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The "Bologna Process" and College Enrolment Decisions ⊕

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Abstract

We use survey data on cohorts of high school graduates observed before and after the Italian reform of tertiary education implementing the 'Bologna process' to estimate the impact of the reform on the decision to go to college. We find that individuals leaving high school after the reform have a probability of going to college that is 10 percent higher compared to individuals making the choice under the old system. We show that this increase is concentrated among individuals with good high-school performance and low parental (educational) background. We interpret this result as an indication of the existence of constraints (pre-reform) -- for good students from less affluent household -- on the optimal schooling decision. For the students who would not have enrolled under the old system we also find a small negative impact of the reform on the likelihood to drop-out from university.

Keywords: University reforms, college enrolment, college drop-out
JEL classification: I23, I28, J24

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1. Introduction

In recent years, following the "Bologna process" aimed at the development of an integrated and coherent European Higher Education Area (EHEA), several European countries have undertaken reforms of the University system[1]. The main changes envisaged by the "Bologna process" to promote labour mobility among member countries, involved an harmonisation of the structure of University programmes, as well as the introduction of a credit system to facilitate mutual recognition of degrees. The move to a common structure for university degrees, though, has had different implications across countries: for some countries the reform simply meant a mild rescheduling of the existing higher education programme structure, while in others it involved a major restructuring of the whole university system, changing both the structure and duration of study programmes. In Italy, for example, the implementation of the reform required to change the existing system moving from a single four/five year degree to a two-tier system characterised by a three year degree (first cycle, undergraduate) and an additional two-year degree (secondary cycle, master level), in effect shortening the duration of studies required for obtaining a university degree. These aspects of the reform have stimulated much controversy between those (favourable) who interpreted the shortening of the first cycle as a mean to increase enrolment, reduce drop-out rates, improve equality of opportunities for access to university and, finally, to allow a faster way to enter the labour market; and those (against) who remained sceptical both about the academic contents of a shorter cycle and the market value of degrees under the new regime.

In this paper, we analyse cohort data on secondary school leavers before and after the reform of the first cycle of the Italian university system and use the reform as an exogenous shock to address the issue of college enrolment, equality of opportunities and college drop out. Since the changes were unanticipated both by students and their families at the time of choosing the secondary school track (in turn a major determinant of college enrolment), the reform provides an ideal experiment to evaluate the impact of length of studies, and of the implied costs, on human capital investments. On these grounds we can contribute to the literature on optimal schooling choice focusing on decisions made at the higher education level, and the related debate on widening access to higher education, as well as on the effect of parental background on the educational choices of their children.

[1] The so called "Bologna process" is in fact the result of a series of Conferences, Paris (1998), Bologna (1999), Prague (2001), Berlin (2003) and Bergen (2005).

We find that individuals leaving secondary school after the reform have a probability of going to college that is 10 percent higher compared to individuals making the choice under the old system. These changes do not appear to be driven by any underlying secular trend in college enrolment and can be thought of as an effect of the reform on human capital investment decisions. We show that this increase is concentrated among able students from unfavourable parental background. We interpret this result as an indication of the existence of constraints (pre-reform) on good students from less affluent household, to make their optimal schooling decision. Since a higher university enrolment does not necessarily imply a larger share of people with a university degree, we also investigate the impact of the reform on university drop-out rates. We find a negative impact of the reform on the likelihood to drop-out from university for the students who would not have enrolled under the old system.

The structure of the paper is as follows. In section 2, after briefly describing the institutional context, we review some of the economic implications of the reform. In section 3, we discuss the data used and provide some descriptive analysis. Section 4 presents the empirical strategy and outlines model specification. The main set of results are reported in section 5, while the last section concludes.

2. The "Bologna process" and the Italian reform of university studies: institutional features and economic implications

The Italian system of tertiary education is, traditionally, university-based: differently from other countries such as Germany, there is no well established system of higher vocational education.[2] Thence, after secondary school completion, school leavers can choose to enrol into university, go into the labour market, or both.

Another important feature of the Italian system is the "legal" value of university degrees which certifies the cultural and professional qualification achieved and is the same across all higher education institutions whose status is recognised by the State. In other words, any given degree at any University in Italy produces legal effects in terms of accession to public sector jobs and to specific regulated occupations (i.e. lawyer, engineer, notary, physician, etc.). Moreover, besides its "legal" value, a university degree also awards the honorific title of "*dottore*", which (still) conveys an important status to

individuals both socially and on the labour market. Both these aspects of the Italian university system (legal value and honorific title) are likely to reinforce a "credential" value of the degree, as opposed to a "market" value (i.e. based on the real value of the qualification obtained and the scientific prestige of the higher education institution involved). [3]

2.1. The Italian reform of university studies

The reform of the Italian university system has developed along two main routes. The first, has envisaged a major change in the structure of degrees, introducing a two-tier structure in which students enrol into a first three-year cycle (*Laurea breve*), and, after graduation from the first tier, they may continue university studies to pursue a second two-year degree (*Laurea magistralis*, the master level). The second route, has been a thorough change of university curricula, which brought a considerable increase in the number of fields student could choose and – for most of the degrees -- a reduction in the number of exams and in the complexity of contents. These features replaced the old system characterised by a binary single-tier structure, in which students could enrol into either 'long' (four-to-five year, *Laurea*) or 'short' (two years, *Diploma universitario*) degree and a selected number of fields. Short courses, however, were not a popular choice: for example, among the high school graduates of 1998 only 11 percent opted for the two year degrees. Long courses can be considered by far the most relevant form of university education under the old system.

Among the reasons to motivate the need to reform the Italian university system those most often reported are the low enrolment rates, the very high drop-out rates, the low number of graduates, the excessive actual length of university studies well above the legal one and not least the relevance of family background in shaping educational choices. Indeed, in the pre-reform system college graduation rate was one of the lowest among the OECD countries; in 2000 only 40 percent of the students enrolled were able to attain a degree and actual graduation length was much higher when compared to other OECD countries (OECD, 2002, 2005; Perotti, 2002).

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[2] In 1999 a new system of higher vocational education (*Istruzione e Formazione Tecnica Superiore*, IFTS) was introduced. However, there is evidence that it was hardly an alternative to the choice set described in the text. In 2001, only about 6000 persons enrolled into such courses (ISFOL, 2004).

[3] The relevance of the credential aspect of university education is consistent with the results of Brunello and Cappellari (2008) who find that while there is substantial heterogeneity in labour market returns across academic institutions, students do not seem to chose university according to these returns, but rather tend to select. universities that are close to the parental home.

In order to gain a better understanding of the factors influencing students' decisions to enrol in university, it is also important to account for the features of secondary education, and their interactions with college enrolment decisions. Specifically, after compulsory education students are given the choice to go in a "generalist" schooling track (*Liceo*) which naturally leads to university studies and is predominantly chosen by students with higher family background. Alternatively students may opt for a more labour market oriented schooling track (*Istituti tecnici e professionali*) where students from lower family background are over represented. As documented in the literature, early school tracking may have a "diversion effect" preventing some individuals from further progressing to the tertiary level thus reinforcing intergenerational correlation in educational attainment (Hanushek and Wößmann, 2006; Brunello and Checchi, 2007). The lack of any vocational training tracks at the tertiary education level in Italy has contributed to reinforce this diversion effect (see Checchi and Flabbi, 2006)

In 2001 the reform introduced with Law 509/1999 reached its implementation stage, mostly to put into practice the main features of "Bologna agreement", but also to deal with the problems of the old system – i.e. increase tertiary enrolment and the number of graduates. The routes through which the reform is likely to have had an impact on human capital investments and students' performance are the reduction in the length of studies (ie. 1-year shortening of the legal duration to get a first cycle degree) and the reduction in the number of exams (and possibly their complexity), both reducing the costs (also implicit costs) of investing in tertiary education (Bagüés *et al*., 2006). On the other side, the wider menu of degrees available and the possibility to prolong education further to obtain a second cycle degree, by allowing a better choice, might also have increased the expected returns of human capital investment. In other words, the various features of the reform are expected to have had an effect on both the number as well as the characteristics of the individuals who made their higher education choice under the new system. In particular, the larger effects on enrolment rates are likely to come from individuals that were somehow constrained in the old system (Ranieri, 2006).

