# The effects of high school choices on academic performance and early labour market outcomes☼

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Abstract
Using microdata on the 1995 cohort of Italian high school graduates, this paper studies the relationship between the type of high school attended (general *versus* technical; private *versus* public) and indicators of subsequent performance. Simultaneity issues that potentially bias this type of exercise are tackled by instrumental variables. Results indicate that choices greatly depend upon the family of origin and prior school performance. General high schools are found to increase the probability of transition to university and to improve performance once at university. On the other hand, private high schools appear to be associated with lower academic performance. Technical schools improve the quality of the school-to-work transition, both in terms of employment probabilities and earnings. Considering interactions between university and labour market participation decisions reduces the estimated direct impact of general high schools, while leaving the effects of private schools unaltered.

Keywords: high school choices; academic and economic performance; endogeneity
JEL codes: I21, J24, C35

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## 1. Introduction

Italian educational policies are the subject of an intense debate. In March 2003 the Italian parliament approved a law of reform of the high school system which introduces a new vocational track that includes class work in the first two years and a mixture of class work and on-the-job training in the last couple of years, plus an additional fifth year for those wishing to enrol into university. The vocational track will parallel the ones of general and technical/professional high schools, based on five years of class work and with free access to university at the end. The new law warrants the possibility of transition between tracks.[1] Overall, the new system will be similar to the ones adopted in some other European countries, namely Germany. Proponents of the new system emphasise the role that labour demand will play, via training schemes, in shaping the type of skills that vocational track students would acquire, therefore facilitating their school-to-work transitions; opponents stress the risks of social segmentation that such system could ingenerate through tracks separation, doubt the feasibility of transitions between tracks, and question the usefulness of learning job-specific skills during school years in a world of fast skill obsolescence.

A second issue debated is school provision. Since 2000, school vouchers started being introduced by some regional governments, with the aim of helping households in choosing their preferred type of school, whether private or public. In September 2003 a new vouchers programme has been introduced nationwide. Given the difference in costs entailed by the two types of provision, vouchers lower the price differential between private schools and public ones, thereby shifting some demand for schooling from the latter to the former. Both freedom of choice and increases in private and public school quality (the latter brought about by greater competition) can be found among the principles inspiring vouchers programmes. Opponents to these policies question the ability of private schools in providing quality education and argue for employing public funds for improving the effectiveness of public schools.

The policy debate prompts several scientific questions. To what extent the choice of a high school track affects later individual outcomes in terms of access to higher education, academic performance, and the school-to-work transition? How does the performance of private school students compare with that of public schools ones? Do differences in performance across high school types reflect a causal effect or are they due to endogenous

[1] The reform goes in the opposite direction compared to the one introduced by the previous government in the late 1990s, in which track choice was deferred to the third year of secondary high education, after two years of uniform education.

sorting of students (due to unobservable ability or unobservable family characteristics, for example) across school types? This paper aims at providing answers to the above questions. Using survey data on a cohort of high school graduates, models of the impact of high school types (general *versus* technical; private *versus* public) on the transition to university, academic performance, labour market participation, employment probabilities and wages are estimated. In order to unravel the causal link between school choices and subsequent outcomes, great attention is devoted to endogenous selection issues, which are tackled by employing instrumental variables within a system of simultaneous limited dependent variables equations.

The literature on the evaluation of school type effects on measures of performance has grown rapidly over the past decade. For example, the impact of catholic schools on academic performance has received considerable attention in the United States. Evans and Schwab (1995) highlight the endogeneity issues that can arise from self-selection of students into catholic schools and use instrumental variables to identify the effect of catholic school attendance on measures of academic success, concluding that catholic schools raise subsequent educational outcomes. Neal (1997) uses area-level measures of catholic schools availability as instruments for school choices, showing that the benefit of catholic schools are confined to urban minorities, possibly as a consequence of the low quality of available public schools. An instrumental variable procedure is employed by Figlio and Stone (1999) to assess the effect of religious and non-religious private schools on educational outcomes, finding that, in general, only the former increase individual outputs relative to public schools. The methodological approach developed by Altonji et al. (2000) is instead based on the use observable information as a way of reducing endogeneity bias; they find that catholic schools are effective in favouring high school completion, while the effect on transition to college is less evident. Recently, researchers' interest on the effect of school choices have also started spreading onto other spheres of human life: an example is Figlio and Ludwig (2000), who look at the effect of catholic school attendance on youths' crime, drug abuse and sexual activity, finding that catholic schools are effective in reducing all three.

While catholic/private *versus* public schools effects have been extensively researched, the general *versus* technical or vocational high school divide is less explored, perhaps not surprisingly, given that US high schools are characterised by greater uniformity under this respect compared to other countries, Italy included. Evidence for Germany indicates that

family income plays a limited role in determining the probability of attending general high schools, other factors such as parental education being more relevant (see, Buchel et al., 2001, and Jenkins and Schluter, 2002).[2] For France, Margolis and Simonnet (2002) show that technical high school graduates outperform general high schools ones in the school-to-work transition, thanks to the more effective labour market networks they can access. Positive earnings effects of vocational high schools compared to general high schools are reported by Moenjak and Worsick (2003) on a sample drawn from the labour force survey of Thailand, after correcting for endogenous selection issues.

Given their current political relevance, it is not surprising that the interest surrounding economics of education issues in Italy is increasing at a fast rate. The main issue emerging from the Italian literature is a strong intergenerational persistence in educational achievement. Checchi et al. (1999) compare intergenerational mobility in incomes and schooling attainment between Italy and the US, finding larger persistence in the former case, and argue that the Italian schooling system might have failed to provide poor families with the incentives to invest in the human capital of their off-springs. Besides family of origin, also high school types appear to be strongly associated to educational outcomes. Bertola and Checchi (2001) study a sample of university students from the University of Milan and find that those coming from general high schools score better than otherwise comparable students on a range of performance indicators. They also consider the differences in academic performance between public and private school students, finding that public schools are associated to the better performances, followed by religious private schools and lay private schools. The importance of high school types for academic performance is confirmed by Boero et al. (2001) who study a sample of Italian college graduate and show that the final graduation mark drops significantly if one compares general and technical high school graduates. The issue of public/private school choices is analysed in Checchi and Jappelli (2002) using subjective assessment of public school quality: they do not find evidence of any quality differential in favour of private school as determinant of the school choice. A theoretical perspective on the optimal school design is provided by Brunello and Giannini (2000), showing that considerations on the desirability of educational stratification can not be unambiguously drawn from an efficiency point of view.

[2] A strong association between secondary school track choice and parental education in Germany has been found also by Dustmann (2001), but without controlling for parental income.

This paper's empirical strategy extends the bivariate probit-type of models employed by Evans and Schwab (1995) and Neal (1997) among others. From a substantive point of view, these extensions allow to control for two endogenous treatments simultaneously (general *versus* technical high school; private *versus* public high school) and for the presence of endogenous truncation on some of the outcomes of interest. Results change substantially when moving from completely exogenous models to the models introduced in this paper, showing how these extensions are relevant. Estimates show that choices greatly depend upon the family of origin and prior school performance. General high schools are found to increase the probability of transition to university and to improve performance once at university. On the other hand, private high schools appear to reduce academic performance. Technical schools improve the quality of the school-to-work transition, both in terms of employment probabilities and earnings. In the final part of the paper, interactions between university and labour market participation decisions are considered, showing that they reduce the estimated impact of general high schools, while leaving the effects of private schools unaltered.

## 2. Data and descriptive patterns of high school choices and subsequent performances

The data used in this paper originate from the "1998 Survey on the school and work experiences of 1995 high school graduates", a cross-sectional sample of 18,843 high school leavers interviewed by the National Statistical Office (ISTAT) three years after graduation. The sample represents approximately 4 percent of the population of Italian high school graduates of 1995 and contains a wide range of information on the high school curriculum and on post high school experiences, either in the tertiary education system – including university – and the labour market. In addition, information on personal characteristics and family background is available.[3]

The Italian high school system at the time of interview may be broadly described by three types of schools: general ('licei'), technical ('istituti tecnici e professionali') and teaching schools ('istituti magistrali'). The first two types are based on a five-years curriculum, at the end of which students can freely chose to enrol in university.[4] General high schools are academic-oriented; technical ones, on the other hand, prepare students for

[3] At the time of interview, compulsory education ended after 8 years, and high school enrolment was not compulsory. The reform of the late 1990s raised compulsory education to 10 years.
[4] Before 1969 graduates from technical or professional high schools were required to pass an additional exam before they could enrol into university.

white collar or skilled blue collar careers. The third type is specifically aimed at training elementary school teachers and is structured into a four years curriculum, plus an additional year required to students who wish to go to university. In the present paper this latter group (which represented approximately 12 percent of the sample originally available) has been excluded from the estimation sample, due to the difference in the structure of the curriculum compared to the other two types. Thence, the choice of the high school track analysed here focuses on the general *versus* technical divide.

As for the other dimension of the Italian debate on educational policies, i.e. the public *versus* private provision of schools, the Survey enables identification of the type of school attended by asking respondents if the school they enrolled in after compulsory education was private or public, and if they made any transition from private to public school (and vice versa) during high school. Differently from the work of Bertola and Checchi (2001), the data do not contain information on the confessional nature of private schools.

The distribution of the type of school attended (general versus technical and public versus private) in the estimation sample is reported in Table 1. The estimation sample excludes those who are employed and started their job while at high school (3.6 percent of the original sample), since their post-graduation choices might not be comparable with those of the rest of the sample. In addition, the estimation sample for the analysis of academic performance excludes students who enrolled into short university diplomas (2.2 percent of the original sample) because it was not possible to compute reliable indicators of academic performance due to small cells (see below for the definition of performance used), and those who did not report the information necessary for computing academic performance (0.05 percent). Graduates from general high schools represent 31 percent of the sample, whereas 12 percent of it graduated from a private high school. The two dimension of high school choices are strongly correlated. The probability of having a private school diploma is 9 percent among graduates from technical schools and 19 percent among students from the licei. The other conditional frequencies presented in the table show that the incidence of students from general high schools is some 17 percent larger among private school graduates than in the overall sample. One explanation of the positive association between the two variables can be found in the larger supply of private education in the general high schools system: official statistics for 1989 indicate that while 14 percent of technical schools were private, the proportion was 30 percent for general high schools. A second reason has to do with family resources: both private and general schools entail

larger costs than public or technical ones, either in term of fees and expected opportunity costs.

