The Changing Economic Returns To Private Education

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Abstract

Despite its relatively small size, the private school sector plays a prominent role in British society. This paper focuses on the changing wage returns to private education in Britain using the British Household Panel Survey and the two mature birth cohort studies, the National Child Development Study (NCDS) and the British Cohort Study (BCS). From a theoretical perspective, the pay premium for private school pupils is expected to have increased, following a period of modernisation during the late 1960s and 1970s and the subsequent decades in which real school fees rose substantially. Using a range of estimation techniques we present consistent evidence in line with the hypothesis that the premium increased significantly between earlier and later cohorts, especially for women for whom the premium was small and insignificant in earlier cohorts. Quantile regressions also indicate that there was no significant premium in the lower quantiles of the residual distribution. The achievement of good academic qualifications is the main route through which a high return to private school attendance is obtained in the later cohorts. Taken together, our findings are consistent with the idea that the private school sector has been successful in transforming its ability to generate the academic outputs that are most in demand in the modern economy.

Key words: returns to education, independent schools, private schools.

JEL Classification: I22, I29, J31

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I. Introduction

Private schools, though far less numerous than state schools, play a prominent role in Britain's economy and society: relative to state schools they educate a significantly disproportionate number of those who find economic, political and social success in later life (Sutton Trust, 2005a, 2005b, 2006; Boyd, 1973; Reid, 1986). In this paper we investigate the changing association between attendance at a private school and subsequent economic success – as measured by pay – covering people who were at school during and beyond an era of educational transformation. The current older generation of workers were educated in the 1960s and 1970s when most state secondary schools were becoming comprehensive and when the private schools were in the first phases of a radical modernisation. While this "revolution" in the private schools had important social and cultural aspects reflecting broader societal changes, central to their new character (it has been maintained) was a rising investment in academic success (Rae, 1981: 154-162). This investment was consolidated after 1980 as fees more than doubled in the next quarter century, and as teacher-pupil ratios and educational facilities continued to improve (Green et al., 2007). Thus, younger generations of workers experienced a transformed private schools sector with a greater emphasis on, and ability to deliver, academic qualifications.

An understanding of the changing links between private schools and economic success is important for the issue of social and economic mobility (Power et al., 2003). The predominant position of private school graduands can be seen alongside evidence of persistent class separation in Britain (Goldthorpe and McKnight, 2004) and, if anything, decreased social mobility across the generations (Blanden et al, 2004), accompanying the general educational expansion of the last quarter century. Argument over whether private education restricts mobility and inculcates privilege, or whether it merely reflects the existing inequality, dates back at least to the early 19th century (Rae, 1981: 23). Since school fees ration access according to family wealth, the larger the economic returns to private education the more the argument that private schools strengthen privilege is underpinned, since the returns act to reinforce across generations the already existent inequalities. At the heart of this lies also the normative question as to whether it is deemed fair that richer parents are able to buy better education for their children, though we shall not be addressing ethical issues in this paper.

Social concern with high returns might be lessened, though not eliminated, if the returns are delivered mainly through the channel of superior academic qualifications: in that case the superior academic qualifications and associated skills might be argued to convey some societal as well as private benefits (Moretti, 2004a and 2004b). Social concern would be reinforced, however, by the prospect of social inefficiency if the private school premium were derived in part from monopolistic access to occupational or business networks for which the schools are the gate keepers – the 'old boys' network'.

If, on the other hand, it were found that the outlay on private education gives a small or even zero return, the picture would be that rich people are spending their money to enjoy certain consumption benefits but not to buy privilege. In that case, while fee-paying families would no doubt be concerned that their money was ill-spent, there would be little or no cause for general social concern over private schools' effects on mobility.

The common perception is that pupils from private schools do indeed receive a substantial wage premium later in life because of their school. Some supportive evidence is found from the few formal econometric studies that have addressed the issue (Dolton and Vignoles, 2000; Dearden et al., 2002; Naylor et al., 2002), but these do not systematically address the channels through which private schooling affect wages (whether through better qualifications or other means), or how these channels and the return itself changed through time as the schools themselves changed. Considering the prominence of the status of private schools in debates over education, and of the related issues of taxation and charitable status[1], there is remarkably little empirical evidence underpinning to the public discourse.[2]

In this paper we address these issues deploying three large-scale representative survey data sets. We use the British Household Panel Survey (BHPS), the National Child Development Study (NCDS) and the British Cohort Study to produce comparable estimations over time of the premium for private schooling. Using a range of techniques we find evidence that the returns increased over time, especially for females. With older cohorts, those educated mainly in the 1950s through the 1970s,

[1] ISC (2003); Millar (2004).
[2] There is an honourable long tradition of sociological concern with the internal processes and social context of public schools, e.g. Wakeford (1969).

there was no significant pay premium on average, but there was a significant pay premium for males in the upper parts of the residual pay distribution. Moreover, there was only partial evidence that this return could be consistent with an 'old boys' network'. On average there were no significant pay premia for females in these older cohorts. In younger cohorts, however, both males and females received a significant pay premium after going to private school. The evidence also implies that Rae (1981) was right to emphasise academic values in his insider account of the transformation of the public schools.[3] The superior academic qualifications attained due to attending private schools became increasingly evident, and in more recent cohorts explain most of the high returns to private education.

Through the paper, the term "return to private schooling" is used interchangeably with the term "private school wage premium", both defined as the percentage elevation of wages associated with having attended a private school. However, the return needs to be understood as a gross return as the estimates in the main part of the paper take no direct account of the investment outlay. The paper concludes with a rough calculation of the net returns to private school investment, implied by our individual estimates and information about average school fees. This calculation suggests that, on average, the parents (sometimes grandparents) of those being educated in private schools during the 1980s made a wise investment.

The paper is organized as follows. In Section II we review the changes that have taken place in the private sector over the last 30 years. Section III briefly describes the three datasets used in this study and the methods used to derive variables. Section IV presents empirical results and interprets the findings. The last section concludes and discusses further research.

II The Changing Environment for Private Education in Britain.

Private schools in Britain have a long history dating back at least to 597 AD. In any modern economy with a fully-fledged education system, however, private schools have to contend with the threat that the state will crowd out private investments in

[3] "Public school" is the older yet confusing term for most fee-paying secondary schools in Britain, though not in Northern Ireland. The phrase came about with the Public Schools Acts of the 19th century which regulated these schools, although more recently the sector has discouraged its use because of its old fashioned connotations.

time-honoured fashion. Private schools have, therefore, to offer their clients something in addition. Top of the list for most schools come better teaching resources, and supportive peer effects through selective admissions procedures. Private schools may also cater for pupils with specialised needs or with religious preferences, the latter being a common hallmark of private schooling in very many countries. Outcomes of the investment can be academic (better qualifications, access to better universities) or non-academic (the 'rounded individual', the 'confident leader', better 'soft skills'). Either the improved qualifications, or the non-academic outcomes or both would then deliver economic returns to the investment as gauged by better pay or access to higher-ranking jobs (perhaps via higher-ranking university education). Schools might also be thought to provide access to 'old boys' networks' or 'old girls' networks'. To compete with state education, schools can also deliver consumption services superior to those available in government schools or elsewhere: sports facilities and tuition, music and other cultural goods, which are tied with the academic education package.

