitions			0.0315			0.105			
			[2.62]***			[10.89]***			
female				0.0048	0.0393	0.0048	0.1352	0.0593	0.069
				[0.30]	[3.34]***	[0.39]	[1.47]	[3.99]***	[1.24]
22 year old				0.071	0.0695	0.0357	0.0366	0.0315	0.0421
				[4.62]***	[5.55]***	[3.58]***	[1.01]	[2.30]**	[1.08]
1st factor extracted from votes and repetition 1st year				0.2205	0.2182	0.201	0.9901	0.4351	1.0027
				[21.40]***	[23.42]***	[26.63]***	[2.08]**	[4.82]***	[2.12]**
attended private secondary				0.087	0.0692	0.0366	0.3037	0.5624	-0.0298
				[3.23]***	[1.77]*	[1.08]	[0.81]	[2.68]***	[0.07]
private x talent				0.0178	-0.0202	-0.034	-7.2139	-2.7597	-5.9434
				[0.87]	[0.73]	[1.70]*	[1.61]	[2.63]***	[1.68]*
father college degree				0.3265	0.3468	0.2338	0.3357	0.2672	0.2416
				[8.30]***	[9.72]***	[14.43]***	[4.38]***	[5.39]***	[3.81]***
mother college degree				0.2756	0.2591	0.2434	0.1948	0.2811	0.0482
				[9.73]***	[6.72]***	[12.93]***	[1.82]*	[7.74]***	[0.33]
Observations	18840	22635	20201	17604	21362	20013	17604	21362	20013
Pseudo R-squared	0.04	0.05	0.01	0.2	0.2	0.2	0.19	0.17	0.16
Log likelihood	-7162.38	-5668.64	-6298.22	-9705.21	-11848.4	-10682.5	-9701.46	-11326.7	-11592.7

Robust z statistics in brackets * significant at 10%; ** significant at 5%; *** significant at 1% - Weighed - errors clustered by regions.
Instruments: father and mother self-employed – share of student in private secondary schools at regional level in 1992-93; graduate grandfather (1995 and 1998) individual tutoring lessons (2001) - Source: see note to Table 2

Table 9 – Determinants of (log) wage - OLS with Heckman's selection equation – ISTAT 1998-2001-2004

	1 log wage 1998	2 employed 1998	3 log wage 2001	4 employed 2001	5 log wage 2004	6 employed 2004
female	-0.2333		-0.1722		-0.2322	
	[7.53]***		[8.50]***		[6.92]***	
22 year old	-0.0389		-0.0582		-0.0966	
	[1.86]*		[3.62]***		[7.17]***	
talent (1st factor extracted from votes and repetition)	0.0575	-0.1189	0.0399	-0.1734	0.0514	-0.234
	[4.37]***	[7.42]***	[6.93]***	[10.16]***	[3.72]***	[13.75]***
attended private secondary	-0.015		0.0283		0.0018	
	[0.54]		[0.71]		[0.08]	
private x talent	0.0038		0.0004		-0.0404	
	[0.12]		[0.01]		[1.98]**	
father self-employed		-0.0109		0.0653		-0.0183
		[0.35]		[2.35]**		[0.68]
mother self-employed		0.0994		-0.0096		0.1117
		[2.30]**		[0.19]		[2.55]**
father college degree		-0.2545		-0.1792		-0.3455
		[3.09]***		[2.61]***		[4.84]***
mother college degree		-0.1859		-0.2025		-0.2126
		[1.84]*		[2.09]**		[3.88]***
Observations	17604		21346		20013	
Log likelihood	-322490.72		-311196.48		-352239.93	

Robust z statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% -
Weighed – errors clustered by regions.
Type of secondary dummies included in the selection equation - regional dummies included in the wage equation.
Source: see note to Table 2