Household incomes are not available in the data; however, the survey contains rather detailed information on parental education and occupation which partly compensates for the unavailability of incomes. The association between school types and parents' education is described in Table 2. The more educated any of the parents, the more likely it is that the children have a general type of degree, with the probability that roughly quadruples when going from parents with none or low educational attainment to parents with university degrees. As long as education is positively associated with incomes, this finding might reflect larger financial endowments of high-education families, which can thus afford to place their children in an academic oriented track. A second explanation has to do with preferences, as long as more educated parents attach higher value to education then less educated ones, and thus prefer general tracks which are more likely to continue with higher education. Finally, parents education might influence children studying capabilities, thereby lowering the costs of their investments in education. Parents' education is also positively associated with the probability of graduating from private schools, possibly reflecting financial endowments.

The association between parents' occupation and school choices is described by Table 3. General school graduates typically tend to come from families where parents are in high-level non manual, managerial or professional occupations. Moreover, also teachers' children tend to graduate in general schools. On the other hand, private school leavers are likely to come from families where parents are self-employed.

The link between previous academic performance (measured by the mark reported in the final exam of the junior high school) and school choices is illustrated in Table 4. The better the performance, the larger the probability of graduating from general schools, rising by 7 times when moving from the lowest to the highest mark. Differences in ability across marks are an explanation for this evidence, the other possibility being better performances from children from high education/high income families compared to the rest of the sample. The opposite link, i.e. decreasing with the marks, can be observed for the probability of graduating in private schools, although the variation is much less astonishing than in the case of the probability of graduating in general schools. The negative association might signal that private education is used as remedial education, and is therefore more frequent

among students at higher risk of experiencing problems in the course of their academic career (see Bertola and Checchi, 2001, on this point).

After having described the associations between family backgrounds and high school choices, in Table 5 the links between choices and subsequent academic performance are considered. Two are the dimensions of academic performance taken into account. The first is the probability of attending university at the time of interview. The second is the speed in passing university exams. Exams can be taken at different dates during the year, and there are no restrictions on the number of times each exam can be taken before being passed. Such a system creates great dispersion in the number of exams passed per year, and exam taking speed depend to a large extent on individual ability and commitment. To exploit such variation, for each of eight broad disciplinary areas in which university courses can be grouped (sciences; medicine; engineering; architecture; economics, business administration and statistics; political sciences; law; and the humanities), the median number of exams passed per year has been computed; the speed indicator is a dummy for being above the median in the subject-specific distribution of the numbers of exams passed per year. Clearly, this is an imperfect performance indicator, since it does not take the marks obtained into account.[5] However, no information on marks is reported in the survey. Moreover, one of the main concerns inspiring the recent reforms of university degrees has been the long duration of university studies in the old system, so that studying the impact of high school choices on the speed in taking exams will yield insights on an issue at the core of Italian educational policies.

Table 5 shows that 40 percent of high school graduates attend university three years after graduation. The proportion halves among technical school graduates and doubles among general school graduates, revealing a strong link between type of degree held and transition to university. Transitions to university are more frequent among private school graduates than they are among public schools ones, although the magnitude of the link is less evident than in the previous case. Due to discontinuities in the distribution of exam passed per year, the sample proportion of cases above the median (the 'fast tracks') is 45 percent. Graduating from a general high school changes this proportion only slightly, by 4 percent; on the other hand, the proportion of fast exam takers among technical school

[5] The performance indicator used by Bertola and Checchi (2001) considers both speed and the marks obtained in each exam.

graduates is 38 percent. Evidence on the private/public school divide shows little variation in speed.

The second dimension of students performance considered in this paper are early labour market outcomes; in particular, the probability of engaging in job search activities, the probability of being employed and the probability of being low paid are taken into account. The ISTAT questionnaire contains a wide array of information on both job search and the characteristics of the current job. As for academic performance, also in this case graduates from teaching schools and those who started their current jobs while at high school have been excluded from the sample. In addition, after testing for endogenous selection and failing to reject the null hypothesis of exogeneity, those who work as self-employed (4.6 percent of the original sample) have been excluded from the estimation sample. Also, excluded are employees with missing wages (an additional 2.6 percent of the original sample). Therefore, the estimation sample for the analysis of economic performance differs from the one used for analysing academic performance, and consists of 14,420 observations. The proportions of graduates from general and private schools, as well as the variation of these proportions by family backgrounds in this sample are very similar to the ones shown in Tables 1-5.

Table 6 illustrates the variation of early labour market outcomes in the sample. An individual is defined as having done some search if she has an occupation of any kind or if she reports herself being on job search. The employment status considered refers to continual employment; unemployed individuals having done some work in the week prior to interview or those on occasional or seasonal jobs are not counted as employed. Partly, such a choice is driven by the data, since no information on job attributes is collected for seasonal or occasional employment; in addition, it allows to focus on stable employment, which is probably more relevant from a policy perspective. Low pay is defined as the bottom quartile of the sample distribution of net hourly pay, i.e. the low pay threshold is defined relatively to the group of high school graduates. After graduation, job search occurs for 68 percent of the sample. The proportion rises to 81 percent among technical school graduates and falls to 40 percent for general school ones, clearly indicating a difference in the propensity for labour market activities between the two educational tracks. A slight difference in job search propensities can also be observed between public and private schools graduates. Of those who search, 42 percent are observed in employment. This rather low figure depends upon the definition of employment adopted: if one included also

seasonal employment, occasional employment and the unemployed reporting hours of works in the week prior to interview, the employment rate would be 68 percent. The employment rate varies depending upon the type of high school attended, passing from the 49 percent of technical schools graduates to the 16 percent of licei students; some variability is evident also between private and public schools. Finally, some associations between school choices and the probability of earning low wages can be detected, although they are less evident compared to the case of employment.

## 3. High school choices and academic performance

The previous section has shown that the link between the type of high school diploma and the probability of going to university is well evident in the data, and similar conclusions apply for the speed in passing exams once at university. In order to disentangle the effect of school types on outcomes, endogeneity issues that are likely to influence raw correlations have to be tackled. One first source of endogeneity has to do with selection into school types, as long as unobserved ability and unobserved parental background might influence both choices and outcomes; as shown in Neal (1997) such a circumstance can be relevant as long as school choices are driven by expected returns on education. Second, the analysis of exams speed can only be performed conditional on university attendance; as long as the sample of university students is not representative of the population of high school graduates, estimates can be biased. What is needed, therefore, is an econometric model that jointly handles endogenous school choices and endogenous sample selection. Given that the parameters of interest are unconditional on labour market decisions (i.e. as in, for example, Ewans and Schwab, 1995, estimating the effect of job search decisions on university attendance is not the aim of this paper) the academic performance model is estimated without taking those decisions into account.[6]

### 3.1 The model of academic performance

In this paper the endogeneity issues discussed above are assessed by means of multivariate probit models. Let observations in the estimation sample be indexed by $i$, $i$=1…$n$, and let the latent propensities to graduate from general schools ($g^*_i$) and private schools ($p^*_i$) be linear functions of individual characteristics:

[6] Insights on the relevance of allowing for interactions between university and labour market choices are provided in Section 5.

$$g^*_i=\beta_g{}'x_{gi}+\varepsilon_{gi} \quad (1)$$

$$p^*_i=\beta_p{}'x_{pi}+\varepsilon_{pi} \quad (2)$$

where the $x$s are vectors of observable attributes such as gender, parental background and indicators of academic performance at the junior high stage, the $\beta$s associated parameter vectors to be estimated and the $\varepsilon$s error terms assumed to be distributed as standard normal. When the latent propensities cross some unobserved thresholds –which can be fixed at zero without loss of generality– individuals are observed to graduate from general or private schools; let $g_i$=I($g^*_i$>0) and $p_i$=I($p^*_i$>0) be dummy variables indicating the two events, the indicator function I( ) taking value one whenever its argument is true and zero otherwise.

Next, assume that the latent propensity to be observed at university at the date of interview, $u^*_i$, depends linearly on a set of personal characteristics $z_u$, and high school choices $g_i$ and $p_i$:

$$u^*_i= \beta_u{}'z_{ui}+\delta_g g_i+\delta_p p_i+\varepsilon_{ui} \quad (3)$$

where the error term $\varepsilon_u$ is assumed to be distributed as standard normal; let $u_i$=I($u^*_i$>0) be a dummy variable signalling university attendance at the date of interview.

Finally, conditionally on university attendance, academic performance can be observed. As explained in Section 2, speed in passing exams is the performance indicator available in the data. Let $n_i$, the average number of exams passed per year by individual $i$, depend on personal attributes $m_s$ and high school choices according to the following relationship:

$$s^*_i\equiv h(n_i)=\beta_s m_{si}+\gamma_g g_i+\gamma_p p_i+\varepsilon_{si} \quad \text{if } u_i=1 \quad (4)$$

where $h$( ) is a suitable monotonic unspecified transformation such as the error tem of (4) is distributed as standard normal, while the relationship is unobservable when individuals are not at university, i.e. when $u_i$=0. An individual is classified to be a ‘fast’ whenever she lies in the upper half of the subject-specific distribution of $n_i$; let $s_i$=I($n_i$>$\mu$) signal that event, where $\mu$ is the median of the subject-specific distribution of exam passed per year. Note that speed is conditional on both high school choices and university attendance.

The vector of error terms $\varepsilon^A_i=(\varepsilon_{gi}, \varepsilon_{pi}, \varepsilon_{ui}, \varepsilon_{si})$ is assumed to follow the four-variate normal distribution:

$$\varepsilon^A_i \sim N_4(0,\Omega) \tag{5}$$

where the correlation matrix $\Omega$ has unit diagonal elements and extra-diagonal elements equal to $\rho_{jk}, j,k=g,p,u,s$. Overall, the model specified is a four-variate probit with censoring of one equation.[7]

Estimation of cross-equation correlation coefficients allows to control for unobserved heterogeneity, therefore eliminating the issues of endogeneity discussed above. The potential endogeneity of high school choices and selection into university can be tested by testing the significance of the elements of $\Omega$.