This range of strategies affords room for a variety of private schools, with mixed offerings and pricing structures. Thus private schools in Britain are quite heterogeneous. They include the traditional 'public schools', the ex-direct grant schools, other private secondary schools, the prep schools, and a small number of pre-prep and specialist schools. Most are for boarding, either exclusively or as a choice; almost all used to be single-sex, though many are now co-educational. Schools vary also in their mix of emphasis on academic and non-academic outcomes; and there is additional variation by religious affiliation. Nevertheless, what all private schools share is the facility to offer something different from state-maintained schools in return for a fee. To represent their common interests, most private schools belong to one or more of 10 associations, which in turn are members or affiliates of the Independent Schools Council (ISC). We return, in Section 4.3, to consider how heterogeneity impinges on estimates of the returns to private schooling.

Among the available strategies, the emphases have changed over recent decades. In Rae's perspicacious insider account of the public schools in the 1960s and 1970s he describes how the schools were obliged to adapt to a new and uncertain environment, characterised by changes in state education, associated political conflict over private schooling, and changing social mores (Rae, 1981). During the 1950s and 1960s there

had been growing unrest about the UK educational system, primarily surrounding the use of selection at age 11 and the continued existence of the private educational sector, which was seen as a bastion of the upper classes. In 1964 Harold Wilson became Prime Minister as leader of the Labour Party, with commitments from the previous year's party conference to call for an end of the selection system and tackle "the problem of public schools". By 1965 the government had asked Local Educational Authorities (LEAs) to draw up plans to convert to a comprehensive system, and appointed a commission to review private education. One of the recommendations (later accepted) from its second report was the abolition of Direct Grant grammar schools, which were partly fee-paying, partly subsidised and academically selective. These schools were given the option of joining the comprehensive system or becoming fully private, which is what two thirds of them did. While the commission did not broaden its attack on the rest of the private school system, the political uncertainty remained and in 1973 the Labour Party in opposition drew up a long-term strategy for proscribing private education altogether. It was only when these plans were abandoned once in power (supported only by a thin majority) that the threat to private schools was alleviated.

The need for political legitimacy in the face of ideological opposition is advanced by Rae as one reason why private schools were starting to become more academic over this period. Other pressures came from above – a decline in monopoly access to Oxford and Cambridge universities, the rise of other universities – and from below in the form of growing parent power. At the start of the 1970s private schools saw an opportunity in the closing of grammar schools around the country, with groups of parents fearing the effect the new comprehensive system would have on their children. These parents had only two options: to band together and appeal to their Local Education Authority (LEA) to maintain the selective schooling system or to send their child to a private school. The former was only moderately successful, with 19 out of 138 LEAs remaining selective.[4] For private schools to take full advantage of grammar school closure they needed to attract parents by showing them that they provided an educational product worth paying for. All these factors meant that the private schools "became more ruthless and single minded in their pursuit of academic

[4] It has recently been shown (Manning and Pischke 2006) that these remaining LEAs are not random, and selection to undertake the comprehensive system was correlated with the socio economic background of its population.

success" (Rae, 1981: 155). The balance of the curriculum was shifted away from the traditional emphasis on classics towards the sciences (Sanderson, 1999: 102-3). More entrance exams were introduced and pass marks were raised. Schools advertised their ever-decreasing pupil-teacher ratios, the average A-level grades of their pupils, and the number of leavers attending Oxbridge; and they became themselves more business-like in their management.

These internal changes within private schools, along with the changing economic and political environment, coincided with a reversal of the schools' fortunes. The sector, parts of which appear to have been in terminal decline during the 1960s and up till the mid 1970s, enjoyed a proportionate stabilisation and then a revival from the late 1970s (see Figure 1 which shows the numbers of full time pupils, schools and teachers in the private sector since the mid-1960s).[5]

Though the 'revolution', as Rae termed it, was said to be over by 1979, this was only the start of an era in which parents would be willing to pay continuously-increasing real fees for private education (Figure 2). Rising fees could be rationalised if parents thought they were getting increased benefits for their money, including rising earnings premia. Two broad socio-economic trends lay behind the rising propensity to pay: the "knowledge economy", implying skill-biased technological change (Berman et al., 1994) with a rapidly-rising demand for qualified labour, and increasing female labour force participation. The former meant that high-level qualifications were going to be increasingly necessary for economic success, in contrast to previous eras when lower qualifications combined with family and school connections were enough. The latter meant that girls were increasingly committed to a successful future in the labour market, with its academic demands.[6] These broad trends applied to all pupils, but the greater flexibility of the private sector, not held back by fiscal or political constraints, enabled it to offer the required improved academic services. The premium for private education would thus be predicted to have increased in this period. One indication of the improved services is that the pupil-teacher ratio declined slowly through the 1970s and more rapidly since then (Figure 3).[7] The drive towards academic achievement

[5] See Glennerster (1970: 131-8) for a contemporaneious dissection of the reasons for private sector decline.

[6] Even among boys, the increased fees were said to generate a moral commitment to try to 'do well' (Walford, 1986: 242).

[7] Within the private school sector, there is evidence that lower pupil-teacher ratios lead to superior academic performance (Graddy and Stevens, 2003).

was also given added emphasis at the margins by the secession of the direct grant schools and later by the Conservative government's Assisted Places Scheme which, from 1980 onwards, began to subsidise places in private schools for a small proportion of able pupils.[8]

The aggregate outcome of these developments has been that the academic achievements of private school pupils have been maintained, or even increased, relative to those of state-school pupils, despite the continued improvements of the latter as the education system expanded in the late 1980s and 1990s. At the top, especially, private schools re-asserted and defended their share of places at Oxford and Cambridge despite the earlier loss of traditional exclusive routes. The lowest points in Oxford and Cambridge acceptances from private schools were encountered in 1976 and 1980 respectively (see Figure 4). The early 1980s leap in their Oxbridge success rates is partly associated with the addition of the previous, highly academic, direct grant schools; but the rate was maintained at a high level, in the range 45% to 55%, until the present. More broadly, private schools tend on average to score higher than state schools on sixth form value-added measures.[9]

High aggregate success rates do not, however, prove anything *per se* about the efficacy of private schooling in generating academic achievements or higher pay, if only because private school pupils come from well-resourced family backgrounds and are often selected on cognitive ability as well as ability to pay. Formal evidence, which conditions for these background variables, is necessary.

There are just a few studies that do this for Britain. For both sexes there is sound evidence that private schooling raised overall academic achievements (Dearden et al., 2002).[10] A caveat to this finding, though, is that on average university students who had attended a private school were, ceteris paribus, somewhat less likely than similar students from state schools to obtain a good degree (Naylor and Smith, 2004; Smith and Naylor, 2001, 2005). Dolton and Vignoles (2000) report a premium on wages of approximately 7% six years after graduation, using a sample of 1980 graduates. Dearden et al. (2002), while investigating school quality, report a 20% wage premium

[8] Though means-tested, the scheme's beneficiaries were often children of professional and managerial parents, many of whom had been at private school (Fitz et al., 1989).
[9] National Statistics, *Bulletin*, Department for Education and Skills, 2004, Issue 01/04, May. http://www.dfes.gov.uk/rsgateway/DB/SBU/b000467/index.shtml
[10] Walford (1990: 44-59) provides a review of earlier mainly non-formal studies.

(after allowing for highest qualification) at age 33 for employees who had attended private school at age 16 in 1974; but found no evidence of an effect at age 23, or for females at either age. Covering a later time, Naylor et al. (2002) found an average private-school premium of 3% for university students graduating in 1993; they also found considerable variation in the premium, which was positively correlated with the fees paid. In total, not a great deal is known about the economic impact of private schools on their pupils, and there is little evidence about the channels through which the impact takes effect or about how the impact and the channels may have changed as the schools have been modernised.