Our discussion about the (positive) effects of the reform on enrolment rates crucially rests on the maintained hypothesis that the reform increased the expected net benefits of college education, through increased returns or (and) reduced costs. For being effective, the latter channel requires prospective college students to perceive the change in degrees structure as an effective reduction in the minimum length of studies required to obtain a

college degree: from four (five in certain cases) to three years. While this is plausible over the years close to the reform, it cannot be excluded that in the longer term other (e.g. general equilibrium) effects would work in the opposite direction. For example, firms may value the new first cycle degrees less than old degrees (e.g. because of reduced complexity of studies), such that students may respond prolonging their studies to obtain the additional two-year degree, thus accumulating more human capital than before. In such a case, the reform would increase the length of university studies and the long term effect would be the opposite of the ones discussed.

One may also think of mechanisms that reinforce the positive short term effects. For example, after the reform, going to college may become the norm for a wider social group, hence increasing the likelihood of college enrolment other things equal, -- e.g. some sort of 'state dependence' effect operating at the societal level over cohorts of high school leavers. One should also stress that besides operating on expected costs and returns, the two-cycle structure introduced by the reform may positively impact on enrolment behaviour if individuals value the size of their opportunities set or if they are risk averse.

<Figure 1 >

At the aggregate level, administrative data show a strong impact of the reform on enrolment rates. Figure 1, reports the evolution of enrolment into higher education (as a share of the cohort of high school graduates), showing the existence of a declining trend before 2001, and a huge increase (over 10 percent) in the year of the reform. The sharp increase in enrolment rates suggests that the reform was largely unanticipated by students, thus providing an ideal experiment to investigate individuals' higher education decisions.[4] By looking at the groups of individuals whose behaviour is affected by the institutional change, the reform can be used to shed light on the determinants of human capital investments and on the constraints operating on individual educational decisions. In general one might expect that the higher inflow of students would come from either less able individuals, those lacking resources (either financial and cultural), or both. Unravelling the drivers of increased university enrolment is therefore an empirical issue

[4] The declining pattern over the 1990s can partly be explained by the introduction of law 122/94 which granted universities the possibility to raise fees above the standards set at the national level. This determined an increase in the average fees over the period preceding the reform. According to official figures from the

that can be solved using the micro-data on high school leavers to perform a before-after comparison of enrolment determinants. Besides enrolment, there are also reasons to believe that the reform may have altered college drop-out behaviour, though the direction of the effect is not clear. The shorter duration of studies and the lower (perceived) complexity, as previously discussed, may work in the direction of reducing drop out rates; conversely, under the hypothesis that the higher inflow of students is coming from the lower part of the ability distribution - with unchanged complexity and pass threshold for exams -, drop out rates could increase. We return this issue later in the paper.

2.2. Evidence from previous studies

A number of studies have investigated the impact of different types of school reforms on a number of economic outcomes - i.e. mainly human capital investment decisions and labour market returns (see, Angrist and Krueger, 1991; Duflo, 2001; Meghir and Palme, 2005; Oreopoulos, 2006; Maurin and McNally, 2008). In this section we shall first focus attention on those studies which, using cohort data and a major change in the educational system (either due to a reform or to a external shock), can be considered closer in spirit to our own[5]. Next, we shall review some of the papers that have investigated educational patterns and the effects of the "Bologna process" within the Italian context.

Meghir and Palme (2005) study the effects of a major educational reform of compulsory schooling in Sweden to assess both the impact on human capital investment decision, as well as on earnings in the labour market. A specific design of the reform (differences across municipalities) is used to implement a differences-in-differences approach on two cohorts of pupils in education. The main findings suggest that the extension of compulsory education requirements increased the share of students obtaining more education (over and above the new compulsory level) for the group with high ability and unskilled father. They also find that labour market earnings increased for the same group of individuals. Overall, the reform is found to have had an impact on intergenerational mobility by loosening constraints faced by students coming from more disadvantaged background and increasing their economic opportunities. Maurin and McNally (2008) investigate the effect of the so-called French 'revolution' of 1968 on

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Ministry of University, such an increasing trend continued also during the years of the reform, with the average fee growing by 5% (in real terms) between 1999 and 2002.

schooling attainment and on subsequent labour market outcomes of the individuals affected. The revolution is seen as a major shock to the performance of students undertaking important examinations in that year (the high school *baccalauréat*), which led to a temporary reduction in exam passing standards and determined an increase in university enrolment. Using data from the cohorts involved, it is shown that the 'marginal' student affected by the shock was mainly coming from a middle-class family background - since those from lower (higher) socio-economic groups are much less (more) likely to progress to higher education in any given year - than would have otherwise been. Next, using the revolution as an instrument for educational attainment, it is found that additional education increased the earnings of the rioting students (by 17 percent), as well as the educational attainment of their children. Oreopoulos (2006) exploits a change in the minimum school-leaving age in the U.K. to investigate returns to schooling. Using different estimation methods (i.e. treatment effects and a regression discontinuity design), the study shows that the benefits from compulsory schooling are very large irrespective of whether reforms have an impact on a majority or minority of those exposed. Finally, Cardoso *et al.* (2006) investigate the effects of the "Bologna process" in Portugal on the demand for higher education. The study exploits the fact that universities had the choice to implement the reform and restructure academic programs in the academic year 2005-2006, or to postpone it up to two years. Using regression analysis applied to count data, they show that degree courses whose curricula was modified in order to comply with the Bologna principles were subject to an increase in demand by students. This (positive) effect is found to be stronger in those institution taking the lead in the reform process, which they interpret as a signalling (of quality) effect.

Previous empirical evidence concerning the Italian educational system suggests that parental income, education and socio-economic status are important determinants of individual educational choices and the probability of graduation. University graduates are more likely to come from higher educated families, income mobility is generally lower and intergenerational correlation in educational attainment higher as compared to other countries (Checchi *et al*., 1999; Checchi and Flabbi, 2006). These patterns are reinforced by the early school tracking feature of the Italian system, as previously discussed, which has been shown to create a "diversion effect" preventing further progression to the tertiary

[5] There is an extensive US and UK literature that investigates several issues also considered here (drop-out rates, probability of enrolment and graduation, and the role of family background). For additional survey

level and strengthening intergenerational correlation (Hanushek and Wößmann, 2006; Brunello and Checchi, 2007). More recent papers have analysed the educational outcomes of the "Bologna process" mainly focussing on the effects on drop-out rates. Boero, *et al.,* (2005) using administrative data drawn from a single University find no effects of the reform – conditional on grading standards - on students drop-out rates. Bratti *et al.* (2006) use case study data, from a single University, to look into the hypothesis that the fast increase in the number of students was accompanied by a reduction in the standard of higher education and investigate the consequences on drop out and graduation rates. They report a significant reduction in course workloads and an increase in student performance after the reform, which are shown to have significantly reduced the likelihood of student dropping out[6]. Di Pietro and Cutillo (2008), using survey data on high school graduates, focus on the impact of the reform on college drop-out rates and document a marked reduction after the reform. They implement a decomposition methodology to assess whether changes in the probability of dropping out are determined by changes in students' observable characteristics or by changes in students' behaviour. Results show that the reduction in drop-out rates is consistent with a change in student behaviour, such as: higher motivation to complete, labour market oriented curricula and increased possibilities to combine study and work. Finally, d'Hombres (2007), use survey data and propensity score methods to estimate the probability of dropping out of university in the post-reform period. Her findings suggest that both the probability of dropping out of university and that of being 'inactive' are significantly lower in the post-reform period.

The empirical evidence on the effects of the reform, as documented above, seems rather controversial showing mixed results for what concerns both economic outcomes and their implications. Most findings, due to the specific data used or to the different methodology, appear difficult to compare, which can be explained both by the scarcity of nationally representative micro data -- which motivated the use of specific data and case studies in the literature -- and by the fact that the reform is still rather recent. Moreover, a common problem to these latter studies is that they use a before-after approach without adequately controlling for changing labour market conditions and other cohort trends,

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evidence see, Hanushek, 1986; Hanushek and Wößmann, 2006; Lemieux, 2006.

[6] In a companion paper Bratti, *et al.* (2007), develop a theoretical model in which individuals decide whether to enrol in university and, conditional on that, whether to drop-out. The theoretical implications suggest that a reduction in higher education standards goes in the direction of increasing the number of students in tertiary education and, by reducing drop-out, also graduation rates. However, the authors warn against the use of drop-out or graduation rates as a mean to evaluate university overall efficiency.

which due to a potential omitted variable bias, may cast doubts on the robustness of the results. In this perspective, the present paper contributes to the existing literature by producing new evidence on the reform effect on college enrolment and college drop out, and the interactions with students characteristics.