Model identification requires valid "instruments", i.e. variables that can be excluded from the outcome equations ($u^*$ or $s^*$) but significantly affect high school choices or selection into university. Candidates as instruments for high school choices are measures of family characteristics relevant at the time the choice was made, but whose effect on students behaviour can be expected to be less relevant in the university years, after their impact on high school choices has been taken into account. The instrument used for general high school is a dummy for having a grandparent with a university degree, i.e. it is assumed that second order intergenerational persistence loses relevance in shaping students' choices as they age from 14 to 19. The private school equation includes the same variable and a dummy for the mother being retired when the individual was 14.[8] Instrumenting selection into university requires variables that affect the choice of going to university but have no residual impact on exams speed. In particular, dummies for the number of siblings in the household of origin will be used here.

### 3.2 Results

Table 7 presents in column (1) results from the estimation of the four-variate probit with censoring; in particular, it provides "marginal effects", evaluated at the means of

[7] Computation of multi-variate normal distributions is performed by simulation, in particular by applying the so-called GHK simulator.

[8] Parental labour market status when interviewees were 14 is available in the data, and tests indicate that, as a whole, it can be excluded from high school equations. Taken in isolation, the dummy for mother retired is found to be significant in the private school equation.

explanatory variables. For comparative purposes, column (2) of the table also reports estimation of academic performance equations from univariate probit models, i.e. ignoring the endogeneity issues.

The bottom part of the table shows results from tests of significance of the instruments, performed using functional form as identifying restriction. The tests indicate that the data support the choice of instruments made: high school choices are significantly affected by grandparents' education and by the mother retirement status when the individual was 14, but have no residual impact on the transition to university; similarly, the presence and number of siblings affects the probability of attending university at the date of interview, but have no impact on exam taking speed.

Three of the cross-equation correlation coefficients are statistically significant at conventional confidence levels, whereas remaining coefficients are not statistically different from zero. The correlation between general high schools and private high schools ($\rho_{gp}$) appears to be positive and very precisely estimated, confirming the evidence already emerged in Section 2 about the strong link between the two variables. Differently from there, however, in this section controls are made for family resources, so it is likely that the positive coefficient reflects a larger supply of private education among general schools than among technical ones. The correlation between private high schools and exams speed ($\rho_{ps}$) is also positive, indicating that the group of private school graduate that go to university is faster in passing exams compared to the average of university students. Finally, the positive estimate of the correlation between university attendance and exams speed ($\rho_{us}$) indicates that there is positive selection into university, i.e. those who are not observed at university would have been slower in taking exams compared to those currently attending; if exams speed can be deemed as an ability indicator, this result suggests that those observed at university are intrinsically more able than those not attending, net of family backgrounds. The table also reports tests for the overall ignorability of high school equations, i.e. tests for the hypotheses that all correlation coefficients referring to a certain high school equation are simultaneously equal to zero, and shows that both processes are non-ignorable for the estimation of academic performance. A test of overall significance of the correlation structure of unobservables also points to the necessity of tackling the various endogeneity issues.

The first two sub-columns of column (1) (P(general) and P(private)) provide estimates of the determinants of high school choices. The presence of a favourable family

background affects both choices significantly. In particular, while general high school graduates tend to come from families where one or both parents, are in managerial or professional occupations, private schools are chosen more frequently when the parents are self-employed or entrepreneurs. Also, teachers' children are likely to graduate from general and public high schools. Parental education positively and strongly influences both probabilities. The indicator of academic performance at junior high school, i.e. before entering high school, is strongly and positively associated to the probability of graduating from a general high school. Much smaller effects, and in the opposite direction, can be observed for private high schools. Overall, results appear to confirm previous findings from Bertola and Checchi (2002) on the fact that private schools attract students from richer families and with relatively lower ability compared to public schools ones, whereas general high schools attract higher performance individuals from richer families.

The estimated effects of graduating from a general high schools on the probability of attending university at the interview date is 43 percent for an individual with other observable attributes equal to the sample mean. This effect compares with an estimate of 47 percent retrievable from the model without endogeneity controls (see column (2), P(university)). The small change in the estimated effect between the two cases reflects the fact that the correlation of unobservables between the two equations ($\rho_{gu}$) is not statistically different from zero. Note, however, that a dramatic drop characterises the asymptotic t-ratio when moving from the exogenous to the endogenous model, reflecting the fact that in the latter case the information is used over a wider parameter space. Similar evidence characterises the marginal effect for private school. In this case, the drop in significance is crucial, since it leads to conclude that there is no effect of private high school attendance on transitions to university. The significance of the negative effect emerging from the exogenous model is a consequence of omitting to control for the role of observable attributes – namely parental background and junior high school marks – in the determination of private school choices.

Estimates associated to parental education indicate a strong intergenerational persistence in higher education: the effect on university attendance roughly doubles when parental educational attainment passes from high school degrees to university degrees. Parents' occupation also affects university attendance significantly. A similar remark applies to junior high school marks. The regression also controls for the final high school

mark and, not surprisingly, it appears to be strongly associated to the probability of being at university.

The importance of controlling for endogeneity is confirmed by the estimates of the exam speed equation, as shown by the rise in size of the effect of general high schools (remarks similar to those put forward when commenting P(university) apply to the drop in significance): general high schools have a positive impact on speed, and when such impact is computed in the entire sample, rather than from a high-speed sub-sample, the magnitude of the effect rises by more than 50 percent. If factors that positively affect speed are magnified by the endogenous selection control, the opposite should hold for speed reducing variables: see, for example, the drop in the marginal effect associated to residence in southern regions. Private schools also negatively affect speed. In this case, however, the sign of the bias is dominated by other sources of unobserved heterogeneity. The estimated positive correlation between unobservables of the private school and speed equation ($\rho_{ps}$) indicates that individuals from private schools going to university have a speed propensity larger than the average. In the exogenous model the marginal effect of private schools on speed is a convolution of a negative causal effect and a positive selection term, which is removed from the marginal effect in the endogenous model. Estimates indicate that endogeneity is relevant, the negative effect of private schools on speed more than doubling when moving from the exogenous to the endogenous model.

Estimates of marginal effects on the other covariates in the speed equation point towards the importance of both parental backgrounds and individual ability (measured by marks reported at junior high and high schools) as explanatory factors of this dimension of academic performance.

## 4. High school choices and early labour market outcomes

The raw correlations presented in Section 2 indicate the existence of a strong link between the type of high school attended and behaviours at labour market entry; in this section the extent to which those associations can be imputed a causal interpretation is investigated. As in Section 3, endogeneity of high school choices is controlled for by explicitly modelling their determinants and by allowing any residual component to freely correlate with the outcomes of interest. Endogenous selection issues are also investigated; however – differently from Section 3 – in this section, a double selectivity process is modelled: selection into job search activity (potentially endogenous for the estimation of employment

probabilities) and selection into employment (potentially endogenous for the estimation of low pay probabilities). The model is estimated without taking university attendance into account, deferring an analysis of its interactions with labour market outcomes to Section 5.

4.1 The model of early labour market outcomes

The probability of graduating from certain types of high school is modelled in the same fashion of Section 3, but on a partly different sample (see Section 2 for the differences in sample selection rules between this and the previous section); thence, the first two equations of the model are equations (1) and (2) of Section 3.

The first labour market outcome considered is the job search decision. Let $r^*_i$, the latent propensity to engage in job search activities after high school graduation for individual $i$, be a linear function of personal attributes $z_r$, high school choices and an error term, assumed to be distributed as standard normal:

$$r^*_i=\beta_r' z_{ri}+\eta_g g_i+\eta_p p_i+\varepsilon_{ri} \tag{6}$$

and let $r_i=I(r^*_i>0)$ be a dichotomous indicator of the search activity.

The employment status at the date of interview can be observed for those individuals who search for a job (recall from Section 2 that self-employment is excluded from the analysis and that seasonal or occasional jobs are considered as unemployment). Assume that it represents some unobserved employment propensity $e^*_i$, which depends upon personal attributes $m_e$ and school choices:

$$e^*_i=\beta_e' m_{ei}+\theta_g g_i+\theta_p p_i+\varepsilon_{ei} \quad \text{if } r_i=1 \tag{7}$$

and let $e_i=I(e^*_i>0)$ indicate whether an individual is employed or not at the interview date. The employment process is censored for those who do not participate in the labour market after graduation.

Besides employment probabilities, another relevant dimension of the school-to-work transition is the wage level that individuals obtain on entry into the labour market. Clearly, entry levels are not fully informative of future earnings prospects, since the correlation between initial and later earnings varies depending upon which model better describes labour market functioning. The focus is placed on the probability of low pay for two

reasons. First, from a substantive point of view, in recent years low pay has emerged as a policy issue in many countries, and research on this topic stresses that as long as there are discontinuities in the earnings process across the distribution, the relevance of earnings determinants might vary according to the earnings quantiles considered. Second, from a modelling point of view, estimating an earnings equation in the multivariate probit context of this paper would have required to assume normality or log-normality of earnings, whereas by focussing on low pay probabilities, normality is required only up to any unspecified transformation of earnings (as will be shown below). Finally, it has been chosen to derive the low pay cut-off from the sample earnings distribution, i.e. to focus on individual earnings relative to the cohort of high school graduates.

Let individual earnings $w_i$ depend upon personal and job attributes $q_l$ and high school choices according to the following equation:

$$f(w_i)=\psi' q_{li} + \omega_g g_i+\omega_p p_i+v_i \quad \text{if } e_i=1 \tag{8.a}$$

where $f(\ )$ is a monotonic unspecified transformation such as the error term $v_i$ is distributed as standard normal; let also $p_{25}$ indicate the first quartile of the earnings distribution. Note that the earnings distribution is censored upon employment (and, *a fortiori*, upon search). An individual is counted as low paid whenever $w_i < p_{25}$, i.e. when $f(w_i)< f(p_{25})$. By subtracting each side of (8.a) from $f(p_{25})$, the earnings process can be rewritten as:

$$l^*_i=\beta_l' q_{li}+\varphi_g g_i+\varphi_p p_i+\varepsilon_{li} \quad \text{if } e_i=1 \tag{8.b}$$

where $l^*_i \equiv f(p_{25})-f(w_i)$, the first element of $\beta_l$ subsumes the difference between $f(p_{25})$ and the constant term in $\psi$, remaining elements of $\beta_l$ are the same as the corresponding elements of $\psi$ but with opposite sign, $\varphi_{g,p}\equiv-\omega_{g,p}$ and $\varepsilon_{li}\equiv- v_i$. Note that now coefficients associated to covariates parameterise low wages. Observing an individual in low pay means that the corresponding latent variable $l^*_i$ is positive; let $l_i=\mathrm{I}(l^*_i >0)$ be a dichotomous indicator of the low pay event.