In the light of this historical overview and of the aggregate outcomes a number of research questions and hypotheses may be stated:

1. Assuming parents are spending their money rationally, we expect there to be an earnings premium on having received private schooling, enough to cover the outlays in fees and ancillary expenses over a number of years, and provide a normal return on capital. One caveat is that the return may, in part, be non-pecuniary. Another is that the benefit might lie in improved marriage or other networking prospects outside the domain of employment. Both caveats imply that the estimated earnings premium will understate the returns to private schooling.

2. Given the increased fees for private schooling, and in the absence of any decline on the return to capital in the 1970s and 1980s, we expect an increase over time in the private school premium.

3. As an extension to Hypothesis 2, it may also be suggested that the trend in labour market returns to private schooling may be significantly different between males and females. Women may not have benefited greatly in earlier periods, due to some girls schools previously performing more like a finishing school than a place of educational training. Transformation of girls schools, in conjunction with increasing labour market participation of women and the rising relative demand for skilled labour, would lead one to expect the returns to private schooling to be rising faster for women.

4. The transformed focus of private schools and the changed economic environment lead us to expect academic achievements to have become over

time a more important channel for the delivery of a return to private school attendance.

III. Data

To address these questions we utilise the British Household Panel Survey (BHPS) and the two British cohort studies (NCDS and BCS) which track people born in 1958 and 1970. These datasets allow us to examine pupils who were in the educational system at the start of the private school reforms and those who were educated later.

The BHPS is a nationally representative sample of some 5,500 households recruited in 1991, with around 10,000 original sample members. These sample members and their children, who also become full sample members after reaching 16, are interviewed each successive year, together with all adult members of their families, even if they split off from their original households to form new families or relocate to other areas of the UK. Additionally, new families are added regularly to maintain the representativeness of the sample over time. Apart from consistency in measurement of key variables over time, BHPS also has the clear advantage of being nationally representative which allows us to study the (longer-term) changes in returns for different birth cohorts. To study the change in private school premium over time, we separate the sample into those who were born before 1960 and those born in 1960 or later. The first cohort will have gone through education mainly during the 1950s and 1960s, with a minority before or after, while the latter will have been educated largely in the 1970s, 1980s and 1990s.

The two ongoing mature longitudinal datasets, the National Child Development Study (NCDS) and the British Cohort Study (BCS) attempt to follow all individuals living in Great Britain who were born in a week of March 1958 (NCDS) and a week of April 1970 (BCS) respectively. Information is gathered about these cohort members and their immediate families at ages 7, 11, 16 and 33 (5, 10, 16 and 30 for BCS). The design of these surveys has allowed use of a host of comparable characteristics before and after the major educational choices made throughout a child's life. For the dependent variable used in our analysis, we use earnings information obtained at age 30/33, where employees are asked to provide information on their usual pay, pay period and number of hours worked. From this we have derived a figure of gross

hourly earnings. Unlike the BHPS there is no possibility of adding new members to the study; this has lead to significant attrition and as we shall see the useable number of observations is considerable smaller than the 17000 or so in the original samples. We have run validation checks to ensure that there have been no significant biases introduced in terms of the characteristics identified in the Birth Sweep, which by definition is representative.

One of the main benefits of using the NCDS and BCS is that it allows us to account for pre-school treatment characteristics, both cognitive and non-cognitive. The non-cognitive attributes of the child are observed in the first sweep, where the mother is asked to describe the child's characteristics through a series of 20 questions. We place these questions into two categories similar to the Rutter Scales (Blanden et al., 2006) for externalising behaviour such as: temper tantrums, hyper-activity, fights often; and for internalising behaviour including: sleeping problems, being a solitary child, biting of nails and experiencing headaches. This information is then combined into two scales using principal component analysis and finally we ensured that the relationships between these responses and the behavioural scales were the same across cohorts, establishing that we were capturing the same childhood characteristics.

For the comparative cognitive covariates we drew upon a range of similar tests the cohort members undertook, omitting tests that only one of the cohorts experienced. In the first sweep standardised scores on vocabulary tests and Harris Figure drawing exercises were used. Age 11/10 cognitive skills were derived from standardising reading comprehension, and maths scores, as well as word and pattern recognition matrices. Although reading based tests were undertaken at age 16, the NCDS used a comprehension based test and the BCS used a vocabulary base (this was the same test as aged 11 and so there was a lot of clustering near the top of the distribution). In its place we used English and Maths exam results taken at age 16, using two scales from 0-5, with 5 being an A grade or Grade 1, for O-levels and GCEs respectively.

With these excellent controls for heterogeneity in cognitive and non-cognitive skills and for other background variables, the comparison of the NCDS and BCS will complement the BHPS estimates of the changing returns over time. The difference in the estimated premiums between these two cohorts will be a measure of the different roles of private schools for those who were aged 11 in 1969 and 1981; this comparison should pick up the hypothesised changes in the private schools described

by Rae (1981), but will not capture the effects of increased resources in the private schools in the late 1980s and thereafter.[11]

4. Empirical Findings

a) Description of Between-Sector Differences Over Time.

We begin with a description of the older and younger cohorts in each of our data sources, categorised by the sector in which employees had been educated. Tables 1A and 1B present summary statistics by school type[12] for the sample of working men and women aged 25 or over but below state retirement age in the first 14 waves of the BHPS, and for whom a complete set of information is available on family background data. The unit of measurement is the person-year. Tables 1C and 1D compare NCDS with BCS by age 11 school type for men and women respectively. Despite the shorter time-span (i.e. 12 years compared with an average of 16 years) and the smaller sample sizes, the patterns of changes in log wage differential and qualification attainment are broadly similar to those for the BHPS.

The tables show that there existed a raw private school wage premium both for older and younger cohorts. For example, female ex-pupils of private schools in our BCS sample earned 32.9% more than ex-pupils of state schools. The premium is substantially greater for men than for women in every cohort; and the premium is greater in the later than in the earlier cohort according to both data sources for women, and according to the BHPS for men. Unsurprisingly, ex-pupils of private schools come predominantly from upper class families: in the BCS, for example, 67.4% had fathers in Socioeconomic Groups I and II (Managerial, Technical and Professional Occupations), as compared with 21.7% of ex-State-school pupils.

Of special interest are the between-sector differences in educational attainment and how these change over time. In both state and private sectors there are increases in

[11] Note, however, that inferences about cohort differences will be premised on the identifying assumption that labour market changes between 1991 and 2004 for the BHPS and between 1991 and 2000 for the NCDS/BCS are not themselves the source of change in the independent school premium.

[12] School type in the BHPS refers to the type of school last attended. Since the compulsory school leaving age in the UK was 15 for people born between 1933 and 1957 and 16 for later birth cohorts, it is not straightforward to compare the BHPS results to those for the two cohort studies, which measure school type at the age of 11 (school type at age 16 contains too many missing values due to the teacher strike). However, there appears to be relatively little changing of school types between the age of 11 and 16 in the NCDS.

educational achievements between the earlier and later cohorts, according to both the BHPS and the NCDS/BCS pair. As gauged by the average years of education, private schools widened their lead over their state counterparts, according to the NCDS/BCS pair. This change over time is consistent with the story told in Section 2: during the 1970s and 1980s the private schools were ahead of the state sector in putting more emphasis on academic achievements than they had chosen to earlier. The largest improvement in the private sector was at degree level and above, while in the state sector sample the big improvement was at the other end of the spectrum. Thus, in the private sector, the proportions with first or higher degrees rose from 38.6% to 54.0% (males) or 39.2% to 62.6% (females); these compare with a growth from 14.4% to 20.3% (males) or 10.5% to 18.4% (females) in the state sector. By contrast, the proportions with no qualifications at all fell from 5.2% to 2.4% (males) and 10.5% to 0% (females) in the private sector, as against 23.9% to 11.9% (males) and 31.1% to 11.1% (females) in the state sector.