3. Data and descriptive statistics

The data used in this paper originate from the "Survey on the education and work patterns of secondary school graduates", a cross-sectional sample of school leavers interviewed by the National Statistical Office (ISTAT) three years after graduation. The data represent approximately 4 percent of the population of Italian secondary school graduates of a given year (which consists roughly of 500000 persons) and contain a wide range of information on the school curriculum and on post-school experiences, either in college and in the labour market. In addition, information on personal characteristics and family background is available.

The two latest waves of interviews were conducted in 1998 and 2001: the latter cohort is the first making college enrolment decisions under the new regime. Therefore, comparing data from the two cohorts offers the opportunity to study the effect of the reform on human capital investments. In principle, in order to reduce noise in the estimation of the reform effect, one would like to compare the 2001 cohort with the cohort leaving schools immediately before the reform introduction, i.e. the school leavers of 2000. Such a possibility is precluded by data availability. This may be problematic if, for example, there is an underlying increasing trend in college enrolment so that widening the time interval between the points at which the before/after comparison is made lead to overestimate the impact of the reform. However, Figure 1 shows that this is definitely not the case in Italy, and in the years from 1998 to 2000 college enrolment rates were essentially constant. On the other hand, considering data some years before the reform rather than immediately before it reduces the risks of anticipation effects, which, in our case, may induce individuals to delay enrolment in order to join the new regime, inflating the estimated between-cohorts differential.

The ISTAT survey refers to all students leaving secondary school with a 5 year diploma in a given year. As discussed in Section 2, the Italian system of secondary education is structured into tracks that, by and large, can be divided between college

oriented (*Licei*) and labour market oriented (*Istituti Tecnici* – educating for white collar careers-- and *Istituti Professionali* – focussed on skilled blue collar occupations). While these tracks represent the larger share of the supply of secondary education, there are other schools intended for individuals aiming at specific profession, such as primary school teachers and figurative artists. Given the special nature of these schools, their students have been excluded from the estimation sample. For teaching schools the exclusion is also motivated by the fact that in 2001 college degrees became a compulsory requirement for accessing the teaching profession, so that observing larger enrolment rates from these schools may not reflect the impact of the "Bologna process", but rather be a consequence of changing rules in the teaching profession. Excluding these observations belonging to these groups plus others with missing information on key explanatory variables in our analysis yielded a final estimation sample of about 36,600 observations of which 18,800 belong to the 1998 cohort and the rest to the 2001 one.

<Table 1>

Summary statistics for the estimation sample are provided in Table 1, showing that the characteristics of the interviewees where rather stable in the two cohorts. The bottom rows of the table show college enrolment and drop out rates. Since the reform substituted all existing college degrees ('short' and 'long' degrees, see Section 2) with the new two-tier system (first and second cycle), college enrolment for the 1998 cohort has been computed considering students reporting having enrolled in both 'short' and 'long' degrees. Raw data clearly indicate that enrolment was higher after the reform, by approximately 10 percentage points, - i.e. by an amount comparable with the administrative data depicted in Figure 1. Note however that the level of administrative figures are some 10 percent larger, and this gap does not seem to vary after the reform. The reason of the gap is that survey data consider enrolment only by students that left secondary school in a specific year, while administrative data record overall enrolment, including individuals that obtained their secondary school degree several years prior to enrolment. Finally, looking at college drop out it appears that the reform did not reduce it, the 2001 figure being 1.5 percent higher than the 1998 one.[7]

[7] Both enrolment and drop out rates match quite closely official statistics published by ISTAT using the same data (see ISTAT, 2004 and 2007)

The final two rows of the table, look at aggregate labour market indicators for the two cohorts. Labour market conditions have changed remarkably in Italy over the past decade, with the unemployment rate dropping from 12 to 7 percent between 1998 and 2006. Part of these changes can be ascribed to labour market reforms (discussed in the next Section) which increased flexibility especially for the youth labour force. It is therefore important to control for changing labour market performance while studying changes in the demand for college education before and after the reform. The first aggregate indicator reported is the unemployment rate for high school graduates in the cohort preceding the ones studied. For example, for the high school graduates of 1998, the figure reported is the 1998 unemployment rate for the high school graduates of 1995, computed from the ISTAT survey on the 1995 cohort of secondary school graduates. For 2001 high school graduates, the figure reported is the unemployment rate for the high school graduates of 1998, observed in 2001. These figures are likely to proxy rather closely the labour market conditions school leavers would have faced had they decided to enter the labour market right after graduation. The table also provides official figures of the youth (15-24 years old) unemployment rate published by ISTAT. Both unemployment rates are averaged over cells defined by gender and region. The evidence provided illustrates remarkable changes in the youth labour market, with unemployment rates dropping by between 6 and 10 percentage points, depending upon the indicator considered.

4. Modelling the effect of the reform on students outcomes

Our repeated cross-sectional data enable us to study the impact of the reform by means of a before-after comparison. That is, by pooling survey data for 1998 and 2001 we estimate the differential in some relevant outcomes between the two cohorts. Assuming that between-cohorts differences are exclusively driven by the reform, such a strategy delivers consistent estimates of the effects of interest.

The data consist of observations about individual outcomes y_i and a set of controls x_i for secondary school graduates in 1998 and 2001. Our basic estimating equation is therefore:

$$y_i = x_i'\beta + \delta r_i + u_i$$

where r_i is a dichotomous indicator for whether the student left secondary school in 2001 (and was therefore exposed to the reform), while u_i is a zero mean error term independent from the vector of observables (x_i' r_i). Given these assumptions

$$\delta = E(y_i | x_i, r_i = 1) - E(y_i | x_i, r_i = 0)$$

measures the impact of the reform on outcomes and can be consistently estimated by regressing the outcome on the observables. For example, if the outcome under analysis is college enrolment, y_i may be thought of as the expected net benefit of enrolling into college, enrolment occurs whenever the net benefit is positive, and δ can be estimated by probit regression.

As discussed, e.g., in Meghir and Palme (2005), results from before-after comparisons should be interpreted with caution since any underlying cohort trend or macroeconomic change could blur estimation of the effect of interest. However, there are three arguments that support the validity our estimating strategy. First, administrative data on the population under analysis clearly show that in the years prior to the reform there was no trend in enrolment rates, see Figure 1. Indeed, college enrolment continuously dropped between the mid and late 1990s, hitting a minimum in 1998 and then stabilising around in the two following years. The first year of the new regime shows a sharp increase in college enrolment, of approximately 10 percentage points. Thence, there not seem to be any underlying increasing trend that, if omitted, could bias upward our estimated effects. Secondly, the vector of observables includes a time-gender-region specific unemployment rate for the cohorts of secondary school graduates leaving high school three years before the cohorts investigated. We use this measure, rather than – say- the youth unemployment rate, because it is likely to be the relevant piece of information about local labour markets on which the cohorts studied based their enrolment decisions. Controlling for local labour market conditions at the time of leaving school is important in our exercise since they influence the expected costs and benefits of college education and the opportunity costs of college enrolment. Moreover, labour market conditions changed sharply in the years of the college reform. A set of labour market reforms aimed at reducing rigidity in the youth labour market were introduced by law in July 1997. These reform generated better labour market conditions for the youth, making the transition to work a more attractive opportunity relative to college enrolment other things being equal. To the extent that their

effectiveness was greater in 2001 than in 1998, omitting the controls for local unemployment rate would bias the estimated effects of the reform downward.[8] Finally, as Table 1 illustrates, observable personal characteristics are rather homogeneous before and after the reform, and to the extent that these similarities carry on also to unobservables, we may think that the assumption of independence between the error term and the reform dummy is not too restrictive.[9]

The regression framework outlined above can be used not only to quantify the impact of the reform on outcomes, but also to assess what are the personal attributes whose impact on outcomes was affected by the reform, thereby making some step in the direction of identifying the channels through which the reform exerted its effects. This can be done by interacting the reform dummy with the set of relevant attributes. Specifically, human capital theory predicts that schooling decisions are constrained by family background and individual ability. To the extent that the reform lowered the costs for accessing college education, one may expect less able pupils from disadvantaged background to increase their enrolment rates relative to otherwise similar individuals. Assuming a dichotomous distribution of both ability and background, one can estimate the following model:

$$y_i = x_i'\beta + \delta r_i + \gamma_1 a_i + \gamma_2 b_i + \gamma_3 a_i r_i + \gamma_4 b_i r_i + \varepsilon_i$$

where a_i indicates high ability individuals, b_i stands for a favourable background, and the set of controls is the same as before, but excluding background and ability. The crucial parameters that measure how much the reform worked through the ability and background channels are γ_3 and γ_4 , i.e. the variations in the effects of ability and background on outcomes before and after the reform. For example, if outcomes are college enrolment rates, a standard human capital model would predict both parameters to be negative.