As in the case of academic performance, endogeneity of high school choices and (double nested) selection is tackled by means of a multivariate probit model, which emerges if one assumes that the vector of error terms $\varepsilon^L_i=(\varepsilon_{gi}, \varepsilon_{pi}, \varepsilon_{si}, \varepsilon_{ei}, \varepsilon_{li})$ follows the five-variate normal distribution:

$$\varepsilon^{L}_{i} \sim N_5(0,\Sigma) \tag{9}$$

where the correlation matrix $\Sigma$ has unit diagonal elements and extra-diagonal elements equal to $\lambda_{jk}$, $j,k=g,p,r,e,l$. Overall, the model specified is a five-variate probit with nested censoring of two equations. Test of the endogeneity of high school choices and selection can be performed by testing the significance of the cross-equation correlation coefficients of unobservables.

Identifying restrictions for the model of early labour market outcomes are as follows. The job search equation is identified using the same indicators of family characteristics relevant at the time high school choices were made used in Section 3, i.e. a dummy for having at least one grandparent holding a university degree in the general high school equation, and that dummy plus a dummy indicating if the mother was retired when the interviewed was 14 in the private school equation. Variables that are –plausibly– not taken into account by employers when screening job candidates might serve for the purpose of identifying the employment equation, the mark reported at junior high school being an example of such variables. Empirically, however, it was found that not only junior high marks, but also high school marks were insignificant in shifting employment probabilities, suggesting that employers do not value the informative content of marks, but probably limit themselves at considering signal embedded in the type of diploma (general *versus* technical) obtained.[9] Therefore, both marks have been used as instruments for employment probabilities. Finally, indicators of parental backgrounds could be excluded from the low pay equation after their impact on schooling choices and employment probabilities have been controlled for. In practice, it was found that maternal background (both in terms of educational attainment and occupation) produced the better performance in terms of excludability from the low pay equation, so that are these variables the ones used as instruments.

4.2 Results

Table 8 illustrates results obtained estimating the economic performance model. For the sake of compactness, high school equations are not reported; results on the determinants of

[9] Boero et al. (2001) find that high school and university marks have no explanatory power in wage regressions for their sample of Italian college graduates.

high school choices were very similar to those obtained from the academic performance model (see also the reported correlation coefficient between unobservables of high school equations, virtually identical to the one of Table 7), and are available upon request.

The adopted identification strategy is supported by the data –see the p-values for instruments significance in the various equations reported at the bottom of the table. Estimated correlations of unobservables indicate that general high school graduates have a job search propensity which is lower than the one of technical school ones. This could be the case if general high school graduates could count on higher non labour incomes even after controlling for the wide range of family background indicators available in the data. Alternatively, one might argue that these individuals are of a less labour-market-oriented type compared with graduates from technical schools. A negative relationship also emerges between general high schools and employment probabilities. Again, an explanation based on differential inclinations towards the labour market across high school types could rationalise this fact. On the other hand, the correlation between general high school and low pay propensity is non significant. Taking into account correlations involving the private school equation, the only significant coefficient is the one with low pay, indicating that private school graduates have an intrinsically lower earnings potential relative to private school students. Remaining correlation coefficients indicate that also selectivity processes are a vehicle for estimates bias. For example, the unobservables of search and employment propensities are negatively and significantly correlated, indicating that the intrinsic employability of those who search is lower compared to the population of high school graduates. Also, employment and low pay propensities are negatively correlated: had the unemployed found a job, their low pay chances would have been larger than the ones of the employed, suggesting that unemployment is due to lack of demand rather than to high reservation wages. Tests for the significance of groups of correlation coefficients indicate that none of the high schools processes is ignorable, and that the whole correlation structure is statistically significant, both facts that motivate the use of the simultaneous equations model.

Comparing estimated marginal effects between models with endogenous and exogenous high school choices further motivates the employed modelling strategy. For example, the search probability differential between general and technical schools is -28 percent in the exogenous model of column (2). Endogenisation reduces the estimated effect by a half: the causal impact of general high school reduces search probabilities by 13

percent, whereas the remaining part of the effect estimated in the exogenous model is due to endogenous sorting. The negative effect that persists after endogenisation indicates that general high schools reduce the probability that a random individual engages in search activities after completing high school compared to technical schools, as could be the case if the type of skills acquired or the overall school environment were more market oriented in the latter case. Taking into account the private/public schools divide, the data indicate that the differential is small and not statistically significant. As for the other determinants of search propensities in column (1), the data indicate that the two sets of characteristics that are relevant in determining high school choices – family background and previous performances at school – still play a role after the impact of high school choices on search probability has been taken into account. For example, search probabilities are smaller when there are no siblings, where parents have high educational attainment, or where parents are located on high ranks of the occupational ladder.

The importance of taking selectivity issues into account is confirmed by looking at results on employability. The marginal effect of general high schools on employment probabilities is negative and drops by 10 percent in absolute value when one moves from the exogenous to the endogenous model. This finding is a result of the negative correlation of unobservables between general high schools and employment equations; net of this negative sorting bias, technical schools graduates still have an employment probability 20 percent larger compared to general schools graduates. It should be stressed that the negative selection effect operates in the opposite direction: since the sample involved in search activity has a lower employment probability compared to the overall sample, the impact of factors that negatively influence employment is overestimated in the sample doing search, and we should observe the marginal effect of general high schools to become more negative after accounting for endogenous selection. The data, however, indicate that negative sorting of less employable individuals into the pool of high school graduates is predominant, and simultaneously accounting for the two endogeneity issues reduces the size of the effect. No significant effect on employment probabilities, on the other hand, can be associated to the choice of a private high school. Remaining marginal effects reveal the existence of a 10 percent gender gap and of marked regional differences, youths from the south and islands showing an employment probability which is 41.2 percent lower than that of otherwise comparable individuals. The data also indicate the relevance of household characteristics as determinants of employment probabilities, a likely consequence of the association between

the former and non-labour incomes on which job searchers can count. For example, the presence of siblings is associated with positive marginal effects, whereas a favourable educational background reduces employment probabilities.

Relevant selection biases emerge if one compares estimates of low pay probabilities from the exogenous and endogenous model, see e.g. the rise in absolute value of the effects of high school choices; in the case of private schools, the rise is also reinforced by making allowance for the positive sorting of low wage individuals into private schools (i.e. $\rho_{pl}>0$). Overall, the model shows that general high schools significantly increase low pay probabilities relative to technical ones, whereas private school reduce such probabilities compared to public schools. The first finding confirms that the type of education provided by technical schools increases economic performance. Explanations for the second finding are less evident. Marginal effects for the other covariates show the existence of a relevant gender pay gap and of marked territorial differentials. The father's educational attainment increases low pay probabilities. The mode of search significantly affects low pay chances. In particular, those who have found the current job through a family network (i.e. the excluded category in the estimation of coefficients underlying marginal effects) seem to have the largest low pay probability. Since family networks are the most important search mode in Italy, especially for first job seekers, this result is rather interesting and is consistent with two not mutually exclusive explanation: family networks are used by less able individuals or family networks tend to provide low wage jobs. The other 'wage determinants' included in the low pay equation have marginal effects that go in the expected directions; for example, low pay probabilities decrease as we move towards high level occupations or large firms, and as more tenured employees are taken into account. It should be noted that the absolute value of the effects is larger in the endogenous model compared with the exogenous one, further confirming the importance of allowing for the various selectivity issues analysed in this paper.

## 5. Assessing interactions between academic performance and labour market outcomes

Results presented so far refer to academic and economic behaviour taken in isolation from each other. Thence, the effects estimated provide the overall impact of a given high school choice on the outcomes of interest, i.e. without distinguishing the direct effect from spill over and feedback effects between the academic and economic spheres. For example, finding, as in Section 3, that general high school students are faster in passing exams

compared to their counterparts graduated from technical high schools might result from the greater time that general school students, less involved in labour market activities than technical schools ones, can devote to exams preparation or from a direct effect of school type, holding labour market behaviour fixed. Similarly, the employment and wage penalties characterising general school students compared to those from technical ones could be due to the greater involvement of the former in tertiary education, or might be present even after controlling for university choices. In general, disentangling between direct and indirect effects is important since it can yield insights on the extent to which the overall impacts estimated in the previous sections reflect differences in post-school choices or differentials in performances holding choices fixed.

The raw data indicate a clear association between academic and labour market outcomes after high school graduation; for example the probability of attending university is 22 percent among job seekers and the employed, and 85 percent among those inactive in the labour market, while conditionally on university attendance the probability of passing exam fast is 35 percent in the former group and 53 in the latter. Looking at the labour market, participation probabilities vary from 38 to 91 percent if one compares university students with non students, corresponding figures being 12 and 53 percent for employment probabilities, while no remarkable difference can be observed in low pay probability (26 and 24 percent). Given these figures, it is plausible to expect that part of the effects of high school types on academic performance (early labour market outcomes) estimated in the previous sections vanish after taking early labour market outcomes (academic performance) into account.

From the modelling point of view, what is required is to allow for interactions between academic and economic outcomes. Considering university attendance and job search, there is no clear a priori on the sequence of the two decisions: the safest strategy is to consider them as simultaneous – not mutually excludable– choices, and their interaction can be modelled in a reduced form fashion, similarly to the general/private school interaction in the previous sections.[10] Exam passing speed can be conditioned on job search, using the same identifying restrictions used for identifying selection into university. The other relevant dimension of labour market outcomes upon which academic performance could be conditioned is employability. However, attempts at estimating the

[10] Such a strategy is further motivated by the difficulty of finding plausible exclusion restrictions for conditioning the two events upon each other, especially given that the conditioning sets in equation (3) and (6) coincide.

exam speed equation with both the search and employment dummies as regressors encountered convergence problems, suggesting lack of identification.[11] Therefore, the extended academic performance model is the model of Section 3, augmented with a job search equation and including the job search dummies among the regressors of the exam speed equation. The extended labour market model is the model of Section 4 augmented with a university attendance equation, and including the university dummy among the regressors of the employment and low pay equations.