It is to be expected that a good part of the raw pay differential between private and state school ex-pupils is attributable to family background and other variables. We are particularly interested in the extent to which the differential is explicable in terms of the differences in educational achievement. We now proceed therefore to derive formal conditional estimates of the premium for private education, using a range of techniques. The prime method for calculating the premium will be through estimating the coefficient attached to private school participation in conventional earnings functions, relating the individual's log real hourly earnings to education, work experience and other controls to be discussed below.

In Section 4.1 we present a range of least squares estimates. As always the possibility of endogenous school type needs to be considered. More able children, it might be argued, could benefit more from private education and may be selected by the schools. If so, and if ability goes unobserved by the researcher the estimated treatment effect of private schooling will be upward biased. On the other hand, some parents may choose private schooling for their less able children in order to compensate for perceived difficulties in the state system – thus introducing a potential downward bias. Bias might also derive from failure to take account of family influences on both school choice and subsequent earning power. The best defence against these potential sources of bias is to include a rich array of measures of ability and of social

background, which we are able to do with our chosen data. Alternatively, one could instrument school type; however, there are no available variables that could be argued to affect school type but not earnings.

In Section 4.2 we also apply the method of propensity score matching (PSM). The idea behind PSM is to match private school leavers with "similar" state-school leavers using control variables for family background as well as cognitive and non-cognitive characteristics where available.

While least squares estimates are concerned with the effect at the mean, policy makers and prospective consumers of private education might also be interested in returns at other parts of the distribution, given the heterogeneity in student ability, family background and school quality. Therefore in Section 4.3 we present quantile regressions at various percentiles of the earnings distribution.

4.1 Least Squares Estimates

The Ordinary Least Squares (OLS) estimates are presented in Tables 2A to 2D. The top left cell of each table gives a baseline figure for the private-school premium, absent any controls. As can be seen, the estimates of the raw differential range from 0.127 (or 14% for women in the Pre-1960 BHPS cohorts in Table 2A) to 0.311 (or 36% for men in the BCS cohort in Table 2D).[13]

In each table successive rows give the private school coefficient estimate after introducing further sets of covariates covering pre-existing variables that may directly affect earnings in later life. Successive columns then introduce covariates that may directly affect earnings but which post-date, and are therefore affected by, the choice of school type.[14] In this manner, the tables give a picture of the extent to which the premium is accounted for by the post-school-choice covariates (primarily, the qualifications achieved).

Consider first the earlier cohorts. For the Pre-1960 cohorts in the BHPS, Table 2A shows that family background explains a large proportion of the raw premium, accounting for a third of the returns for men and over half for women. A similar

[13] In each case we report the effect on log pay, with the associated percentage premium in brackets.
[14] Note that the BHPS cohorts Tables also include a column controlling for age, which obviously is not necessary in the case of the NCDS and BCS cohorts who are (in their respective cohorts) aged the same.

pattern is reported in Table 2C from the NCDS 1958 birth cohort. In Table 2C, once prior cognitive and non-cognitive skills are further controlled for, one could not reject the null hypothesis that on average attendance at a private school in this earlier era generated no private pecuniary benefits in later life. This finding appears striking but one should not necessarily conclude that the private school investment was wasted. There may have been consumer or non-pay benefits not captured in our approach. Moreover, the point estimates of the premia remain positive. Schools and pupils are also quite heterogeneous, leaving the possibility that some groups did benefit, a question to which we return below.

The picture changes with the later cohorts. In these cases the extent to which family background and prior abilities account for the private school premium is reduced, and there remains a premium whatever one's background, estimated for males to be 0.158 (17%) for the BHPS and 0.173 (19%) for the BCS, and for females to be 0.173 (19%) for the BHPS and 0.149 (16%) for the BCS.

To sum up so far, in respect of hypothesis 1 the premium was substantial in the later cohorts but not in the earlier cohorts. In respect of hypothesis 2 and 3, the premium for males increased by about 10 percentage points in the case of the NCDS/BCS pair, but by only 4 points (and insignificantly) in the BHPS. Thus for males the expectation that the return would have increased over the period is only partially supported. For females, however, the increase in the premium is more substantial, from 6% to 19%. With a similar pattern in the NCDS/BCS, these findings support hypothesis 3: over this time girls schools came to deliver an educational product that was more valued in the labour market than in earlier cohorts.

Reading further across the columns of Tables 2B and 2D it can be seen that the private school premium observed in later cohorts is very largely accounted for by the skills and qualifications gained at school. Taking the BCS findings for females, for example, the return is reduced from 0.149 (16%) to 0.045 (5%) after controlling for cognitive skills, and to 0.011 (1%) after controlling also for the maximum achieved educational qualification. In all cases the coefficient estimate, after controlling for maximum qualifications, is insignificantly different from zero. Thus one could not reject the hypothesis that on average there are no network benefits or other benefits associated with non-certified human capital from private schooling. The significant benefits are exclusively associated with the academic qualifications (and in the case of

BCS the cognitive skills) attributable to private schooling. Since there were no significant benefits in the earlier cohorts, this finding is consistent with hypothesis 4, confirming that Rae (1981) was correct to stress the academic transformation of private schools in the 1970s.

4.2 Robustness check: Propensity Score Matching estimates.

A possible concern with the analysis above is that private and state school attendees are quite different in their observable characteristics so that linear unweighted regression methods may suffer from a lack of common support. This problem can be accounted for using Propensity Score Matching (PSM) as one can restrict the analysis to those individuals from the state sector who share similar enough characteristics to have possibly attended a private school and vice versa. PSM also has the advantage of being in effect a fully interacted OLS model, allowing for each control variable to have an effect on each other. Finally, its semi-parametric nature does not require us to make the assumption of linearity in the outcome equation.

As a means of testing the robustness of the findings to date Appendix Tables A to D therefore present PSM estimates of the returns to private education for both sets of cohorts. Here the treatment group (private-school attendees) and the control group (state-school attendees) are matched on all pre school characteristics.[15] The first row reports the raw (prematched) differences.

Unlike with the OLS findings, PSM gives a statistically significant premium for males in the earlier cohort of the BHPS. However, the premium for females is low and insignificant. Concerning Hypothesis 2, as we saw with the OLS analysis we find an increase in the returns for attending a private school. The Average Treatment effect on the Treated (ATT) for males rose from 12% to 19% in the BHPS and a similar 8% to 18% in the cohort studies. Similarly the Average Treatment effect on the Untreated (ATU) (the effect private schooling would have had on those who attended at state sector school) also increased over this period. The ATT, but not the ATU, rose more for females than for males. Although few of the matching estimates from the NCDS/BCS pair are statistically significant, they show a pattern that is consistent with the BHPS results in general. Also worthy of note is that in both BHPS cohorts the estimated ATU exceeds the ATT, implying that there were some state-school girls

[15] For PSM we are not controlling for highest qualification achieved as this is a post treatment observation and would lead to misleading results.

who would have benefited more from attending private schools than those who actually attended. The same is true of the younger, but not the older, male cohorts.