<Table 2>

[8] One may argue that area-level college enrolment is endogenous to unemployment. Note, however, that we are using the unemployment rate for high school graduates of cohorts of students different than the ones analysed, which should mitigate simultaneity issues. Moreover, we expect the effect of aggregate college participation on unemployment to be negative, as long as it reduces the number of youths searching for a job. On the other hand, we anticipate the 'true' unemployment coefficient in the enrolment equation to be positive, since unemployment reduces the opportunity costs of going to college. In this context, the potential bias is likely to be negative underestimate, such that our estimated coefficient can be considered a lower bound estimate of the true effect.

[9] See the next Section for further discussion and evidence on this point.

5. Results

5.1 The effect of the reform on college enrolment

A first set of results is presented in Table 2 which shows probit estimates of the effect of the reform on college enrolment rates. The regression of column (1) includes only a gender dummy and regional dummies, plus the reform dummy, and estimates the reform impact to be positive and in the order of 9 percent, reproducing the differential estimated from the raw data in Table 1. The second column includes the local unemployment rate (for the cohorts of secondary school graduates leaving high school three years before the cohorts investigated) among regressors and clearly shows the relevance of doing so. The effect of unemployment is positive and precisely estimated, suggesting that high unemployment reduces the opportunity cost of time spent in education, thus increasing enrolment rates. More importantly, the reform impact is now larger by some 3 percentage points. Such change reflects the improvement in labour market conditions between 1998 and 2001 documented in Table 1. Given that better labour market conditions act as a disincentive to college enrolment, omitting the unemployment rate lead to underestimate the impact of the reform.

Subsequent columns of the table progressively saturate the regression model with the "usual" set of controls for family background and individual ability. Specifically, controls for parental education and occupation, marks in the final exams of junior high school, the secondary school track of graduation, and marks in the final exam of secondary education are progressively added in columns (3), (4), (5) and (6) of the table, respectively. Parental education has an effect on college enrolment which is well above that of parental occupation, and quantitatively the effect appears to be rather similar between father and mother. The other powerful driver of human capital investments is individual ability, whose earlier measurement in the data is at the end of compulsory education, normally at the age of 14 (the 8^{th} grade). Comparing the enrolment rates of low and high performers in the final exam of compulsory education, we can observe an increase of more than 40 percentage points. Including controls for the secondary school track of graduation shows that students from the academic oriented tracks (the omitted category) have by far the largest probability of choosing college enrolment after graduation, followed by students from technical and, at an even lower level, professional schools. Also, the school track does not appear to be orthogonal to parental background and pre-track ability. The

reduction in the impacts of background and ability occurring after the inclusion of school track among regressors reveals that those two factors are important determinants of track choice. Even after including all these significant shifters of the net benefits of college enrolment, the estimated impact of the reform remains statistically significant and its size quantitatively stable across specifications, confirming the visual impression derived from Table 1 about the orthogonality between the reform and the observables, a fact consistent with the hypothesis that the reform is randomly allocated across individuals.

<Table 3>

Having established that the reform increased enrolment rates, the relevant question becomes why. Did the reduction in the costs of education attracted students from more disadvantaged background, less able pupils, or both? Table 3 provides an answer to such questions by looking at the interactions between the reform and personal characteristics. Column (1) of the table starts by interacting the reform with school tracks, which we have seen to play a crucial role in streaming students into college. Results show that a relevant part of the effect is concentrated among students from technical schools, which closed their gap relative to academic oriented schools students by 6 percent. On the other hand, no differential increase in enrolment rates can be detected from the professional track.

Considering that ability and background play a major role in allocating students into school tracks, this evidence suggests that those who increased college enrolment thanks to the reform should be of intermediate ability and background. In order to look directly at this issue, the second column of the table considers a model unconditional on school tracks, but including the interaction of parental education and students ability with the reform dummy.[10] The results for parental background show that the advantage – in terms of enrolment rates – of having a father with college degree was reduced by the reform, consistently with the view that the reform has had an impact on intergenerational correlations in education. The result for ability, instead, does not support the view that the reform increased the access of less able individuals. If anything, the opposite seems to hold, more able individuals increasing their enrolment rates after the reform. Re-introducing school tracks into the model does not solve the puzzle, see column 3, in which

[10] Interactions of the reform with parental occupations were also added to the model, but were found to have no explanatory power.

the interaction between father education and the reform loses significance (picking up the fact that parental education affects track choice) while the interaction between the reform and ability remains significant and gains size compared with column (2).

Thus, it seems that the most able saw they enrolment chances increased by the reform. One explanation for this finding could be that these individuals were somehow constrained in their behaviour before the reform. For example, these may be able children of low educated parents who make a sub-optimal investment in human capital due constraints in the (economic and cultural) resources available for the investment. By lowering investments costs, the reform may therefore have corrected such sub-optimal equilibrium.[11]

5.2 Sensitivity analysis

In order to assess the plausibility of our conclusions about the interplay between family background and students ability in constraining pre-reform enrolment decisions, in this section we perform some sensitivity analyses.

<Table 4>

We start by performing a placebo analysis and estimate the change in college enrolment between the 1995 and 1998 cohorts of secondary school leavers. The aim of the robustness check is to assess the absence of any increasing trend in college enrolment already present before the reform that may bias our estimates upward. Figure 1 indicated that any such trend is absent in administrative data, and now we want to confirm the finding on survey data. We therefore some of run the regressions of interest by using data for the 1995 and 1998 cohorts of high school graduates, i.e. the latest cohorts with available data choosing college enrolment under the old system.[12] Results are in Table 4. The regression of the first column controls for gender and region, and estimates a decline in college enrolment of about 3 percent. Such a decline is smaller than the one depicted in Figure 1 (which is roughly 5 percentage points), and definitely rules out the hypothesis that

[11] These results are in line with the findings of Meghir and Palme (2005) who report a beneficial effect of the Swedish educational expansions for able pupils from less advantaged background.

[12] No information on the unemployment rate of high school graduates of older cohorts is available for students leaving high school in 1995. Therefore, in the placebo analysis the youth (15-24 years old) unemployment rate is used in place of the unemployment rate of high school graduates to control for changing labour market conditions.

college enrolment was already on an upward trend before the Bologna process was implemented in 2001. The second column adds a control for local labour market conditions, which attracts a positive coefficient, although less precisely estimated compared with Table 2. One reason for the loss of precision may be that both enrolment rates and unemployment rates experience less variation between 1995 and 1998 than they did in the years surrounding the reform. The other columns in the Table add in the additional controls for parental background and students ability. It is noteworthy that controlling for background leads to estimate a larger drop in enrolment. If, as we argued above, dropping enrolment was caused by increasing university fees, this finding indicates that a favourable background is a viable way for lifting the financial constraints induced by higher fees, so that netting out the effect of background the reduction in enrolment would have been even larger. Controlling for both background and ability, the regression adjusted estimate of the decrease in college enrolment between 1995 and 1998 is 8 percent. Overall, placebo tests support our conclusions on the effects of the reform on college enrolment.

<Table 5>

We next look at the interaction between ability and background in determining enrolment before and after the reform. If unfavourable parental background was preventing able pupils from making optimal investments, then we should observe the ability/reform interaction to positively affect the enrolment decisions of individuals from unfavourable background, whereas for individuals with more favourable family origins the impact of ability on choices should not vary after the reform. To this end, we estimate the model of Table 3, column 2, by level of father education. Results from such exercise are reported in Table 5, which shows that the gain in enrolment rate accruing to more able individuals is evident only for the children of fathers with an intermediate level of education, supporting our hypothesis[13]. Moreover, for the sub-sample with father highly educated, there is a positive and significant interaction term between the reform and having a mother highly educated, while the coefficient on the reform dummy is negative and marginally statistically significant. While the latter coefficient picks up the reduced advantage in

enrolment rates for children with favourable background already seen in Table 3, the former indicates that such a reduction is smaller the higher mother's education.

<Table 6>

Another reason why our results may be driven by the choice of specification is that schooling ability and family background (especially educational one) are positively correlated. A number of theories could explain such correlation[14]. From the point of view of our analysis, it could imply that the ability effect that we find is in fact a consequence of the effect operating through parental background. To check this possibility, we estimated the model of Table 3, column 2, interacting the reform with either ability or background, but not both. Results are provided in Table 6, which shows that our conclusions are not a consequence of the positive association between background and ability.