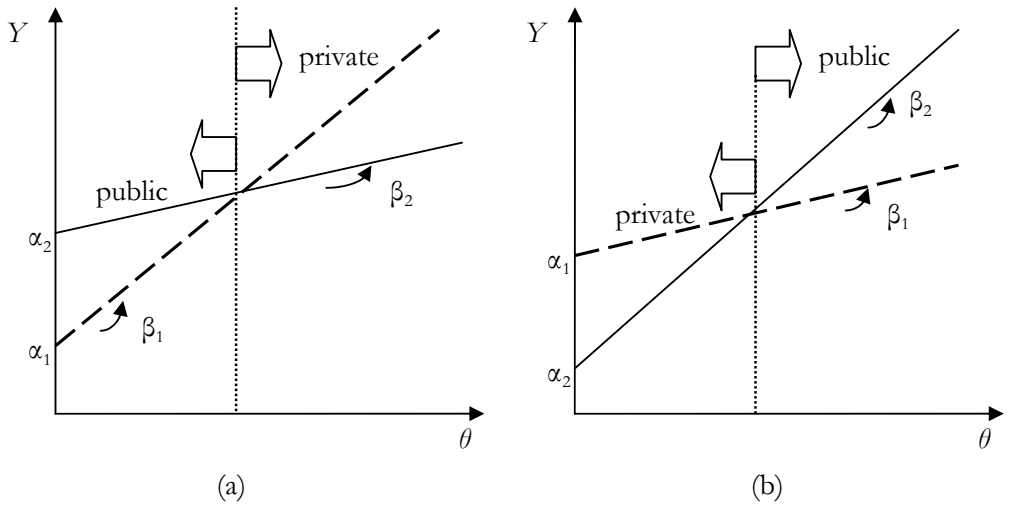

Figure 1 –Different returns to talent and student choices.

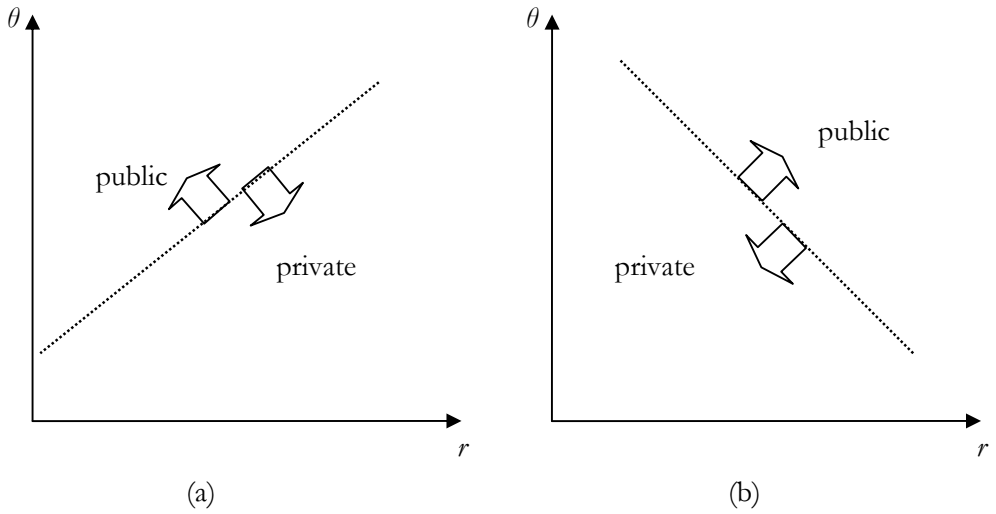

Figure 2 – Selection into schools.