4.3 Quantile Regression

The Ordinary Least Squares (OLS) regression focuses exclusively on the conditional mean function and hence gives a rather incomplete summary of the joint distribution of the dependent and explanatory variables. In contrast, the Quantile Regression method provides a richer characterization of the data through the estimation of a range of conditional quantile functions (the most well-known of which is the conditional median function) and can be consistent under weaker stochastic assumptions than with least squares estimation.

In Tables 3A to 3D we use Quantile Regressions to investigate heterogeneity in the private school premium and how this has changed over time. The models presented correspond to the bottom row specifications in Tables 2A to 2D which control for family backgrounds. The tables show that the OLS estimates of the premium average out a considerable heterogeneity across the quantiles. For example, with the BHPS sample the premium for males is 0.168 (18%) at the 90^{th} percentile and - 0.009 (-1%) at the 10^{th} percentile.

For males, returns are generally bigger at the higher quantiles (though the relationship is not monotonic). If we assume that the residuals in the pay equations capture a combination of unobserved attributes and abilities, this finding means that private schools have more of an impact on pay the greater is the unobserved individual ability. This finding is consistent with the expectation that the private schools attended by more able pupils are of better quality (in this sense, that they deliver a higher pay premium). In other words, the better schools may be more academically selective. For females a similar pattern is found using the BHPS. Thus, unlike with the OLS estimates, where the finding was that private schools had no significant average effect in the earlier cohorts, it is seen here that the upper quantiles did receive a significant premium. Only in the lower quantiles were there no wage benefits.

In several cases the estimated premium increased over time, especially for females, consistent with the OLS findings. For males there were rises at the 10^{th} and 25^{th} percentiles, implying improvements in the return from schools attended by lower

ability pupils, but no rises for the upper quantiles. For females, there were rises at both the upper and the lower quantiles.

After controlling for maximum achieved qualification the estimated premia are much reduced but a similar pattern is found. For example, in the older BHPS cohort, the returns for males are significant and positive at all the percentiles shown, other than the 10^{th} percentile where the premium is negative. The implication is that private schools, in all but the lowest ability students, were delivering something over and above academic qualifications that was of value in the labour market. This finding is consistent with there being an 'old boys' network' for some schools, or else with the schools inculcating valuable uncertified qualities in their pupils. The data could not discriminate between these alternative explanations. There remains, however, no evidence in the older cohorts of significant positive premia for females at any quartile, after conditioning for maximum qualification.

4. Conclusions

Despite its relatively small size, the private school sector plays a prominent role in British society. A good understanding of the magnitude and source of the private school premium and any trends over time is important from a public policy perspective. However, for various reasons this subject has been under-researched. This paper has aimed to start to fill this gap by focusing on the changing returns to private education in Britain using data from the NCDS and BCS birth cohorts along with the British Household Panel Survey. We have presented consistent evidence that the returns to private schooling increased significantly for the more recent birth cohorts, and more sharply for women than for men. There is also evidence of differential changes at different points of the distribution, as evidenced by the quantile regression estimates.

In light of the development of education policy, and of changes in the economic and social environment, private schools began a process of transformation in the late 1960s and thereafter. We expected therefore that, whereas those attending private school before the transformation took full effect will have received some pay benefits in return for the investment, those attending in later years (and paying higher fees) would have received an increased return (especially females). We also expected that

the achievement of academic qualifications was becoming the channel through which most returns were delivered.

To examine these expectations we split the BHPS sample into older and younger cohorts, and in a complementary analysis compared estimates between the NCDS and BCS cohorts which are 12 years apart in age. Between earlier and later cohorts the private schools considerably widened their academic lead over state schools as measured by the subsequent achievement of university degrees. Our hypotheses are generally supported by the findings which have emerged in a robust way using a range of estimation techniques. In the later cohorts our least squares estimates of the pay premium, after allowing for family background and other controls, were in the range 16% to 19%. The findings were refined using quantile regressions, which showed that the returns from private schools were larger for those with greater 'residual' or unobserved earning abilities, consistent with the observation that high quality schools are academically selective. In the OLS results we found no evidence of any significant private school premium once family background was controlled for; however, the quantile regressions revealed that it was only at the lower quantiles that there was no significant positive premium. Similarly, in the OLS results that control for qualifications achieved there was no evidence that could support the existence of an 'old boys' network' in the earlier cohorts. Yet, the quantile regressions revealed that there were significant positive returns for males at all but the lowest (10^{th}) percentile; and these could be seen as evidence for additional effects of private schooling which may include network effects.

To obtain these benefits, pupils' families had to pay fees. Did they get good value? While it is impossible to provide a definitive answer to this question with available data, one can deduce an order-of magnitude estimate for the average net return. Taking the private-school-educated respondents in the BCS cohort, the average annual boarding fee was £2700 at 1980 prices, which with an assumed 10-year private-school period, and allowing for alternative cost reductions, equates roughly to £75,000 at 2000 prices. At this point in their lives our estimate (a 19% premium) implies an additional £5,000 extra pay received in 2000. While this premium might alter over time it would extend into pension receipts. Using this figure as a rough estimate of annual returns over the course of a post-school lifetime gives a return on capital of approximately 7%.

The estimates of the net return and the premium, however, are also subject to a few caveats. Perhaps most importantly, the transformation of private schools changed considerably the experience of children at private schools. Vastly improved facilities for diverse sporting and cultural activities raised the quality of the experience over previous eras. These benefits, widely known to exceed those available in state schools, net out part of the cost of private school investments. The estimated average net rate of return, 7%, is thus an underestimate. For those groups of private-school pupils who were at the lower quantiles of the residual pay distribution and who appear to have received no financial premium, their consolation might have to be sought here.

One reason why the premium might be underestimated arises from measurement error. Since sectoral allocation in our sample is based on school attendance at one age (11), the data do not capture the effect of individuals switching between sectors. Measurement error in an independent variable would generate downward bias in the absolute size of the coefficient estimate. Set against these downward biases, there remains also the possibility of omitted variable bias, previously alluded to, which could generate biases in either direction depending on the selection policies of schools and the strategies of parents. We have suggested, however, that the rich and unique NCDS/BCS survey pair include several aspects of ability and social background much more effectively than in most studies of earnings.

The implications of these findings are as follows. On average those paying for private education in the 1970s and beyond were getting good value for their money. Above the fact that private school pupils were spending their school lives enjoying facilities normally far better than those available in state schools, these pupils benefited through improved pay later in life, and the financial return is broadly comparable to the returns on other capital. Around the average the benefits were greater for some than for others, but so also did the fees vary. It is also apparent that the chief means of delivering the labour market return is through the better academic qualifications that are delivered by private schools using their rising resources. If academic achievements are, therefore, to be a target for government policy, emulation of the private schools would appear to be a policy worth considering. Nevertheless the exclusiveness of the private schools is also shown in the fact that the sector has not expanded beyond its roughly 8% of the total pupil base for many decades. Our

findings also imply that many others could have benefited from the boost given by the resources available in private schooling, but did not do so. Since selection into the schools, despite some bursaries and the Assisted Places Scheme, is primarily based on families' ability to pay, and given the substantial returns achieved, it is hard to escape the conclusion that private schools during the period under examination also served to reproduce inequalities in British society.[16]

Neither the NCDS/BCS comparison nor the BHPS split will have captured the effect of the inflation-busting rises in school fees of the recent decade. Therefore, the changes we have examined in this paper only cover the start of a period of long-term transformation of the private school sector fuelled by rising resources. There is an ongoing research need here, to examine whether very recent private school graduands are getting still larger premiums to match the rising fees. We think that research into these private returns should also be part of a broader plan for better understanding of the role of private schools in Britain, including their external effects on other schools and within the labour market, with concomitant implications for both education and taxation policies.