Table 9 reports marginal effects estimated from the extended models.[12] The reduced form correlation between university attendance and job search –not reported—was estimated at -0.67 in both cases, with asymptotic t-ratios larger than 50, reflecting the strong negative association between the two outcomes already emerged from the raw data. The effect of general high schools on university attendance probability is now 36 percent, compared with the 43 percent of Table 7. Therefore, part of the effect estimated in Section 3 was a reflection of the fact that general high school reduce search probabilities, and university attendance and job search are negatively associated. Previous conclusions on the absence of effects of private schools on university attendance are instead confirmed. Considering the exam speed equation, the effects of general schools (+15 percent in Section 3) becomes statistically insignificant, whereas a -12 percent effect can be imputed to the search dummy –although the underlying coefficient is not very precisely estimated. The differential exam speed between general and technical school is therefore entirely due to the more intense job search propensity of technical school students that go to university, which lower their performance. The negative effect of private schools, conversely, retains roughly the size and significance already estimated in Section 3.

The effect of general high schools on job search probabilities is hardly affected by the inclusion of a university attendance equation in the labour market model, see Table 9, column 2. Conversely, controlling for university attendance reduces the effect of general high schools on employment probabilities by two thirds, while the university dummy included among the regressors of that equation attracts a stunning – 30 percent effect. Therefore, only a part of the employment penalty characterising general school students in comparison with technical school ones can be thought of as a direct effect (say due to the fact that general knowledges are less valued in the labour market compared to technical

[11] Considering that the proportion of cases scoring 1 on both exam speed and employment is 0.7 percent of the estimation sample, identification issues might originate from problems of "small cells".
[12] The full set of estimates underlying the table is available upon request.

skills), the rest being imputable to the larger incidence of university attendance (which presumably weakens job search effectiveness) among students from general high schools. Similar remarks apply for the impact of general high schools on low pay probabilities, changing from almost 18 percent to zero when comparing estimates in Tables 8 and 9, but this time the effect does not pass to the university attendance dummy. As for academic performance, conclusions on the impact of private schools are robust to the inclusion of a university attendance equation in the labour market model.

## 6. Concluding remarks

The high school choices of young Italians largely depend on two factors: ability and family background. This paper has shown that better performance individual and those with favourable educational and occupational family background tend to select into general high schools. On the other hand, the probability of graduating from a private school rises with the availability of resources in the family of origin but decreases with school performance prior to high school.

This paper has provided evidence on the effects of high school choices on subsequent academic performances. Graduating from a general high school substantially increases the probability of attending university, whereas no shift in such a probability due to private schools can be found in the data after a proper allowance is made for simultaneity issues. Once at university, the speed in passing exams – a crucial performance indicator for today's Italian students—is found to depend positively on general school attendance and negatively on private school one. Therefore, while attending a general high school can be seen as a way of improving ones academic outcomes, the data indicate that private schools, if anything, reduce them.

High school effects are not confined to college outcomes, but also spread on the school-to-work transition. This time, patterns are reversed, and graduates from technical schools score much better on either the probability of finding a stable job, or the probability of finding a job above a pre-determined low pay cut-off. Given that the model controls for observed and unobserved heterogeneity, these results are unlikely to reflect a low quality of general schools students that go on the labour market; rather, they may be given a causal interpretation, suggesting that generalist skills are not valued in the youths' labour market. On the other hand, private school attendance is found to reduce low pay probabilities.

Further analysis on the role of interactions between academic and labour market outcome has shown that, typically, general high school effects on outcomes work through the choice of attending university or engaging in job search and are, in this sense indirect. Conversely, estimated effects of private schools do not vary when those interactions are taken into account.

From the modelling point of view, this paper has placed considerable emphasis on simultaneity issues, coherently with some previous contributions in this literature. With the aim of tackling those issues, multivariate probability models with partial observability have been developed. Results support the adopted modelling strategy, as both high school choices and selectivity issues matter for the estimation of the effects of interest. Ignoring those issues would have led to wrong conclusions in most cases.

The picture emerging from this paper extends previous findings for Italy. Family background plays a central role in determining school choices, while choices have relevant effects on subsequent educational and economic paths. By deepening the separation between generalist and vocational tracks, the reform of secondary high education which will be implemented in the near future might have the effect of increasing the role of parental backgrounds in shaping individuals' lives. An effective functioning of the mechanisms designed in order to guarantee the 'equal dignity' of tracks –such as the possibility of track changes after the initial choice— appear as a crucial feature of the implementation phase for preventing intergenerational persistence and social segmentation to increase. As for the other topical dimension of the school debate, i.e. school provision, the negative effect of private schools estimated in the academic performance equation indicates that, on average, private schools are less effective than public ones in enhancing subsequent educational outcomes.

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Table 1: The distribution of high school degree types

| | Private school ? | No | Yes | Total | Percent |
|---|---|---|---|---|---|
| General school? | | | | | |
| No | | | | | |
| Number of cases | | 9574 | 972 | 10546 | 68.87 |
| Row frequencies | | 90.78 | 9.22 | | |
| Column frequencies | | 71.30 | 51.51 | | |
| Yes | | | | | |
| Number of cases | | 3853 | 915 | 4768 | 31.13 |
| Row frequencies | | 80.81 | 19.19 | | |
| Column frequencies | | 28.70 | 48.49 | | |
| Total | | 13427 | 1887 | 15314 | |
| Percent | | 87.68 | 12.32 | | |

Table 2: High school degree types and parental background

| | Probability of graduating in a general school | | Probability of graduating in a private school | |
|---|---|---|---|---|
| | By father's education | By mother's education | By father's education | By mother's education |
| None or elementary | 14.06 | 14.84 | 8.67 | 8.29 |
| Junior high school | 21.97 | 23.02 | 11.28 | 11.62 |
| High school | 46.57 | 51.21 | 15.04 | 17.15 |
| University degree | 78.97 | 81.76 | 18.33 | 15.31 |

Table 3: High school degree types and parental occupation

| | Probability of graduating in a general school | | Probability of graduating in a private school | |
|---|---|---|---|---|
| | By father's occupation | By mother's occupation | By father's occupation | By mother's occupation |
| Self employed shop seller/retailer | 32.81 | 30.28 | 22.46 | 21.71 |
| Craft | 21.92 | 24.20 | 11.88 | 16.89 |
| Farmer | 13.40 | 13.41 | 8.17 | 6.15 |
| Entrepreneur | 32.86 | 32.26 | 22.70 | 22.58 |
| Professional | 53.75 | 52.38 | 20.30 | 20.00 |
| Manager | 66.29 | 79.31 | 18.79 | 18.62 |
| Teacher | 68.00 | 67.60 | 6.50 | 13.31 |
| White collar high level | 40.22 | 47.73 | 11.42 | 16.57 |
| White collar low level | 35.18 | 42.04 | 10.77 | 15.45 |
| Blue collar high level | 15.62 | 14.34 | 8.20 | 10.80 |
| Blue collar low level. | 15.45 | 18.17 | 7.87 | 9.87 |
| Not available/ does not know | 27.99 | 24.37 | 14.15 | 10.74 |

Table 4: High school degree types and junior high school marks

| | Probability of graduating in a general school | Probability of graduating in a private school |
|---|---|---|
| sufficiente (D) | 10.17 | 13.81 |
| buono (C) | 23.63 | 12.10 |
| distinto (B) | 43.56 | 11.32 |
| ottimo (A) | 68.84 | 9.23 |

Table 5: High school degree types and academic performance

| | Probability of attending university | Probability of taking exams quickly* |
|---|---|---|
| Whole sample | 40.81 | 45.64 |
| Graduated in istituti tecnici professionali | 22.34 | 38.62 |
| Graduated in a liceo | 81.67 | 49.88 |
| Graduated in a public school | 40.02 | 46.13 |
| Graduated in a private school | 46.42 | 42.68 |

*conditional on university attendance

Table 6: High school degree types and early labour market outcomes

| | Probability of job search after graduation | Probability of being employed* | Probability of being low paid** |
|---|---|---|---|
| Whole sample | 67.71 | 42.77 | 24.76 |
| Graduated in istituti tecnici professionali | 80.95 | 49.18 | 24.23 |
| Graduated in a liceo | 40.47 | 16.40 | 31.31 |
| Graduated in a public school | 68.41 | 43.24 | 25.17 |
| Graduated in a private school | 62.65 | 39.01 | 21.13 |