<Table 7>

Finally, one further explanation for our results on ability is measurement error. Besides recall bias or mis-reporting, one problem with our indicator is that it refers to ability measured at age 14 (e.g. the 8th grade) , whereas college enrolment decisions are based also on the information extracted from the performance in high school, which is summarised by the marks reported in the final examinations at the age of 19 (e.g. the 13th grade). To the extent that some individuals perform better as 8th graders than they do as 13th graders and such downward mobility in performance has increased over time, our conclusions about parental background constraining college enrolment choices would be misplaced. We therefore re-estimate our model using 13th grade marks as the relevant ability indicator to be interacted with the reform, either alone (column 1) or in conjunction with 8th grade marks (column 2). Results from these regressions are given in Table 7. We find that individuals from the upper-middle tail of the 13th grades distribution increased their enrolment into college after the reform relative to those in the bottom part of the marks distribution. Moreover, when we include also interactions between the earliest

[13] This result is consistent to the findings of Maurin and McNally (2008), who show that the main effects of the "1968 revolution" on labour market outcomes were due to students coming from middle-class family background.

grades and the reform, we find results in line with the ones presented in Table 3. Overall, it seems that the specific point in students careers from which we chose to measure ability is not driving our conclusions about family backgrounds and constraints on education.

5.3 College drop out

The results discussed so far show that the reform had an impact on university enrolment rates and that the additional inflow of students mainly originated from families with parents with an intermediate educational level. However, higher enrolment does not necessarily translate in a higher stock of human capital at the national level, nor it implies an increase in intergenerational mobility in education. To the extent that the additional inflow of college intakes has a large propensity to quit before completion, changes in intergenerational correlations at college entry might not translate into analogous changes at college exit, such that human capital outcomes and the link between educational attainment and family background will remain unaffected. For example, this could be the case if the additional intakes come from the lower tail of the ability distribution, although results previously discussed are not consistent with such a view. In order to assess these issues, in this section we investigate college drop out rates before and after the reform.

<Table 8>

The data enable identification of college drop outs thanks to a survey question on the interruption of college studies. Since the question is answered at most three years since enrolment, the observed drop out indicator is subject to right censoring. This holds for all pre-reform students enrolled in four year courses and for students that, before or after the reform, did not enrol at university immediately after leaving school, but with some lag. However, since most drop outs typically occur within the first or second year of graduation, we can expect the bias induced by right censoring to be mild. Moreover, we observe any lag existing between school graduation and college enrolment, and control for it in the regression. Importantly, it should be noted that the relevance of any bias due to censoring is larger before the reform rather than after it, so that our estimates will be, at worst, an upper bound of the true effect.

[14] See Solon (2002) and Blanden *et al.* (2007) for recent evidence and a discussion of the implications of the relationship between the education of parents and that of their children.

The reduction in course length is a first evident channel through which the reform may reduce drop outs. Individuals quit college when they realize that they may have overestimated the net benefit of college degrees, and by lowering the cost of education the reform can make the overestimation less likely. But in addition, there are other factors at play that may work in the direction of reducing post-reform drop outs. For example, there is evidence that after the reform, teaching standards were lowered (see Bratti et al, 2006) which is an alternative way of reducing the (effort related) costs of education, and thence drop outs. Our analysis is not aimed at disentangling these competing explanations, but estimates the overall change in drop out induced by the reform.

Results are presented in Table 8, which shows estimates from probit regressions of a drop out indicator on a set of controls.[15] All the factors included as regressors in the college enrolment model are also controlled for in the drop out equation. Considering that the drop out decision is probably based on updated information on labour market conditions compared with the enrolment decision, the youth unemployment rate in the year prior to the survey is used in place of the unemployment rate of high school graduates in the year of enrolment. Moreover, dummies for the time span separating school leaving and college enrolment account for the censoring issues discussed above. Ideally, the field of college studies should also be included in the drop out equation. However, such an information is not recorded in the survey for university dropouts, and we are forced to omit it from the drop out model. Such an exclusion may bias our results if the reform shifted field choice, and fields are characterised by different drop out rates, a caveat to be borne in mind when interpreting results on drop out rates.

The first column of the table shows that drop out rates were some 0.8 percent larger after the reform, and the effect is not precisely estimated. The regression adjusted estimate is thus half of the effect estimated from raw data in Table 1, and considering this as an upper bound, we can conclude that the reform did not affect the average college drop out. Estimated marginal effects associated with the other controls listed in the first column show that college drop out is more frequent among males, students with less favourable family background or with lower ability, and students from labour market oriented secondary schools. The dummies for lagged college enrolment attract positive (1 year lag)

[15] Since the college drop out indicator is observable only conditional on college enrolment, drop out regressions are potentially prone to issues of endogenous sample selection. We investigated such possibility by means of probit models with endogenous sample selection, but found the sample selection term to be not statistically significant at conventional levels of confidence.

and negative (2 years lag) signs. The positive sign of the first coefficient may be interpreted as a selection effect, since more able and motivated individuals enrol right after high school, while lower ability individuals may wait longer to enrol and are more likely to drop out. These kind of effects are at play also for students enrolling more than one year after high school completion. For this latter group, however, it is more likely that the censoring issues discussed earlier display their effects, and in fact our estimates indicate that these students have lower chances of quitting college studies compared with individuals who enrolled in college right after high school completion.

The second column in Table 8 considers results from interacting the reform with secondary school tracks, in order to assess whether the absence of any average effect is indeed the result of heterogeneous effects offsetting each other across groups defined by type of high school. Results indicate that this is not the case since coefficients on the interaction terms and on the reform dummy are not statistically significant.

To assess this point more directly, in the third column the reform dummy is interacted with parental education and students ability. While there is no clear pattern on background, for ability we find results that are in line with those obtained for college enrolment, -- i.e. the reform benefited (in terms of lower drop out rates) more able individuals. In this sense the reform can be seen as having improved the efficient allocation of individuals into college education, as the additional intakes are also displaying lower drop out rates..

6. Concluding remarks

The "Bologna process", aimed at the development of a common structure within higher education in European countries, is changing the contour of university studies – both in terms of structure and duration of study programmes – as well as the economic incentives to go to college. Italy is an interesting example, since the implementation of the reform implied a major restructuring of the existing system unanticipated by students and determined a significant change in college enrolment rates. While for some students, the effect of the reform simply meant a re-scheduling of their progression through the education system, for a sizeable group of student the reform seem to offer better opportunity to attend higher education. In this paper we use survey data on two secondary school leavers cohorts to assess the impact of the reform of Italian university system on human capital investment decisions. We find that the reform significantly increased the probability of going to college and that this effect is stronger for the 'marginal' student, i.e.

individuals with good schooling ability but unfavourable family background. We interpret this result within a standard human capital investment framework as evidence of either financial or cultural constraints (or both) that, pre-reform, prevented a subset of the population from making optimal investment choices.

We also study university drop out and find that the reform had a small beneficial effect for the students who would not have enrolled under the old system. Overall, results are consistent with an equalising effect of the reform on opportunities in the access to higher education. Since these are estimated on the first cohort of individuals exposed to the new system of university education, it will be important to monitor the future developments of college enrolment and drop out, once more data will become available.

References

Angrist, J.D. and Krueger, A.B., (1991) "Does Compulsory School Attendance Affect Schooling and Earnings?" *Quarterly Journal of Economics*, 106(4), 79–1014.

Bagüés, M., Sylos Labini, M. and Zinovyeva, N. (2006), "Endogenous grading standards and labour market mismatch", paper presented at the *Brucchi Luchino 2006 conference* (Padua).

Blanden, J., A. Goodman, P. Gregg, and S. Machin, (2007), "Changes in Intergenerational Mobility in Britain," in M. Corak (ed), *Generational Income Mobility in North America and Europe*, Cambridge University Press.

Bratti, M., Broccolini, C. and Staffolani, S. (2006), "Is «3+2» Equal to 4? University Reform and Student Academic Performance in Italy", *DEA* Working Paper no. 251, *Università Politecnica delle Marche*, Ancona.

Bratti, M., Broccolini, C. and Staffolani, S. (2007), "Mass tertiary education, higher education standard and university reform: a theoretical analysis", *DEA* Working Paper no. 277, *Università Politecnica delle Marche*, Ancona.

Brunello, G. and Cappellari, L. (2008) "The Labour market Effects of Alma Mater: Evidence from Italy", *Economics of Education Review*, forthcoming.