[16] See Walford (1991: 103-121) for a balanced consideration of arguments for and against private schools in the light of contemporaneous evidence.

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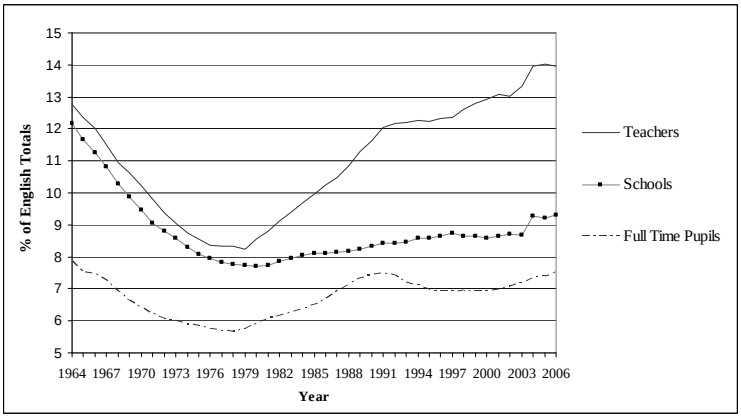
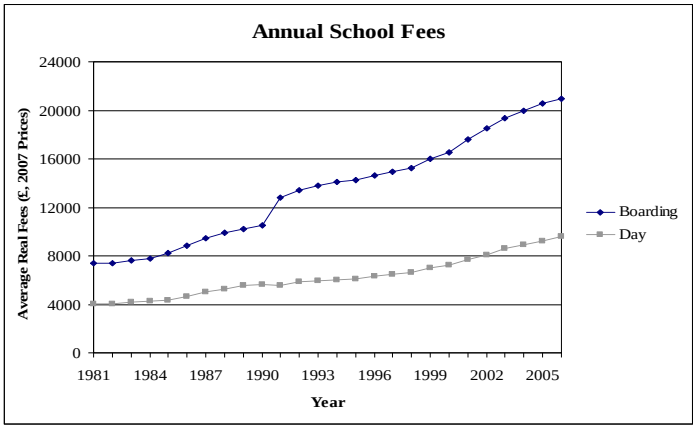
Figure 1. The Relative Quantity of Private Education, England 1964-2006



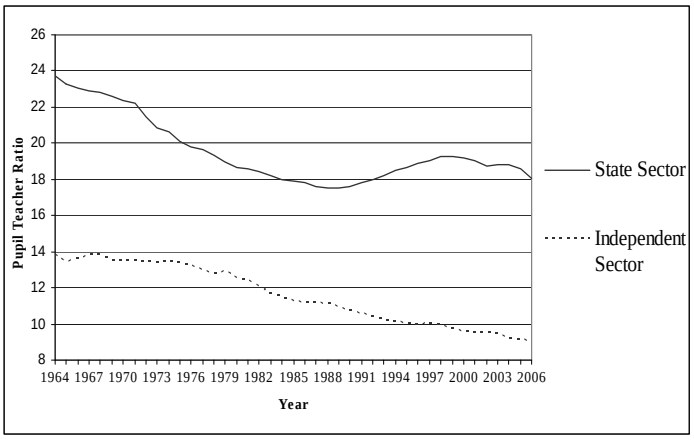
Notes: Source-DSCF 2007; i) Full Time Pupils Only; ii) State Sector Includes; Primary, Secondary, Nursery & Special Schools; iii) Includes both the full-time and the full-time equivalent of part-time teachers; iv) From 1971 onwards, state sector only includes qualified teachers; v) Independent Sector includes Direct Grant Grammar Schools up to and including 1980; vi) From 1990 Independent Sector includes City Technology Colleges; vii) From 2004 Independent Sector includes City Academies.

Figure 2. The Price of Private Education.



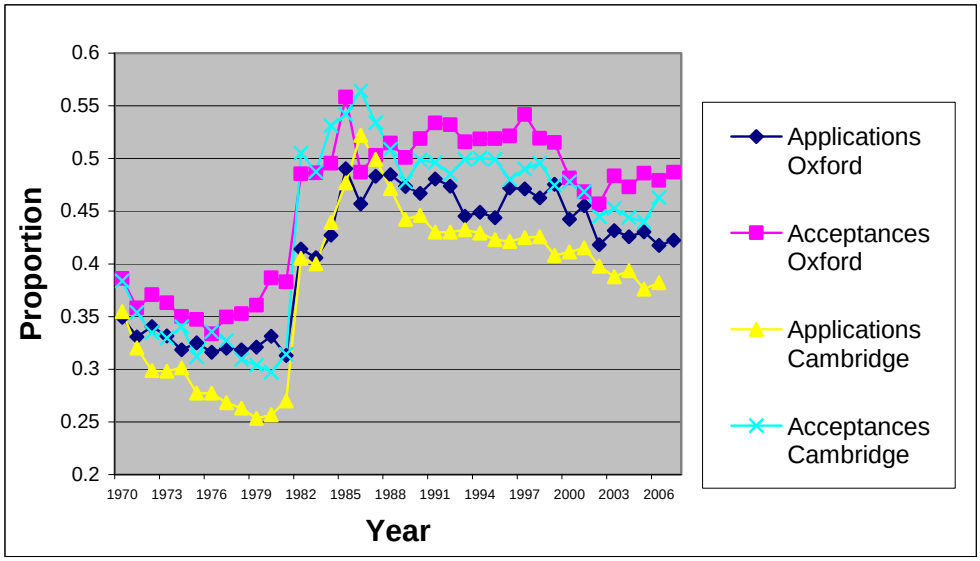
Notes: Source – Independent Schools Council Census Data, 1982-2007; Authors' calculations; RPI, ONS 2006; Prior to 1992 the average fee is not weighted by school size.

Figure 3. The Pupil-Teacher Ratio, England, 1964-2006.



Notes: i) Full Time Pupils Only; ii) State Sector Includes; Primary, Secondary, Nursery & Special Schools; iii) Includes both the full-time and the full-time equivalent of part-time teachers; iv) From 1971 onwards, state sector only includes qualified teachers; v) Private Sector includes Direct Grant Grammar Schools up to and including 1980; vi) From 1990 Private Sector includes City Technology Colleges; vii) From 2004 Private Sector includes City Academies.

Figure 4 Applications and Acceptances to Oxbridge from Private Schools



Source: Oxford and Cambridge Admissions Offices.