*Conditional on job search, excludes the self employed

**Conditional on being employed. Low pay defined as bottom quartile of the sample distribution of hourly net pay

Table 7: Models of academic performance

| | (1) Endogenous choices and selection | | | | | | | | (2) Exogenous choices and selection | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P(general) | | P(private) | | P(university) | | P(fast) | | P(university) | | P(fast) | |
| General school | | | | | 0.429 | (5.97) | 0.153 | (1.77) | 0.469 | (39.71) | 0.084 | (5.22) |
| Private school | | | | | -0.049 | (0.79) | -0.196 | (2.39) | -0.040 | (2.65) | -0.061 | (3.07) |
| Female | 0.096 | (11.59) | 0.031 | (6.03) | -0.031 | (2.68) | 0.027 | (1.79) | -0.036 | (3.59) | 0.031 | (2.24) |
| Resides in the north east | -0.013 | (1.00) | -0.019 | (2.70) | 0.001 | (0.08) | -0.013 | (0.65) | 0.006 | (0.42) | -0.008 | (0.40) |
| Resides in the centre | 0.004 | (0.34) | -0.056 | (8.55) | 0.015 | (1.00) | -0.152 | (8.18) | 0.015 | (1.06) | -0.156 | (8.26) |
| Resides in the south | 0.010 | (0.81) | -0.039 | (5.68) | 0.064 | (4.40) | -0.242 | (12.73) | 0.065 | (4.53) | -0.263 | (14.18) |
| Has 1 sibling | -0.069 | (5.88) | -0.043 | (6.19) | -0.063 | (4.14) | | | -0.061 | (4.20) | | |
| Has 2 siblings | -0.081 | (6.20) | -0.051 | (6.81) | -0.083 | (4.77) | | | -0.079 | (4.81) | | |
| Has 3 siblings | -0.085 | (4.76) | -0.060 | (5.99) | -0.090 | (3.87) | | | -0.087 | (3.90) | | |
| Has 4 or more siblings | -0.149 | (6.23) | -0.053 | (3.98) | -0.106 | (3.38) | | | -0.105 | (3.48) | | |
| Father's educational degree | | | | | | | | | | | | |
| Junior high school | 0.034 | (2.65) | 0.016 | (2.06) | 0.003 | (0.21) | 0.001 | (0.05) | 0.003 | (0.18) | -0.005 | (0.20) |
| High school | 0.117 | (7.24) | 0.031 | (3.03) | 0.092 | (4.73) | 0.027 | (0.99) | 0.087 | (4.78) | 0.005 | (0.18) |
| University | 0.295 | (11.26) | 0.061 | (3.81) | 0.225 | (6.40) | 0.051 | (1.34) | 0.212 | (7.12) | 0.013 | (0.39) |
| Not reported | 0.043 | (1.26) | 0.031 | (1.46) | -0.050 | (1.30) | -0.036 | (0.60) | -0.051 | (1.31) | -0.040 | (0.62) |
| Mother's educational degree | | | | | | | | | | | | |
| Junior high school | 0.040 | (3.32) | 0.014 | (1.92) | 0.031 | (2.27) | 0.038 | (1.83) | 0.031 | (2.27) | 0.032 | (1.43) |
| High school | 0.141 | (8.94) | 0.058 | (5.69) | 0.089 | (4.37) | 0.076 | (2.78) | 0.083 | (4.59) | 0.054 | (2.06) |
| University | 0.281 | (9.40) | 0.052 | (2.90) | 0.148 | (3.75) | 0.116 | (2.93) | 0.136 | (3.89) | 0.095 | (2.61) |
| Not reported | 0.163 | (3.86) | 0.051 | (2.03) | -0.028 | (0.58) | -0.030 | (0.43) | -0.032 | (0.69) | -0.037 | (0.50) |
| Father's occupation | | | | | | | | | | | | |
| Self employed shop seller/retailer | 0.127 | (5.77) | 0.130 | (8.31) | 0.105 | (4.03) | 0.093 | (2.44) | 0.099 | (4.07) | 0.060 | (1.61) |
| Craft | 0.045 | (2.29) | 0.035 | (2.69) | 0.056 | (2.52) | 0.065 | (1.89) | 0.054 | (2.44) | 0.055 | (1.49) |
| Farmer | -0.013 | (0.48) | 0.016 | (0.94) | 0.046 | (1.57) | 0.039 | (0.82) | 0.051 | (1.72) | 0.032 | (0.63) |
| Entrepreneur | 0.088 | (3.44) | 0.136 | (7.44) | 0.129 | (4.31) | 0.107 | (2.54) | 0.122 | (4.29) | 0.070 | (1.66) |
| Professional | 0.127 | (5.17) | 0.079 | (4.80) | 0.151 | (5.14) | 0.087 | (2.29) | 0.148 | (5.23) | 0.051 | (1.36) |
| Manager | 0.148 | (6.15) | 0.058 | (3.77) | 0.130 | (4.45) | 0.093 | (2.62) | 0.122 | (4.40) | 0.068 | (1.89) |
| Teacher | 0.065 | (2.07) | -0.045 | (2.53) | 0.103 | (2.58) | 0.052 | (1.24) | 0.096 | (2.42) | 0.049 | (1.12) |
| White collar high level | 0.075 | (4.16) | 0.008 | (0.66) | 0.107 | (5.16) | 0.082 | (2.68) | 0.102 | (4.97) | 0.069 | (2.16) |
| White collar low level | 0.056 | (2.80) | 0.005 | (0.41) | 0.089 | (3.88) | 0.056 | (1.70) | 0.087 | (3.80) | 0.043 | (1.25) |
| Blue collar high level | -0.033 | (2.10) | -0.005 | (0.51) | 0.010 | (0.56) | 0.037 | (1.25) | 0.010 | (0.57) | 0.038 | (1.22) |
| Not reported | 0.025 | (0.75) | 0.022 | (1.08) | 0.108 | (2.85) | 0.078 | (1.43) | 0.103 | (2.72) | 0.058 | (1.01) |

| | (1) Endogenous choices and selection | | | | | | | | (2) Exogenous choices and selection | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P(general) | | P(private) | | P(university) | | P(fast) | | P(university) | | P(fast) | |
| Mother's occupation | | | | | | | | | | | | |
| Self employed shop seller/retailer | 0.009 | (0.36) | 0.045 | (2.70) | -0.013 | (0.45) | -0.029 | (0.72) | -0.015 | (0.51) | -0.042 | (0.95) |
| Craft | 0.020 | (0.54) | 0.055 | (2.20) | 0.024 | (0.57) | 0.000 | (0.00) | 0.020 | (0.47) | -0.012 | (0.18) |
| Farmer | -0.049 | (1.11) | -0.024 | (0.88) | -0.020 | (0.42) | -0.083 | (1.14) | -0.025 | (0.52) | -0.085 | (1.06) |
| Entrepreneur | 0.004 | (0.07) | 0.025 | (0.66) | 0.018 | (0.24) | 0.046 | (0.48) | 0.013 | (0.17) | 0.041 | (0.40) |
| Professional | 0.047 | (0.93) | 0.015 | (0.49) | -0.012 | (0.19) | -0.074 | (1.09) | -0.016 | (0.26) | -0.082 | (1.11) |
| Manager | 0.177 | (3.22) | -0.004 | (0.14) | 0.149 | (2.11) | -0.126 | (2.39) | 0.142 | (2.03) | -0.147 | (2.63) |
| Teacher | 0.042 | (1.74) | -0.008 | (0.56) | 0.027 | (0.93) | -0.047 | (1.35) | 0.025 | (0.84) | -0.048 | (1.28) |
| White collar high level | 0.072 | (3.01) | 0.026 | (1.74) | 0.055 | (1.96) | -0.029 | (0.83) | 0.050 | (1.81) | -0.044 | (1.18) |
| White collar low level | 0.036 | (1.61) | 0.014 | (0.99) | -0.001 | (0.05) | -0.046 | (1.35) | -0.005 | (0.18) | -0.053 | (1.43) |
| Blue collar high level | -0.062 | (2.36) | 0.011 | (0.63) | -0.079 | (2.60) | -0.066 | (1.34) | -0.080 | (2.65) | -0.060 | (1.11) |
| Not reported | -0.008 | (0.46) | -0.001 | (0.08) | -0.044 | (2.32) | -0.050 | (1.75) | -0.046 | (2.40) | -0.046 | (1.50) |
| Junior high school mark (D to A) | | | | | | | | | | | | |
| Buono (C) | 0.146 | (11.67) | -0.020 | (3.11) | 0.089 | (6.02) | 0.047 | (1.87) | 0.085 | (6.44) | 0.032 | (1.30) |
| Distinto (B) | 0.331 | (23.25) | -0.032 | (4.40) | 0.163 | (7.06) | 0.088 | (2.67) | 0.153 | (10.04) | 0.065 | (2.61) |
| Ottimo (A) | 0.530 | (35.89) | -0.051 | (6.83) | 0.245 | (6.85) | 0.125 | (2.85) | 0.225 | (12.59) | 0.103 | (3.92) |
| Missing | 0.164 | (7.76) | 0.022 | (1.97) | 0.098 | (4.09) | 0.108 | (3.02) | 0.092 | (4.06) | 0.083 | (2.30) |
| High school enrollment at | | | | | | | | | | | | |
| 13 | -0.013 | (0.81) | 0.035 | (3.25) | 0.055 | (2.71) | 0.053 | (2.21) | 0.056 | (2.78) | 0.044 | (1.78) |
| 15 | -0.023 | (1.22) | 0.015 | (1.43) | -0.081 | (3.86) | -0.009 | (0.25) | -0.079 | (3.78) | 0.004 | (0.12) |
| 16 or more | 0.020 | (0.54) | 0.026 | (1.40) | -0.048 | (1.16) | -0.159 | (2.00) | -0.051 | (1.25) | -0.171 | (1.88) |
| Born before 1970 | -0.100 | (2.29) | 0.141 | (4.89) | -0.150 | (1.32) | -0.230 | (1.05) | -0.144 | (1.27) | -0.265 | (1.05) |
| Born between 1970 and 1973 | -0.147 | (5.59) | 0.113 | (6.97) | -0.124 | (2.66) | -0.116 | (1.18) | -0.121 | (2.63) | -0.104 | (0.94) |
| Born in 1974 | -0.074 | (4.07) | 0.021 | (1.98) | -0.067 | (2.15) | -0.102 | (1.78) | -0.065 | (2.08) | -0.097 | (1.52) |
| Born in 1975 | -0.029 | (2.57) | 0.007 | (0.92) | -0.009 | (0.46) | -0.054 | (1.58) | -0.007 | (0.35) | -0.057 | (1.50) |
| Born in 1977 | 0.176 | (9.60) | -0.023 | (2.19) | -0.027 | (1.07) | -0.050 | (1.60) | -0.036 | (1.61) | -0.041 | (1.30) |
| High school mark (36 to 60) | | | | | | | | | | | | |
| from 41 to 45 | | | | | 0.082 | (6.13) | 0.061 | (2.93) | 0.081 | (6.01) | 0.052 | (2.39) |
| from 46 to 50 | | | | | 0.183 | (12.78) | 0.125 | (5.68) | 0.184 | (12.82) | 0.103 | (4.82) |
| from 51 to 55 | | | | | 0.295 | (16.67) | 0.249 | (9.39) | 0.293 | (16.55) | 0.214 | (8.95) |
| from 56 to 59 | | | | | 0.335 | (14.26) | 0.280 | (8.83) | 0.334 | (14.18) | 0.237 | (8.31) |
| 60 | | | | | 0.428 | (17.74) | 0.367 | (11.36) | 0.426 | (17.58) | 0.312 | (11.55) |
| Has failed during high school | | | | | -0.070 | (3.97) | -0.071 | (2.42) | -0.072 | (4.06) | -0.069 | (2.15) |