Brunello, G. and Checchi, D. (2007) "Does School Tracking Affect Equality of Opportunity? New International Evidence", *Economic Policy*, 22 (52), 781-861

Cardoso A.R., Portela, M., Sá C. and Alexandre F. (2006) "Demand for Higher Education Programs: The Impact of the Bologna Process", *IZA* Discussion Paper 2532.

Checchi, D. and Flabbi, L. (2006), “Intergenerational Mobility and Schooling Decisions In Italy and Germany”, *IZA* Discussion Paper 2876.

Checchi, D., Ichino, A. and Rustichini, A. (1999), “More Equal but Less Mobile? Education Financing and Intergenerational Mobility in Italy and in the US”, *Journal of Public Economics*, 74, 351-393.

d'Hombres B. (2007) "The impact of university reforms on dropout rates and students' status: Evidence from Italy", unpublished manuscript, CRELL *Centre for Research on Lifelong Learning*, The European Commission.

Di Pietro, G. and Cutillo, A. (2008), “Degree flexibility and university drop-out: The Italian experience” *Economics of Education Review*, forthcoming.

Duflo E. (2001) "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment", *American Economic Review*, 91 (4), 795-813

Hanushek, E. (1986), “The economics of schooling: production and efficiency in public schools”. *Journal of Economic Literature,* 24, 1141-1177.

Hanushek, E. and L. Wößmann. (2006). “Does Educational Tracking Affect Performance and Inequality? Differences-In-Differences Evidence Across Countries” The *Economic Journal*, 116, C63-C76.

ISFOL (2004), Il primo triennio dei percorsi IFTS. Sintesi dei risultati delle attività di monitoraggio e valutazione. Rome: ISFOL.

ISTAT (1995), *Sistema educativo e mercato del lavoro*. Rome: ISTAT.

ISTAT (2004), I diplomati e lo studio. Indagine 2001. Rome: ISTAT.

ISTAT (2007), I diplomati e lo studio. Indagine 2004. Rome: ISTAT.

Lemieux, T. (2006). “Post-secondary education and increasing wage inequality”, *American Economic Review*, 96 (2), 195-199.

Maurin E. and McNally S. (2008). "Vive la Révolution! Long term returns of 1968 to the angry students", *Journal of Labor Economics*, 26 (1), 1-33.

MIUR (2006), *Settimo Rapporto sullo Stato del Sistema Universitario*, Ministero dell’università e della ricerca, Rome.

OECD (2002), *Education at a glance*. Paris: OECD.

OECD (2005), *Education at a glance*. Paris: OECD.

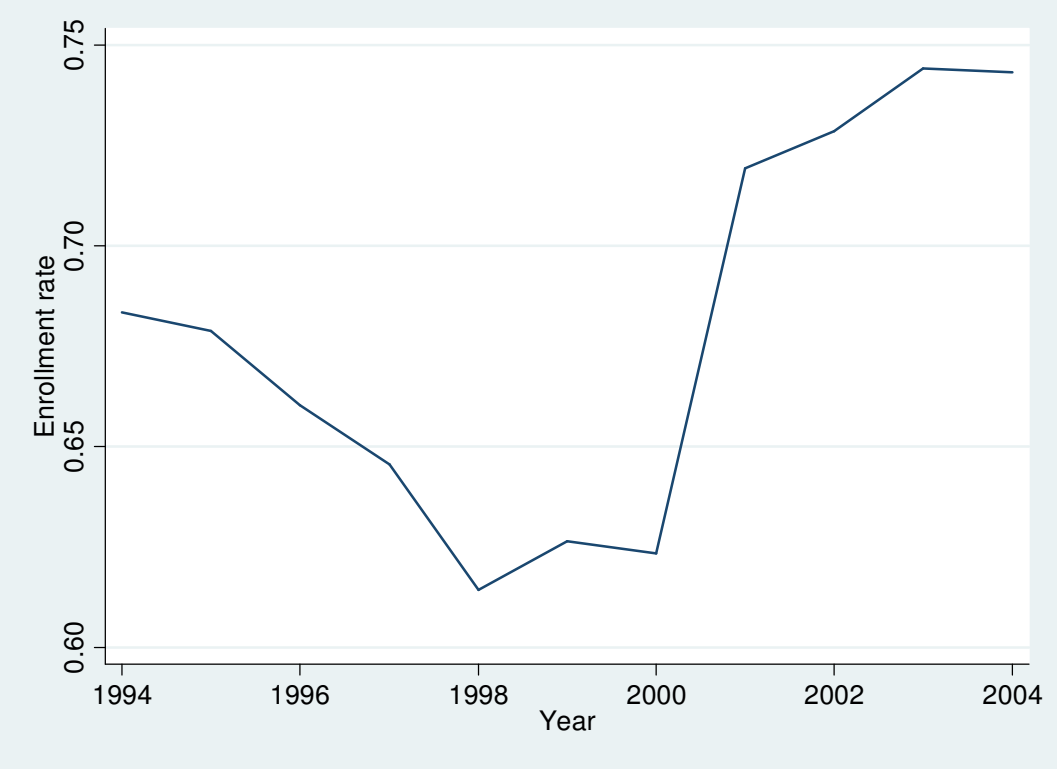
Oreopoulos, P. (2006) "Estimating Average and Local Average Treatment Effects of Education when Compulsory Schooling Laws Really Matter" *American Economic Review*, 96 (1), 152-175.

Perotti, R. (2002), "The Italian university system: rules vs. incentives", in ISAE, *Monitoring Italy,* Rome.

Ranieri, A. (2006), "Quanto fa davvero «3+2»?", in Almalaurea (ed.), *L'università in transizione: laureati vecchi e nuovi alla luce della riforma*. Bologna: il Mulino.

Solon, G., (2002), "Cross-Country Differences in Intergenerational Earnings Mobility", *Journal of Economic Perspectives*, 16, 59-66

Figure 1 - Enrolment rates into higher education in Italy: 1994-2004 (first cycle – laurea breve)



Source: MIUR (2006)

Table 1: Sample descriptive statistics by year of high school graduation

	1998	2001
Number of observations	18,809	17,803
Father compulsory degree or lower	55.7	51.28
Father secondary degree	34.72	36.61
Father college degree	9.58	12.11
Mother compulsory degree or lower	60.88	54.29
Mother secondary degree	31.47	35.61
Mother college degree	7.65	10.09
Father occupation high	15.07	22.28
Father occupation intermediate	41.49	31.69
Father occupation low	43.44	46.03
Mother occupation high	7	8.48
Mother occupation intermediate	17.99	18.9
Mother occupation low	17.33	20.94
Mother not working	57.68	51.58
Junior school mark D	31.14	24.98
Junior school mark C	26.57	29.39
Junior school mark B	20.06	21.62
Junior school mark A	22.23	24
Ist.Professionali	17.68	17.18
Ist.Tecnici	47.09	46.22
Licei	35.23	36.6
Secondary school mark D	33.96	34.42
Secondary school mark C	29.67	26.69
Secondary school mark B	18.8	17.95
Secondary school mark A	17.57	20.94
College enrollment	52.80	61.76
College drop out	9.94	11.45
Unemployment rate for high school graduates of preceding cohort[a,c]	35.36	24.7
Youth unemployment rate[b,c]	34.22	28.00

Note: statistics computed using survey weights.
[a]Our calculations using the ISTAT survey of high school graduates for the preceding cohort.
[b]Official figures from ISTAT.
[c]Averages over cells defined by region and gender