Table 1A: Summary Statistics: BHPS Male (cross-sectional weights used)

	Private		State	
	Pre-1960 cohorts	Post-1960 cohorts	Pre-1960 cohorts	Post-1960 cohorts
Log real wage (dep. var)	2.390	2.419	2.159	2.174
Age	48.91	32.68	48.29	32.42
South-east region	0.493	0.427	0.333	0.302
Prop. married	0.807	0.557	0.798	0.527
Prop. Cohabiting	0.056	0.174	0.058	0.174
Self-employed	0.236	0.146	0.193	0.125
Prop. with higher degrees	0.124	0.047	0.035	0.032
Prop. with first degrees	0.262	0.493	0.109	0.171
Prop. with further edu. qual.	0.394	0.196	0.326	0.350
Prop. with A Levels	0.110	0.144	0.124	0.131
Prop. with O Levels	0.058	0.094	0.164	0.183
Prop. with no qualifications	0.052	0.024	0.239	0.119
Prop. with missing qualifications	0.000	0.002	0.004	0.014
Years of education	15.24	15.95	12.83	13.81
Father has some qualification	0.324	0.170	0.135	0.266
Father has further educ. qualification	0.272	0.358	0.201	0.317
Father has degree	0.148	0.338	0.035	0.085
Family non-intact when respondent 16	0.915	0.825	0.889	0.833
Number of siblings	1.729	1.533	2.224	1.919
Mother's age when respondent born	29.26	27.94	27.89	26.78
Birth order index	0.935	0.934	0.969	0.998
Unweighted Number of Observations (person-year)	1046	762	13965	11166

Table 1B: Summary Statistics: BHPS Female (cross-sectional weights used)

	Private		State	
	Pre-1960 cohorts	Post-1960 cohorts	Pre-1960 cohorts	Post-1960 cohorts
Log real wage (dep. var)	1.983	2.208	1.894	2.004
Age	48.55	31.17	47.38	32.52
South-east region	0.564	0.556	0.330	0.296
Prop. married	0.739	0.603	0.748	0.573
Prop. Cohabiting	0.048	0.128	0.051	0.175
Self-employed	0.174	0.146	0.067	0.045
Prop. with higher degrees	0.098	0.039	0.025	0.028
Prop. with first degrees	0.294	0.587	0.080	0.156
Prop. with further edu. qual.	0.207	0.159	0.270	0.360
Prop. with A Levels	0.088	0.154	0.077	0.121
Prop. with O Levels	0.208	0.060	0.232	0.219
Prop. with no qualifications	0.105	0.000	0.311	0.111
Prop. with missing qualifications	0.001	0.001	0.005	0.005
Years of education	15.03	16.34	12.89	13.99
Father has some qualification	0.221	0.204	0.104	0.205
Father has further educ. qualification	0.282	0.328	0.261	0.338
Father has degree	0.214	0.416	0.046	0.075
Family non-intact when respondent 16	0.900	0.950	0.890	0.843
Number of siblings	1.747	1.588	2.308	1.928
Mother's age when respondent born	30.065	30.222	28.39	27.19
Birth order index	0.977	1.132	0.965	1.026
Unweighted Number of Observations (person-year)	1045	499	13033	12293

Notes: sample with non-missing family background information and wages.

Table 1C: Summary Statistics: NCDS & BCS Male

	Private Age 11		State Age 11	
	NCDS	BCS	NCDS	BCS
Log Real Gross Hourly Wage	2.537	2.533	2.302	2.227
Log Real Gross Weekly Wage	6.301	6.415	6.043	6.049
Father Figures:				
Social Economic Group I	0.198	0.283	0.050	0.056
Social Economic Group II	0.431	0.391	0.136	0.161
Social Economic Group III Non Manual	0.043	0.087	0.096	0.085
Social Economic Group III Manual	0.095	0.011	0.412	0.389
Social Economic Group IV	0.060	0.000	0.154	0.097
Social Economic Group V	0.000	0.000	0.040	0.027
Social Economic Group NA	0.009	0.011	0.022	0.031
Social Economic Group Miss	0.164	0.217	0.090	0.154
Birth Index	1.033	1.088	0.974	1.055
Ethinc Minority	0.026	0.022	0.018	0.020
Natural Mother	0.802	0.772	0.899	0.848
Natural Father	0.802	0.761	0.867	0.806
Non UK Mother	0.095	0.087	0.050	0.056
Non UK father	0.060	0.076	0.062	0.064
South East	0.259	0.207	0.179	0.146
Post Degree	0.017	0.141	0.022	0.041
Degree	0.431	0.500	0.145	0.140
A level	0.181	0.152	0.083	0.087
O level	0.259	0.152	0.400	0.428
Below O level	0.078	0.033	0.209	0.112
Average Highest Qualification	3.054	3.578	2.266	2.468
Years of education	15.577	17.174	12.762	12.923
Total	116	92	2680	3140

Table 1D: Summary Statistics: NCDS & BCS Female

	Private Age 11		State Age 11	
	NCDS	BCS	NCDS	BCS
Log Real Gross Hourly Wage	2.217	2.333	1.968	2.056
Log Real Gross Weekly Wage	5.429	6.019	5.170	5.501
Father Figures:				
Social Economic Group I	0.260	0.226	0.043	0.060
Social Economic Group II	0.365	0.369	0.135	0.178
Social Economic Group III Non Manual	0.021	0.048	0.098	0.074
Social Economic Group III Manual	0.125	0.083	0.423	0.371
Social Economic Group IV	0.063	0.012	0.136	0.101
Social Economic Group V	0.000	0.000	0.051	0.029
Social Economic Group NA	0.000	0.036	0.025	0.037
Social Economic Group Miss	0.167	0.226	0.089	0.151
Birth Index	1.007	1.104	0.987	1.047
Ethinc Minority	0.010	0.000	0.015	0.025
Natural Mother	0.802	0.774	0.900	0.848
Natural Father	0.792	0.738	0.861	0.795
Non UK Mother	0.063	0.048	0.057	0.069
Non UK father	0.052	0.060	0.053	0.070
South East	0.281	0.310	0.169	0.160
Post Degree	0.083	0.155	0.023	0.051
Degree	0.292	0.476	0.136	0.151
A level	0.167	0.155	0.097	0.105
O level	0.375	0.190	0.457	0.489
Below O level	0.031	0.012	0.167	0.105
Average Highest Qualification	3.022	3.578	2.307	2.506
Years of education	14.525	16.667	12.785	13.295
Total	96	94	2080	2752

Table 2A: BHPS Returns Matrix, Pre-1960 Birth cohorts

Male N=15011	No controls	Plus age, age sq, South East (**Baseline Model**)	Plus Max Qualification
Own variables	0.197***	0.190***	0.033
	0.073	*0.074*	*0.073*
+ Family Background	0.111	0.116	0.021
	0.075	*0.076*	*0.074*
Female N=14078	**No controls**	**Plus age, age sq, South East (Baseline Model)**	**Plus Max Qualification**
Own variables	0.127*	0.111*	-0.051
	0.066	*0.065*	*0.062*
+ Family Background	0.060	0.051	-0.040
	0.069	*0.068*	*0.063*

Table 2B: BHPS Returns Matrix, Post-1960 Birth cohorts

Male N=11928	No controls	Plus age, age sq, South East (**Baseline Model**)	Plus Max Qualification
Own variables	0.265***	0.237***	0.069
	0.061	*0.059*	*0.058*
+ Family Background	0.158**	0.130	0.033
	0.061	*0.059*	*0.058*
Female N=12792	**No controls**	**Plus age, age sq, South East (Baseline Model)**	**Plus Max Qualification**
Own variables	0.273***	0.237***	0.004
	0.089	*0.090*	*0.082*
+ Family Background	0.173**	0.143	0.004
	0.093	*0.094*	*0.086*

***Notes**:*

*** indicates statistical significance at the 1%, ** for 5% and * for 10% level. Standard errors in parentheses.

Max qualification: Dummies for higher degree, first degree, further education, A Level, O Level, and missing qualifications (omitted category: qualification below O Level)

Family background variables: dummies for father having degree, further education qualification, some qualification (omitted cat: no qualification) an indicator for living in non-intact families when the respondent was 16, number of siblings, mother's age when respondent was born and birth order index (see Booth & Kee 2005, IZA DP 1713).