| | (1) Endogenous choices and selection | | | | | | | | (2) Exogenous choices and selection | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P(general) | | P(private) | | P(university) | | P(fast) | | P(university) | | P(fast) | |
| Has changed high school | | | | | -0.059 | (2.81) | -0.008 | (0.23) | -0.054 | (2.58) | 0.002 | (0.05) |
| Age at end of high school | | | | | 0.004 | (0.42) | 0.029 | (1.64) | 0.003 | (0.38) | 0.033 | (1.68) |
| One grandparent has university degree | 0.068 | (4.72) | 0.015 | (1.68) | | | | | | | | |
| Mother was retired when individual was 14 | | | -0.034 | (1.96) | | | | | | | | |
| $\rho_{gp}$ (general;private) | 0.330 | | | | (17.86) | | | | | | | |
| $\rho_{lu}$ (general;university) | 0.071 | | | | (0.67) | | | | | | | |
| $\rho_{ls}$ (general;speed) | 0.036 | | | | (0.30) | | | | | | | |
| $\rho_{pu}$ (private;university) | 0.024 | | | | (0.28) | | | | | | | |
| $\rho_{ps}$ (private;speed) | 0.231 | | | | (1.72) | | | | | | | |
| $\rho_{us}$ (university;speed) | 0.338 | | | | (2.88) | | | | | | | |
| Ignorability of general high school. $H_0$: $\rho_{gp}=\rho_{gu}=\rho_{gs}=0$ | 0.0000 | | | | [3] | | | | | | | |
| Ignorability of private high school. $H_0$: $\rho_{gp}=\rho_{pu}=\rho_{ps}=0$ | 0.0000 | | | | [3] | | | | | | | |
| Significance of overall correlation structure. | 0.0000 | | | | [6] | | | | | | | |
| Significance of instruments for high school choices | 0.0000 | | | | [3] | | | | | | | |
| Exclusion of instruments from university equation | 0.6553 | | | | [2] | | | | | | | |
| Significance of instruments for selection into university. | 0.0000 | | | | [4] | | | | | | | |
| Exclusion of instruments from speed equation | 0.3386 | | | | [4] | | | | | | | |
| Number of observations | 15295 | | | | | | | | 15295 | | 6231 | |
| Log likelihood | -22028.041 | | | | | | | | -6562. 8803 | | -3874.0788 | |
| Model's chi2 | 0.0000 | | | | [219] | | | | 0.0000 | [60] | 0.0000 | [56] |

Note: The model in column (1) is estimated via simulated maximum likelihood, using a GHK simulator with 130 random draws. The models in column (2) are univariate probits. The table reports marginal effects evaluated at the mean of explanatory variables. Asymptotic t-ratios in brackets refer to underlying coefficients. P-values from hypotheses tests are reported, degrees of freedom in square brackets. The excluded category is: technical or vocational high school, public high school, male, resides in the north west, has no siblings, has both parents with no or elementary degree in low level manual occupations, reported a mark of D at junior high school, enrolled at high school at 14, is born in 1976, reported a mark between 36 and 40 at high school, has never failed at high school, has never changed high school, has no grandparents with university degree and his/her mother was not retired when the individual was 14.

Table 8: Models of early labour market outcomes

| | (1) Endogenous choices and selection | | | | | | (2) Exogenous choices and selection | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P(search) | | P(employment) | | P(low pay) | | P(search) | | P(employment) | | P(low pay) | |
| General school | -0.130 | (2.03) | -0.197 | (4.20) | 0.176 | (2.02) | -0.280 | (26.14) | -0.293 | (20.3) | 0.060 | (2.24) |
| Private school | 0.045 | (0.76) | -0.011 | (0.15) | -0.166 | (2.07) | 0.019 | (1.46) | 0.003 | (0.14) | -0.030 | (1.35) |
| Female | 0.049 | (4.44) | -0.096 | (8.12) | 0.156 | (8.31) | 0.062 | (7.22) | -0.087 | (7.94) | 0.107 | (7.17) |
| Resides in the north east | 0.004 | (0.31) | 0.057 | (3.35) | -0.079 | (3.55) | 0.022 | (0.17) | 0.056 | (3.30) | -0.050 | (2.78) |
| Resides in the centre | 0.017 | (1.35) | -0.174 | (11.10) | 0.138 | (4.88) | 0.015 | (1.25) | -0.169 | (11.35) | 0.080 | (4.22) |
| Resides in the south | 0.015 | (1.23) | -0.412 | (26.75) | 0.414 | (9.44) | 0.013 | (1.09) | -0.400 | (27.79) | 0.265 | (11.15) |
| Has 1 sibling | 0.063 | (4.88) | 0.031 | (1.77) | -0.011 | (0.45) | 0.054 | (4.44) | 0.036 | (2.11) | 0.005 | (0.22) |
| Has 2 siblings | 0.088 | (5.97) | 0.037 | (1.79) | 0.026 | (0.88) | 0.075 | (5.53) | 0.045 | (2.29) | 0.042 | (1.76) |
| Has 3 siblings | 0.080 | (4.09) | 0.038 | (1.41) | 0.025 | (0.61) | 0.067 | (3.56) | 0.043 | (1.65) | 0.041 | (1.21) |
| Has 4 or more siblings | 0.114 | (4.28) | 0.021 | (0.62) | 0.050 | (0.98) | 0.095 | (3.70) | 0.028 | (0.86) | 0.061 | (1.41) |
| Father's educational degree | | | | | | | | | | | | |
| Junior high school | 0.0001 | (0.01) | -0.011 | (0.71) | 0.025 | (1.28) | 0.005 | (0.38) | -0.007 | (0.50) | 0.014 | (0.88) |
| High school | -0.049 | (2.78) | -0.041 | (1.96) | 0.058 | (1.94) | -0.033 | (2.05) | -0.039 | (1.93) | 0.027 | (1.16) |
| University | -0.169 | (5.70) | -0.120 | (2.95) | 0.159 | (2.06) | -0.130 | (5.34) | -0.122 | (3.20) | 0.072 | (1.17) |
| Not reported | -0.021 | (0.62) | 0.005 | (0.10) | 0.167 | (2.95) | -0.018 | (0.52) | 0.011 | (0.25) | 0.145 | (2.95) |
| Mother's educational degree | | | | | | | | | | | | |
| Junior high school | -0.005 | (0.40) | -0.023 | (1.65) | | | 0.0001 | (0.04) | -0.022 | (1.59) | | |
| High school | -0.070 | (3.85) | -0.035 | (1.63) | | | -0.048 | (3.09) | -0.033 | (1.62) | | |
| University | -0.159 | (5.06) | -0.056 | (1.13) | | | -0.121 | (4.41) | -0.073 | (1.52) | | |
| Not reported | -0.108 | (2.49) | 0.005 | (0.09) | | | -0.088 | (2.07) | -0.018 | (0.34) | | |
| Father's occupation | | | | | | | | | | | | |
| Self employed shop seller/retailer | -0.145 | (5.93) | -0.002 | (0.07) | -0.009 | (0.21) | -0.128 | (5.65) | -0.014 | (0.51) | -0.024 | (0.77) |
| Craft | -0.098 | (4.75) | 0.015 | (0.62) | 0.005 | (0.16) | -0.093 | (4.49) | 0.006 | (0.27) | 0.004 | (0.16) |
| Farmer | -0.064 | (2.35) | -0.014 | (0.45) | -0.079 | (1.76) | -0.064 | (2.32) | -0.022 | (0.74) | -0.069 | (2.05) |
| Entrepreneur | -0.161 | (5.73) | 0.073 | (2.14) | -0.041 | (0.88) | -0.148 | (5.56) | 0.058 | (1.79) | -0.034 | (0.96) |
| Professional | -0.187 | (6.98) | 0.018 | (0.50) | -0.028 | (0.52) | -0.166 | (6.50) | 0.002 | (0.05) | -0.029 | (0.70) |
| Manager | -0.098 | (3.94) | -0.010 | (0.29) | 0.021 | (0.42) | -0.077 | (3.30) | -0.011 | (0.34) | 0.006 | (0.13) |
| Teacher | -0.083 | (2.65) | -0.029 | (0.54) | -0.001 | (0.01) | -0.077 | (2.48) | -0.033 | (0.62) | -0.005 | (0.06) |
| White collar high level | -0.091 | (4.84) | -0.007 | (0.30) | 0.023 | (0.68) | -0.082 | (4.44) | -0.013 | (0.59) | 0.012 | (0.45) |
| White collar low level | -0.099 | (4.83) | 0.012 | (0.48) | -0.023 | (0.63) | -0.093 | (4.51) | 0.002 | (0.08) | -0.020 | (0.69) |
| Blue collar high level | -0.021 | (1.30) | 0.060 | (3.37) | -0.046 | (1.80) | -0.026 | (1.58) | 0.055 | (3.13) | -0.024 | (1.14) |
| Not reported | -0.140 | (3.97) | -0.046 | (1.07) | -0.127 | (1.85) | -0.136 | (3.86) | -0.060 | (1.44) | -0.111 | (2.31) |