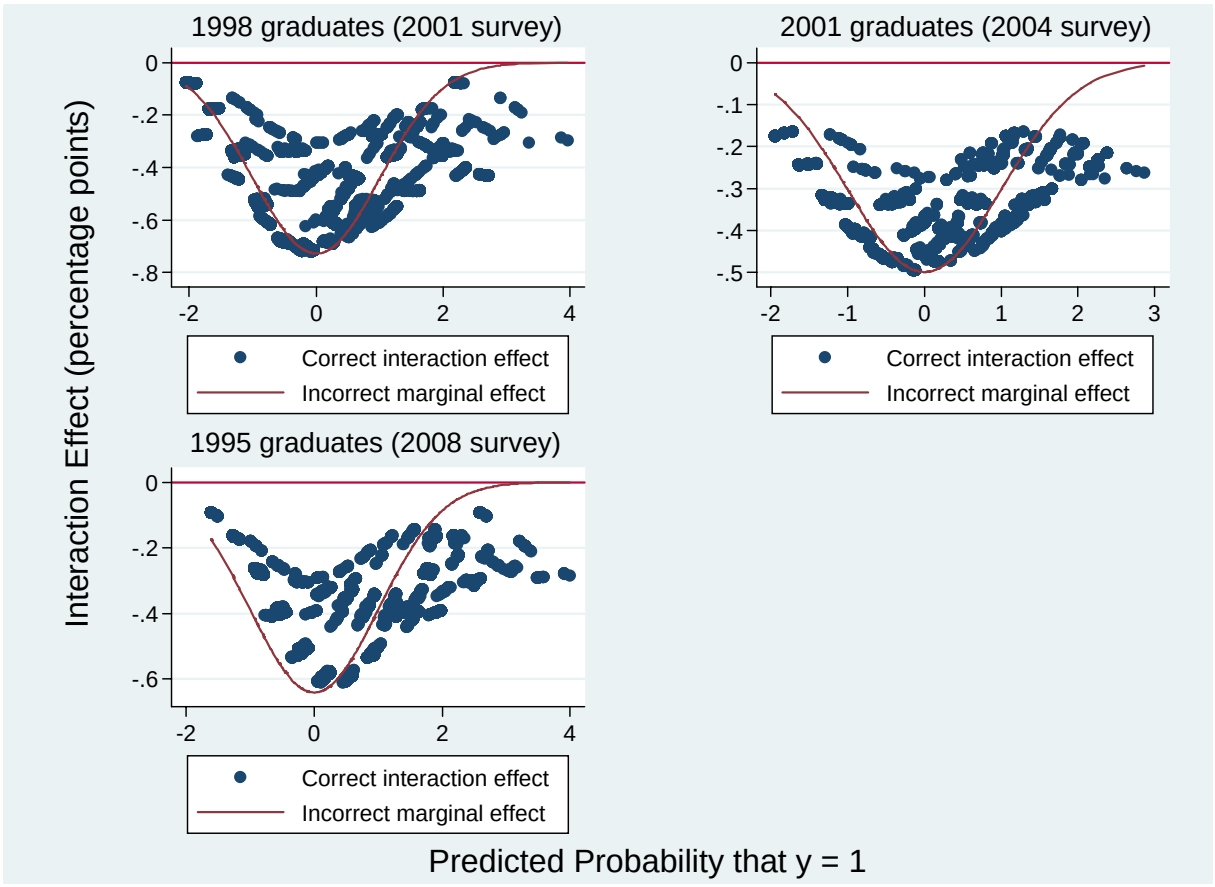

Figure 3 – Observation-specific marginal interaction effects between talent and private, after IV estimation of probability of college enrolment, as plotted by the inteff.ado procedure in Stata.