Table 2: The effect of the reform on college enrolment rates

	(1)		(2)		(3)		(4)		(5)		(6)	
Female	0.099	(0.008)	0.077	(0.010)	0.109	(0.010)	0.042	(0.011)	0.022	(0.011)	-0.006	(0.010)
Father secondary degree					0.146	(0.010)	0.127	(0.010)	0.088	(0.010)	0.089	(0.011)
Father college degree					0.300	(0.014)	0.272	(0.015)	0.173	(0.017)	0.166	(0.017)
Mother secondary degree					0.151	(0.009)	0.120	(0.009)	0.072	(0.010)	0.075	(0.010)
Mother college degree					0.298	(0.014)	0.249	(0.018)	0.162	(0.021)	0.158	(0.023)
Father high level occupation					0.089	(0.015)	0.092	(0.016)	0.055	(0.016)	0.058	(0.016)
Father mid level occupation					0.051	(0.012)	0.051	(0.010)	0.036	(0.009)	0.038	(0.010)
Father occupation not reported					0.095	(0.016)	0.109	(0.015)	0.075	(0.018)	0.076	(0.019)
Mother high level occupation					0.093	(0.025)	0.070	(0.028)	0.035	(0.030)	0.029	(0.031)
Mother mid level occupation					0.039	(0.013)	0.029	(0.013)	0.024	(0.015)	0.021	(0.015)
Mother not working					-0.040	(0.012)	-0.051	(0.012)	-0.043	(0.012)	-0.047	(0.012)
Mother occupation not reported					0.039	(0.032)	0.071	(0.034)	0.063	(0.033)	0.060	(0.033)
Junior school mark C							0.145	(0.011)	0.073	(0.012)	0.023	(0.013)
Junior school mark B							0.317	(0.009)	0.177	(0.012)	0.075	(0.014)
Junior school mark A							0.435	(0.009)	0.254	(0.016)	0.096	(0.021)
Professional school									-0.609	(0.012)	-0.666	(0.011)
Technical school									-0.470	(0.013)	-0.509	(0.012)
Secondary school mark C											0.132	(0.011)
Secondary school mark B											0.223	(0.010)
Secondary school mark A											0.306	(0.010)
Unemployment rate			0.003	(0.001)	0.002	(0.001)	0.002	(0.001)	0.002	(0.001)	0.002	(0.001)
Reform	0.09	(0.008)	0.118	(0.010)	0.095	(0.012)	0.088	(0.011)	0.114	(0.012)	0.120	(0.012)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low education and low level occupation, has the lowest mark in the final exam of junior and secondary school (=D), graduated from the academic oriented school track in 1998. N Obs=36612 . Probit marginal effects evaluated at the sample average of explanatory variables

Table 3: College enrolment rates with interaction between the reform and students' characteristics

	(1)		(2)		(3)	
Female	0.022	(0.011)	0.041	(0.011)	0.021	(0.011)
Father secondary degree	0.089	(0.010)	0.139	(0.016)	0.100	(0.015)
Father college degree	0.173	(0.017)	0.299	(0.020)	0.192	(0.020)
Mother secondary degree	0.072	(0.010)	0.121	(0.016)	0.064	(0.018)
Mother college degree	0.162	(0.022)	0.249	(0.028)	0.145	(0.038)
Father secondary degree * Reform			-0.026	(0.020)	-0.022	(0.019)
Father college degree* Reform			-0.086	(0.043)	-0.046	(0.037)
Mother secondary degree* Reform			-0.004	(0.019)	0.014	(0.020)
Mother college degree* Reform			0.001	(0.047)	0.035	(0.049)
Father high level occupation	0.055	(0.016)	0.092	(0.015)	0.054	(0.015)
Father mid level occupation	0.036	(0.010)	0.051	(0.010)	0.035	(0.010)
Father occupation not reported	0.075	(0.019)	0.111	(0.015)	0.075	(0.018)
Mother high level occupation	0.035	(0.029)	0.069	(0.028)	0.037	(0.030)
Mother mid level occupation	0.025	(0.015)	0.029	(0.013)	0.025	(0.015)
Mother not working	-0.044	(0.012)	-0.051	(0.012)	-0.043	(0.012)
Mother occupation not reported	0.061	(0.033)	0.069	(0.034)	0.059	(0.033)
Junior school mark C	0.073	(0.012)	0.130	(0.017)	0.057	(0.020)
Junior school mark B	0.177	(0.012)	0.320	(0.011)	0.166	(0.015)
Junior school mark A	0.254	(0.016)	0.418	(0.013)	0.215	(0.024)
Junior school mark C* Reform			0.031	(0.022)	0.033	(0.024)
Junior school mark B* Reform			-0.007	(0.026)	0.026	(0.028)
Junior school mark A* Reform			0.066	(0.030)	0.098	(0.034)
Professional school	-0.606	(0.015)			-0.618	(0.016)
Technical school	-0.497	(0.016)			-0.505	(0.017)
Professional school* Reform	-0.001	(0.031)			0.031	(0.031)
Technical school* Reform	0.066	(0.025)			0.084	(0.025)
Unemployment rate	0.002	(0.001)	0.002	(0.001)	0.002	(0.001)
Reform	0.073	(0.025)	0.086	(0.019)	0.029	(0.031)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low education and low level occupation, has the lowest mark in the final exam of junior high school (=D), graduated from the academic oriented school track in 1998. N Obs=36612 . Probit marginal effects evaluated at the sample average of explanatory variables

Table 4: Placebo tests

	(1)		(2)		(3)		(4)		(5)		(6)	
Female	0.079	(0.008)	0.056	(0.016)	0.086	(0.018)	0.030	(0.020)	0.026	(0.022)	0.002	(0.023)
Father secondary degree					0.175	(0.011)	0.159	(0.012)	0.116	(0.012)	0.115	(0.012)
Father college degree					0.361	(0.013)	0.343	(0.014)	0.238	(0.019)	0.236	(0.019)
Mother secondary degree					0.169	(0.012)	0.139	(0.012)	0.080	(0.014)	0.080	(0.014)
Mother college degree					0.326	(0.015)	0.271	(0.019)	0.153	(0.027)	0.143	(0.029)
Father high level occupation					0.070	(0.016)	0.077	(0.018)	0.042	(0.018)	0.041	(0.018)
Father mid level occupation					0.033	(0.010)	0.035	(0.010)	0.025	(0.010)	0.028	(0.011)
Father occupation not reported					0.006	(0.015)	0.014	(0.016)	0.008	(0.016)	0.012	(0.016)
Mother high level occupation					0.038	(0.027)	0.035	(0.027)	0.013	(0.027)	0.005	(0.027)
Mother mid level occupation					0.026	(0.017)	0.018	(0.018)	0.015	(0.019)	0.009	(0.020)
Mother not working					-0.066	(0.017)	-0.078	(0.017)	-0.071	(0.018)	-0.078	(0.018)
Mother occupation not reported					-0.004	(0.023)	0.010	(0.023)	0.013	(0.025)	0.006	(0.027)
Junior school mark C							0.149	(0.011)	0.080	(0.012)	0.023	(0.012)
Junior school mark B							0.320	(0.008)	0.176	(0.011)	0.073	(0.013)
Junior school mark A							0.440	(0.008)	0.253	(0.015)	0.089	(0.019)
Professional school									-0.602	(0.011)	-0.655	(0.010)
Technical school									-0.509	(0.011)	-0.550	(0.011)
Secondary school mark C											0.140	(0.012)
Secondary school mark B											0.223	(0.011)
Secondary school mark A											0.325	(0.011)
Unemployment rate			0.002	(0.001)	0.002	(0.001)	0.001	(0.001)	0.000	(0.002)	0.000	(0.002)
Completed High school in 1998	-0.033	(0.008)	-0.031	(0.008)	-0.058	(0.010)	-0.067	(0.010)	-0.074	(0.010)	-0.080	(0.011)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low education and low level occupation, has the lowest mark in the final exam of junior and secondary school (=D), graduated from the academic oriented school track in 1995. N Obs=33476. Probit marginal effects evaluated at the sample average of explanatory variables

Table 5: College enrolment rates with interactions (reform and students' ability) by father's education achievements

	Father education low		Father education intermediate		Father education high	
Female	0.028	(0.014)	0.055	(0.017)	0.016	(0.008)
Father high level occupation	0.074	(0.026)	0.092	(0.017)	0.032	(0.020)
Father mid level occupation	0.057	(0.014)	0.047	(0.013)	-0.005	(0.021)
Father occupation not reported	0.064	(0.030)	0.102	(0.017)	0.040	(0.010)
Mother high level occupation	0.132	(0.048)	0.035	(0.029)	0.017	(0.013)
Mother mid level occupation	0.043	(0.022)	0.005	(0.020)	0.014	(0.009)
Mother not working	-0.049	(0.017)	-0.060	(0.017)	0.003	(0.011)
Mother occupation not reported	0.028	(0.047)	0.081	(0.038)	0.025	(0.011)
Mother secondary degree	0.139	(0.027)	0.102	(0.014)	-0.018	(0.020)
Mother college degree	0.303	(0.074)	0.233	(0.020)	-0.006	(0.023)
Mother education intermediate*reform	-0.002	(0.032)	-0.011	(0.022)	0.031	(0.015)
Mother education high*reform	-0.001	(0.117)	-0.078	(0.061)	0.048	(0.015)
Junior school mark C	0.136	(0.024)	0.105	(0.025)	0.036	(0.007)
Junior school mark B	0.362	(0.021)	0.269	(0.017)	0.061	(0.009)
Junior school mark A	0.491	(0.023)	0.348	(0.014)	0.120	(0.019)
Junior school mark C* Reform	0.038	(0.027)	0.026	(0.032)	-0.012	(0.020)
Junior school mark B* Reform	0.003	(0.034)	-0.025	(0.040)	-0.001	(0.017)
Junior school mark A* Reform	0.050	(0.044)	0.088	(0.034)	0.002	(0.020)
Unemployment rate	0.003	(0.001)	0.001	(0.001)	-0.001	(0.001)
Reform	0.095	(0.022)	0.050	(0.024)	-0.049	(0.024)
Number of observations	22235		11675		2702	