| | (1) Endogenous choices and selection | | | | | (2) Exogenous choices and selection | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | P(search) | | P(employment) | | P(low pay) | P(search) | | P(employment) | | P(low pay) |
| Mother's occupation | | | | | | | | | | |
| Self employed shop seller/retailer | -0.037 | (1.38) | 0.032 | (0.94) | | -0.031 | (1.15) | 0.022 | (0.65) | |
| Craft | 0.000 | (0.01) | 0.086 | (1.82) | | 0.007 | (0.17) | 0.069 | (1.44) | |
| Farmer | 0.072 | (1.65) | -0.066 | (1.32) | | 0.066 | (1.50) | -0.055 | (1.12) | |
| Entrepreneur | -0.172 | (2.45) | -0.063 | (0.63) | | -0.168 | (2.39) | -0.085 | (0.86) | |
| Professional | -0.005 | (0.11) | -0.101 | (1.34) | | 0.001 | (0.02) | -0.087 | (1.15) | |
| Manager | -0.083 | (1.71) | -0.148 | (1.68) | | -0.059 | (1.26) | -0.144 | (1.65) | |
| Teacher | -0.001 | (0.04) | -0.084 | (2.42) | | 0.006 | (0.25) | -0.086 | (2.50) | |
| White collar high level | -0.025 | (1.07) | -0.047 | (1.51) | | -0.015 | (0.63) | -0.057 | (1.86) | |
| White collar low level | -0.011 | (0.49) | -0.021 | (0.72) | | -0.006 | (0.25) | -0.018 | (0.61) | |
| Blue collar high level | 0.084 | (3.20) | 0.037 | (1.20) | | 0.079 | (2.98) | 0.050 | (1.62) | |
| Not reported | -0.002 | (0.11) | 0.004 | (0.23) | | 0.0001 | (0.01) | 0.002 | (0.09) | |
| Junior high school mark (D to A) | | | | | | | | | | |
| Buono (C) | -0.032 | (2.41) | | | | -0.023 | (1.90) | | | |
| Distinto (B) | -0.084 | (4.05) | | | | -0.051 | (3.69) | | | |
| Ottimo (A) | -0.143 | (4.59) | | | | -0.083 | (5.35) | | | |
| Missing | -0.041 | (1.90) | | | | -0.027 | (1.34) | | | |
| High school enrollment at | | | | | | | | | | |
| 13 | 0.009 | (0.52) | | | | 0.009 | (0.54) | | | |
| 15 | 0.046 | (2.51) | | | | 0.042 | (2.28) | | | |
| 16 or more | 0.029 | (0.82) | | | | 0.030 | (0.82) | | | |
| Born before 1970 | 0.231 | (2.97) | | | | 0.229 | (2.92) | | | |
| Born between 1970 and 1973 | 0.152 | (4.05) | | | | 0.145 | (3.90) | | | |
| Born in 1974 | 0.118 | (4.58) | | | | 0.113 | (4.31) | | | |
| Born in 1975 | 0.047 | (2.65) | | | | 0.044 | (2.48) | | | |
| Born in 1977 | -0.042 | (2.05) | | | | -0.022 | (1.18) | | | |
| High school mark (36 to 60) | | | | | | | | | | |
| from 41 to 45 | -0.042 | (3.62) | | | | -0.044 | (3.68) | | | |
| from 46 to 50 | -0.112 | (8.83) | | | | -0.113 | (8.77) | | | |
| from 51 to 55 | -0.163 | (10.2) | | | | -0.166 | (10.28) | | | |
| from 56 to 59 | -0.237 | (11.2) | | | | -0.240 | (11.29) | | | |
| 60 | -0.296 | (13.7) | | | | -0.297 | (13.77) | | | |

| | (1) Endogenous choices and selection | | | | | | (2) Exogenous choices and selection | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | P(search) | | P(employment) | | P(low pay) | | P(search) | | P(employment) | | P(low pay) | |
| Has failed during high school | 0.020 | (1.26) | | | | | 0.018 | (1.11) | | | | |
| Has changed high school | 0.018 | (0.97) | | | | | 0.017 | (0.90) | | | | |
| Age at end of high school | -0.020 | (2.61) | | | | | -0.020 | (2.60) | | | | |
| Search mode current job | | | | | | | | | | | | |
| Knew the employer personally | | | | | -0.005 | (0.19) | | | | | -0.004 | (0.19) |
| Contacted by the employer | | | | | -0.104 | (3.57) | | | | | -0.083 | (3.70) |
| Job advertisement | | | | | -0.053 | (1.93) | | | | | -0.042 | (1.89) |
| Sending CVs to employers | | | | | -0.052 | (2.44) | | | | | -0.043 | (2.46) |
| Public competition | | | | | -0.253 | (4.53) | | | | | -0.177 | (4.99) |
| Family firm | | | | | 0.051 | (1.22) | | | | | 0.043 | (1.19) |
| Employment agencies | | | | | -0.081 | (2.24) | | | | | -0.064 | (2.23) |
| Part-time | | | | | -0.171 | (6.40) | | | | | -0.131 | (7.56) |
| Work and training contract | | | | | 0.058 | (2.31) | | | | | 0.050 | (2.43) |
| Fixed term contract | | | | | -0.069 | (2.77) | | | | | -0.059 | (2.85) |
| Occupation | | | | | | | | | | | | |
| White collar high level | | | | | -0.134 | (1.66) | | | | | -0.108 | (1.80) |
| White collar low level | | | | | -0.005 | (0.25) | | | | | -0.004 | (0.26) |
| Blue collar high level | | | | | -0.003 | (0.14) | | | | | -0.003 | (0.18) |
| Employee of family firm | | | | | 0.088 | (1.69) | | | | | 0.075 | (1.64) |
| Apprenticeship | | | | | 0.230 | (5.26) | | | | | 0.219 | (5.66) |
| Public sector | | | | | 0.009 | (0.35) | | | | | 0.008 | (0.34) |
| Industry | | | | | | | | | | | | |
| Agriculture | | | | | 0.022 | (0.46) | | | | | 0.022 | (0.53) |
| Retail trade | | | | | 0.035 | (1.61) | | | | | 0.026 | (1.41) |
| Transport & communication | | | | | 0.004 | (0.11) | | | | | 0.000 | (0.01) |
| Financial services | | | | | -0.131 | (2.51) | | | | | -0.103 | (2.64) |
| Public administration, Education, Health | | | | | -0.018 | (0.47) | | | | | -0.019 | (0.61) |
| Housing or IT services | | | | | 0.079 | (2.07) | | | | | 0.067 | (2.01) |
| Other services | | | | | 0.105 | (3.88) | | | | | 0.092 | (3.95) |

| | (1) Endogenous choices and selection | | | | (2) Exogenous choices and selection | | | |
|---|---|---|---|---|---|---|---|---|
| | P(search) | P(employment) | P(low pay) | | P(search) | P(employment) | P(low pay) | |
| 6≤Firm size<15 | | | -0.108 | (4.93) | | | -0.088 | (5.44) |
| 15≤Firm size<50 | | | -0.166 | (6.62) | | | -0.129 | (7.62) |
| 50≤Firm size<100 | | | -0.223 | (6.47) | | | -0.163 | (7.81) |
| Firm size≥100 | | | -0.267 | (8.27) | | | -0.206 | (11.48) |
| Job started in 1995 | | | -0.090 | (3.62) | | | -0.073 | (3.79) |
| Job started in 1996 | | | -0.095 | (4.13) | | | -0.077 | (4.37) |
| Job started in 1997 | | | -0.053 | (2.67) | | | -0.045 | (2.81) |
| $\lambda_{gp}$ (general;private) | 0.338 | | (17.96) | | | | | |
| $\lambda_{gr}$ (general;search) | -0.242 | | (2.37) | | | | | |
| $\lambda_{ge}$ (general;employment) | -0.106 | | (1.81) | | | | | |
| $\lambda_{gl}$ (general;low pay) | 0.041 | | (0.43) | | | | | |
| $\lambda_{pr}$ (private;search) | -0.085 | | (0.85) | | | | | |
| $\lambda_{pe}$ (private;employment) | -0.005 | | (0.05) | | | | | |
| $\lambda_{pl}$ (private;low pay) | 0.225 | | (1.73) | | | | | |
| $\lambda_{re}$ (search;employment) | -0.284 | | (3.56) | | | | | |
| $\lambda_{rl}$ (search;low pay) | 0.063 | | (0.46) | | | | | |
| $\lambda_{el}$ (employment;low pay) | -0.501 | | (2.68) | | | | | |
| Ignorability of general high school. $H_0$: $\lambda_{gp}=\lambda_{gr}=\lambda_{ge}=\lambda_{gl}=0$ | 0.0000 | | [4] | | | | | |
| Ignorability of private high school. $H_0$: $\lambda_{gp}=\lambda_{pr}=\lambda_{pe}=\lambda_{pl}=0$ | 0.0000 | | [4] | | | | | |
| Significance of overall correlation structure. | 0.0000 | | [10] | | | | | |
| Exclusion of instruments from search equation | 0.1943 | | [2] | | | | | |
| Significance of instruments for selection into search | 0.0000 | | [20] | | | | | |
| Exclusion of instruments from employment equation | 0.4062 | | [20] | | | | | |
| Significance of instruments for selection into employment | 0.0216 | | [15] | | | | | |
| Exclusion of instruments from low pay equation | 0.4318 | | [15] | | | | | |

| | (1) Endogenous choices and selection | | (2) Exogenous choices and selection | | |
|---|---|---|---|---|---|
| Number of observations | 14420 | | 14420 | 9764 | 4176 |
| Log likelihood | -25686.232 | | -7261.268 | -5513.3071 | -1868.704 |
| Model's chi2 | 0.0000 | [258] | 0.0000 [60] | 0.0000 [40] | 0.0000 [55] |

Note: The model in column (1) is estimated via simulated maximum likelihood, using a GHK simulator with 130 random draws. The models in column (2) are univariate probits. The table reports marginal effects evaluated at the mean of explanatory variables. Asymptotic t-ratios in brackets refer to underlying coefficients. P-values from hypotheses tests are reported, degrees of freedom in square brackets. The excluded category is: technical or vocational high school, public high school, male, resides in the north west, has no siblings, has both parents with no or elementary degree in low level manual occupations, reported a mark of D at junior high school, enrolled at high school at 14, is born in 1976, reported a mark between 36 and 40 at high school, has never failed at high school, has never changed high school, has no grandparents with university degree and his/her mother was not retired when the individual was 14, found current job via family networks, works full time on a permanent contract, works in private sector manufacturing for a small firm, started current job in 1998.

Table 9: Direct effects of high school choices

| | (1) Academic performance | | | | (2) Early labour market outcomes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | P(university) | | P(fast) | | P(search) | | P(employment) | | P(low pay) | |
| General school | 0.365 | (4.95) | 0.007 | (0.08) | -0.139 | (1.89) | -0.069 | (1.27) | 0.081 | (0.86) |
| Private school | -0.051 | (0.77) | -0.221 | (2.67) | 0.021 | (0.32) | -0.013 | (0.18) | -0.147 | (2.01) |
| Attends university | | | | | | | -0.305 | (6.96) | 0.084 | (0.78) |
| Does job search | | | -0.128 | (1.20) | | | | | | |

Note: Column (1) reports selected marginal effects obtained estimating the model of Table7, column 1, augmented with a job search equation, including the job search dummies among regressors of the exam speed equation. Column (2) reports selected marginal effects obtained estimating the model of Table8, column 1, augmented with a university attendance equation, including a university dummy among regressors of the employment and low pay equations. Marginal effects are evaluated at the means of explanatory variables. Asymptotic t-ratios in brackets refer to underlying coefficients. Both models are estimated via simulated maximum likelihood, using a GHK simulator with 130 random draws