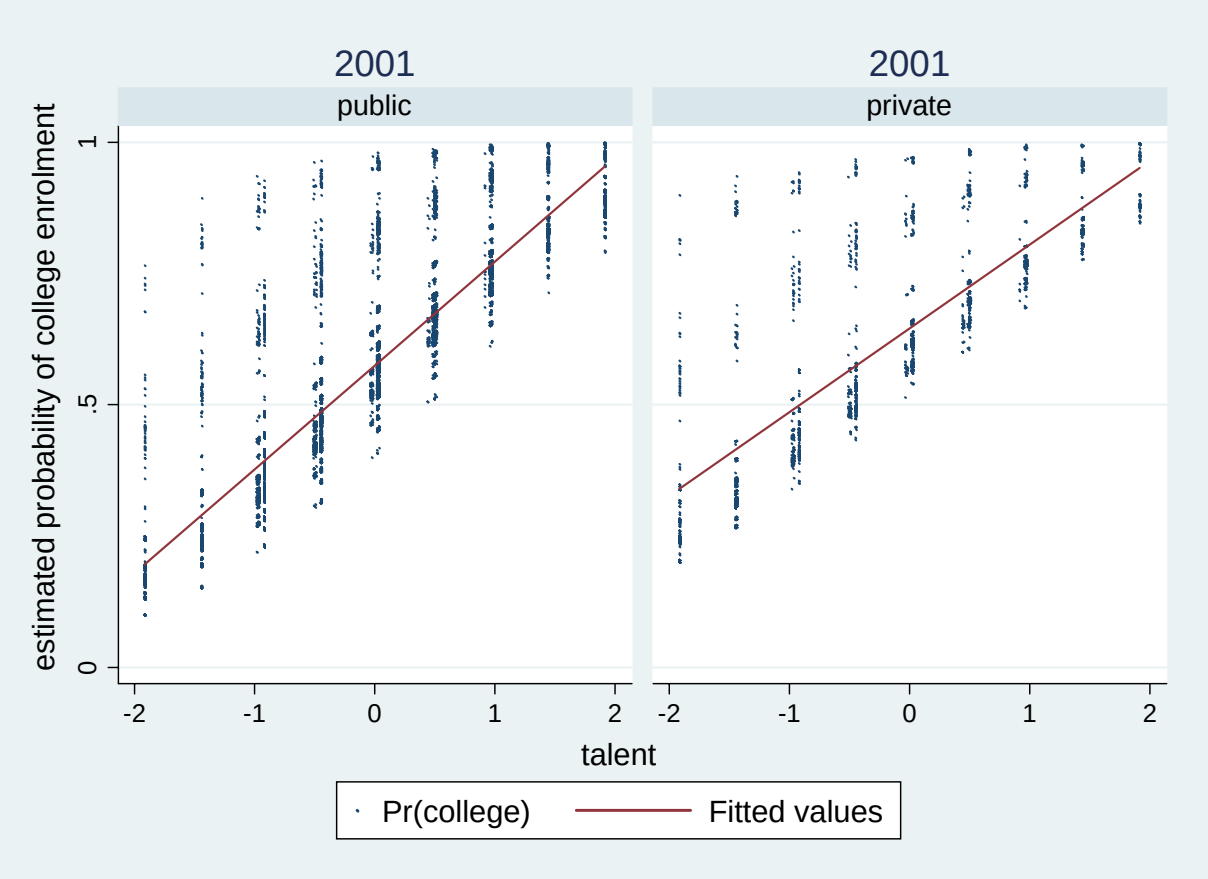

Figure 4 – Probability of college enrolment – ISTAT 2001.

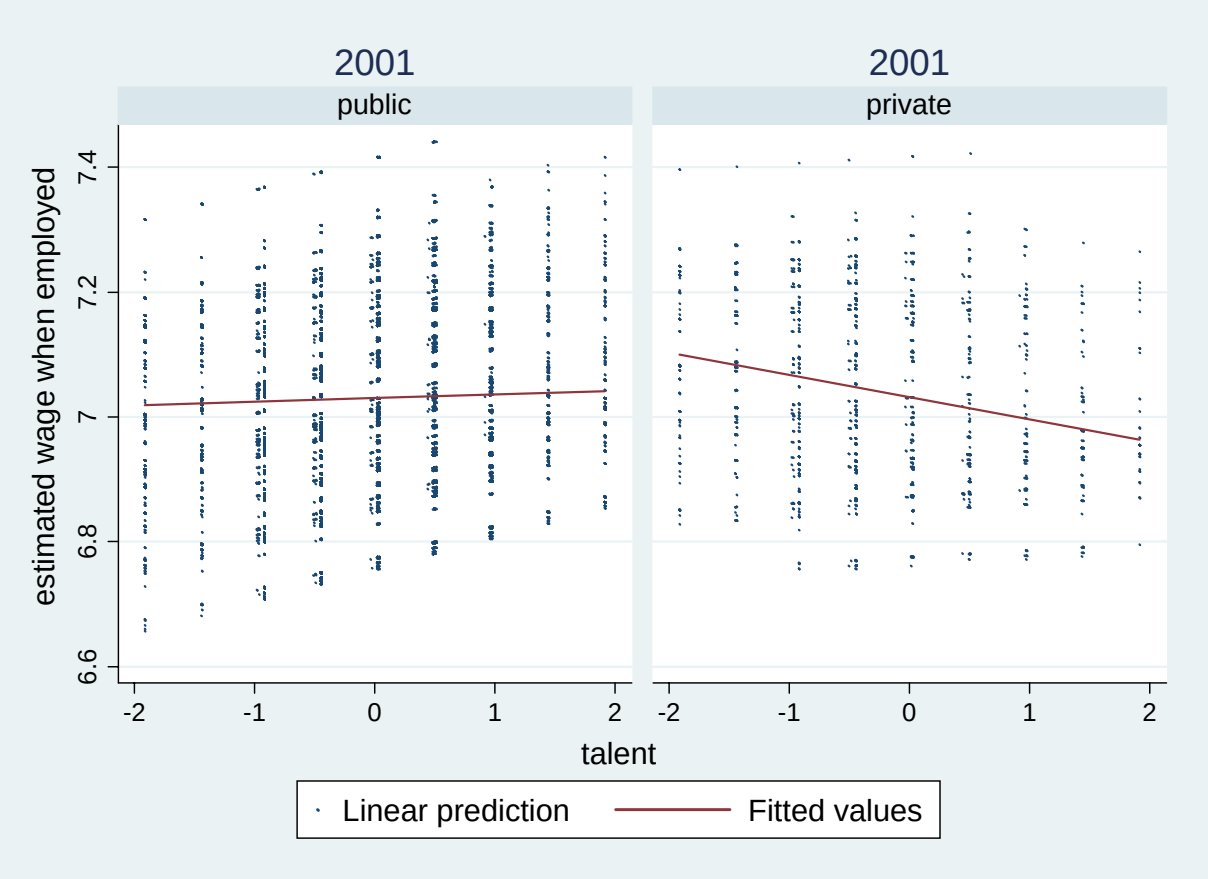

Figure 5 – Predicted wage conditional on selection into employment – ISTAT 2001.