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low level occupation, has mother with low level education has the lowest mark in the final exam of junior high school (=D), graduated from the academic oriented school track in 1998. N Obs=36612 . Probit marginal effects evaluated at the sample average of explanatory variables

Table 6: College enrolment rates, non-simultaneous interaction of the reform with ability and parental background

	(1)		(2)	
Female	0.042	(0.011)	0.042	(0.011)
Father secondary degree	0.139	(0.016)	0.127	(0.011)
Father college degree	0.300	(0.020)	0.271	(0.015)
Mother secondary degree	0.121	(0.016)	0.120	(0.009)
Mother college degree	0.247	(0.028)	0.249	(0.018)
Father secondary degree * Reform	-0.025	(0.020)		
Father college degree* Reform	-0.087	(0.043)		
Mother secondary degree* Reform	-0.003	(0.019)		
Mother college degree* Reform	0.005	(0.047)		
Father high level occupation	0.092	(0.016)	0.092	(0.015)
Father mid level occupation	0.051	(0.010)	0.051	(0.010)
Father occupation not reported	0.111	(0.015)	0.109	(0.015)
Mother high level occupation	0.069	(0.028)	0.070	(0.027)
Mother mid level occupation	0.030	(0.013)	0.029	(0.013)
Mother not working	-0.051	(0.012)	-0.051	(0.012)
Mother occupation not reported	0.070	(0.034)	0.069	(0.034)
Junior school mark C	0.145	(0.011)	0.131	(0.017)
Junior school mark B	0.317	(0.009)	0.320	(0.011)
Junior school mark A	0.435	(0.008)	0.418	(0.013)
Junior school mark C* Reform			0.029	(0.022)
Junior school mark B* Reform			-0.009	(0.026)
Junior school mark A* Reform			0.065	(0.029)
Unemployment rate	0.002	(0.001)	0.002	(0.001)
Reform	0.103	(0.016)	0.071	(0.016)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low level occupation, has mother with low level education has the lowest mark in the final exam of junior high school (=D), graduated from the academic oriented school track in 1998. N Obs=36612 . Probit marginal effects evaluated at the sample average of explanatory variables

Table 7: College enrolment rates, measuring ability with high school exam's final mark

	(1)		(2)	
Female	-0.005	(0.011)	-0.006	(0.011)
Father secondary degree	0.098	(0.015)	0.098	(0.015)
Father college degree	0.186	(0.020)	0.185	(0.020)
Mother secondary degree	0.068	(0.018)	0.068	(0.018)
Mother college degree	0.135	(0.040)	0.137	(0.040)
Father secondary degree * Reform	-0.017	(0.020)	-0.017	(0.020)
Father college degree* Reform	-0.049	(0.038)	-0.044	(0.038)
Mother secondary degree* Reform	0.011	(0.021)	0.011	(0.021)
Mother college degree* Reform	0.045	(0.051)	0.042	(0.051)
Father high level occupation	0.058	(0.016)	0.057	(0.016)
Father mid level occupation	0.037	(0.010)	0.037	(0.010)
Father occupation not reported	0.077	(0.019)	0.077	(0.019)
Mother high level occupation	0.030	(0.031)	0.031	(0.031)
Mother mid level occupation	0.022	(0.015)	0.022	(0.015)
Mother not working	-0.048	(0.012)	-0.048	(0.012)
Mother occupation not reported	0.057	(0.033)	0.056	(0.033)
Junior school mark C	0.025	(0.013)	0.000	(0.020)
Junior school mark B	0.076	(0.014)	0.060	(0.018)
Junior school mark A	0.097	(0.021)	0.053	(0.032)
Junior school mark C* Reform			0.046	(0.023)
Junior school mark B* Reform			0.031	(0.027)
Junior school mark A* Reform			0.092	(0.038)
Secondary school mark C	0.120	(0.019)	0.125	(0.018)
Secondary school mark B	0.196	(0.014)	0.204	(0.013)
Secondary school mark A	0.290	(0.015)	0.301	(0.014)
Secondary school mark C* Reform	0.024	(0.023)	0.015	(0.023)
Secondary school mark B* Reform	0.070	(0.026)	0.053	(0.025)
Secondary school mark A* Reform	0.050	(0.030)	0.019	(0.031)
Professional school	-0.660	(0.014)	-0.671	(0.015)
Technical school	-0.537	(0.016)	-0.545	(0.016)
Professional school* Reform	-0.011	(0.032)	0.025	(0.034)
Technical school* Reform	0.070	(0.025)	0.089	(0.025)
Unemployment rate	0.002	(0.001)	0.002	(0.001)
Reform	0.052	(0.029)	0.009	(0.036)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low level occupation, has mother with low level education has the lowest mark in the final exam of junior high school (=D), graduated from the academic oriented school track in 1998. N Obs=36612 . Probit marginal effects evaluated at the sample average of explanatory variables

Table 8: The effect of the reform on college drop out rates

	(1)		(2)		(3)	
Enrolled one year after graduation	0.031	(0.011)	0.031	(0.011)	0.044	(0.012)
Enrolled two years after graduation	-0.067	(0.005)	-0.067	(0.005)	-0.071	(0.006)
Female	-0.032	(0.008)	-0.032	(0.008)	-0.036	(0.008)
Father secondary degree	-0.015	(0.006)	-0.015	(0.006)	-0.020	(0.010)
Father college degree	-0.055	(0.008)	-0.055	(0.008)	-0.080	(0.009)
Mother secondary degree	0.016	(0.008)	0.016	(0.008)	0.000	(0.010)
Mother college degree	-0.012	(0.017)	-0.012	(0.016)	-0.032	(0.024)
Father secondary degree * Reform					-0.005	(0.012)
Father college degree* Reform					0.035	(0.030)
Mother secondary degree* Reform					0.015	(0.014)
Mother college degree* Reform					0.009	(0.037)
Father high level occupation	0.005	(0.009)	0.005	(0.009)	-0.002	(0.009)
Father mid level occupation	-0.002	(0.008)	-0.001	(0.008)	-0.004	(0.008)
Father occupation not reported	0.004	(0.012)	0.004	(0.012)	-0.003	(0.012)
Mother high level occupation	-0.010	(0.015)	-0.010	(0.015)	-0.016	(0.015)
Mother mid level occupation	-0.015	(0.009)	-0.015	(0.009)	-0.015	(0.010)
Mother not working	-0.006	(0.008)	-0.005	(0.008)	-0.005	(0.008)
Mother occupation not reported	-0.028	(0.014)	-0.028	(0.014)	-0.030	(0.013)
Junior school mark C	-0.025	(0.006)	-0.025	(0.006)	-0.042	(0.008)
Junior school mark B	-0.043	(0.006)	-0.043	(0.006)	-0.058	(0.008)
Junior school mark A	-0.079	(0.008)	-0.079	(0.008)	-0.102	(0.009)
Junior school mark C* Reform					0.003	(0.016)
Junior school mark B* Reform					-0.029	(0.011)
Junior school mark A* Reform					-0.034	(0.014)
Professional school	0.172	(0.014)	0.152	(0.019)		
Technical school	0.087	(0.009)	0.091	(0.013)		
Professional school* Reform			0.018	(0.014)		
Technical school* Reform			-0.005	(0.012)		
Unemployment rate	0.000	(0.001)	0.000	(0.001)	0.000	(0.001)
Reform	0.007	(0.006)	0.008	(0.010)	0.021	(0.011)

Notes: Regression includes regional dummies and uses survey weights. Asymptotically robust standard error adjusted to account for repeated observations at the gender-region-year level. The omitted category is male, has parents with low level occupation, has mother with low level education has the lowest mark in the final exam of junior high school (=D), graduated from the academic oriented school track in 1998. N Obs=16651. Probit marginal effects evaluated at the sample average of explanatory variables

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