Table 2C: NCDS Returns Matrix, Age 11, Wages 33

NCDS Males, Private School Age 11, Wages 33. (N=2796)				
	No Controls	Plus: Age 10/11 Cognitive	Plus: Age 16 Cognitive	Plus: Max Qualification
Private School	0.249*** *0.047*	0.147*** *0.045*	0.115** *0.045*	0.078* *0.045*
Plus: Family Background	0.090* *0.049*	0.07 *0.047*	0.058 *0.047*	0.039 *0.047*
Plus: Age 5/7 Cognitive	0.085* *0.048*	0.073 *0.047*	0.062 *0.047*	0.042 *0.047*
Plus: Age 5/7 Non Cognitive	0.086* *0.048*	0.073 *0.047*	0.062 *0.047*	0.042 *0.047*

NCDS Females, Private School Age 11, Wages 33. (N=2176)				
	No Controls	Plus: Age 10/11 Cognitive	Plus: Age 16 Cognitive	Plus: Max Qualification
Private School	0.277*** *0.056*	0.115** *0.052*	0.089* *0.052*	0.067 *0.05*
Plus: Family Background	0.096* *0.057*	0.032 *0.054*	0.028 *0.054*	0.04 *0.053*
Plus: Age 5/7 Cognitive	0.084 *0.056*	0.035 *0.054*	0.03 *0.054*	0.043 *0.053*
Plus: Age 5/7 Non Cognitive	0.084 *0.056*	0.035 *0.055*	0.03 *0.054*	0.042 *0.053*

Note: *** indicates statistical significance at the 1%, ** for 5% and * for 10%.

Table 2D: BCS Returns Matrix, Age 11, Wages 30

BCS Males, Private School Age 11, Wages 30. (N=3232)				
	No Controls	Plus: Age 10/11 Cognitive	Plus: Age 16 Cognitive	Plus: Max Qualification
Private School	0.307*** *0.057*	0.194*** *0.056*	0.158*** *0.055*	0.082 *0.055*
Plus: Family Background	0.159*** *0.058*	0.126** *0.056*	0.115** *0.056*	0.063 *0.056*
Plus: Age 5/7 Cognitive	0.164*** *0.057*	0.131** *0.056*	0.120** *0.056*	0.068 *0.056*
Plus: Age 5 Non Cognitive	0.168*** *0.057*	0.135** *0.056*	0.123** *0.056*	0.07 *0.056*

BCS Females, Private School Age 11, Wages 30. (N=2846)				
	No Controls	Plus: Age 10/11 Cognitive	Plus: Age 16 Cognitive	Plus: Max Qualification
Private School	0.288*** *0.057*	0.115** *0.055*	0.085 *0.054*	0.032 *0.053*
Plus: Family Background	0.149*** *0.057*	0.054 *0.055*	0.038 *0.055*	0.005 *0.054*
Plus: Age 5/7 Cognitive	0.143** *0.056*	0.056 *0.055*	0.039 *0.055*	0.006 *0.054*
Plus: Age 5 Non Cognitive	0.144** *0.056*	0.056 *0.055*	0.04 *0.055*	0.006 *0.054*

Note: *** indicates statistical significance at the 1%, ** for 5% and * for 10%.

Table 3A: BHPS Quantile regression, Pre-1960 Birth cohorts

	Male				Female			
	Not controlling for max qualifications		Controlling for Max Qualification		Not controlling for max qualifications		Controlling for Max Qualification	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
10th percentile	-0.009	0.085	-0.131**	0.055	-0.050	0.051	-0.094***	0.032
25th percentile	0.064*	0.035	0.051**	0.022	-0.009	0.038	0.007	0.018
50th percentile	0.134**	0.052	0.043**	0.018	0.156**	0.053	-0.000	0.015
75th percentile	0.213**	0.067	0.060**	0.020	0.156**	0.079	-0.021	0.019
90th percentile	0.168**	0.075	0.097**	0.027	0.103	0.088	0.011	0.022
Obs			15011				14078	
OLS	0.116	0.076	0.021	0.074	0.051	0.068	-0.040	0.063

Table 3B: BHPS Quantile regression, Post-1960 Birth cohorts

	Male				Female			
	Not controlling for max qualifications		Controlling for Max Qualification		Not controlling for max qualifications		Controlling for Max Qualification	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
10th percentile	0.080*	0.042	0.006	0.042	0.141**	0.040	0.007	0.047
25th percentile	0.125**	0.026	0.017	0.023	0.142**	0.029	0.034	0.027
50th percentile	0.126**	0.022	0.034	0.019	0.155**	0.032	0.049*	0.026
75th percentile	0.134**	0.023	0.095**	0.020	0.186**	0.029	0.098**	0.026
90th percentile	0.180**	0.025	0.157**	0.026	0.236**	0.039	0.151**	0.029
Obs	11928		11928		12792		12792	
OLS	0.130**	0.059	0.033	0.058	0.143	0.094	0.004	0.086

Notes: All models control for age, age square, the South-east region, and family background variables, apart from a private school dummy. Family background variables include dummies for father having degree, further education qualification, some qualification (omitted cat: no qualification) an indicator for living in non-intact families when the respondent was 16, mother's age when respondent was born and birth order index (see Booth & Kee 2005, IZA DP 1713).

[TABLES 3C AND 3D TO BE ADDED]

Table 3C: NCDS Quantile regression, Age 11, Wages 33

	Male				Female			
	Not controlling for max qualifications		Controlling for Max Qualification		Not controlling for max qualifications		Controlling for Max Qualification	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
10th percentile	0.021	0.07	0.024	0.085	0.205**	0.054	0.037	0.058
25th percentile	0.051	0.052	-0.021	0.059	0.034	0.053	0.06	0.052
50th percentile	0.135**	0.059	0.094*	0.057	0.195**	0.072	0.068*	0.041
75th percentile	0.222**	0.056	0.193**	0.051	0.143**	0.062	0.036	0.064
90th percentile	0.147*	0.077	0.099*	0.051	0.114	0.098	0.119	0.097
Obs	2796		2796		2176		2176	
OLS	0.090*	0.049	0.039	0.047	0.096*	0.057	0.04	0.053

Table 3D: BCS Quantile regression, Age 11, Wages 30

	Male				Female			
	Not controlling for max qualifications		Controlling for Max Qualification		Not controlling for max qualifications		Controlling for Max Qualification	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
10th percentile	0.009	0.109	-0.03	0.094	0.160**	0.07	-0.013	0.067
25th percentile	0.140**	0.061	0.011	0.051	0.137**	0.07	-0.012	0.048
50th percentile	0.179** *	0.059	0.103**	0.046	0.065	0.056	-0.051	0.051
75th percentile	0.250** *	0.063	0.165** *	0.055	0.149**	0.066	0.007	0.053
90th percentile	0.319** *	0.101	0.187** *	0.07	0.124	0.087	0.022	0.100
Obs	3232		3232		2847		2847	
OLS	0.159** *	0.058	0.063	0.056	0.149** *	0.057	0.005	0.054

Note: *** indicates statistical significance at the 1%, ** for 5% and * for 10%.

Appendix

Appendix Table A: Propensity Score Matching (PSM), BHPS Pre-1960 Birth cohorts

	Men		Women	
	Coefficient	Std. Error	Coefficient	Std. Error
Prematched	0.158***	0.030	0.148***	0.025
ATT	0.121**	0.050	0.034	0.041
ATU	-0.102	0.085	0.087**	0.041
ATE	-0.088	0.080	0.083**	0.039

Appendix Table B: Propensity Score Matching (PSM), BHPS Post-1960 Birth cohorts

	Men		Women	
	Coefficient	Std. Error	Coefficient	Std. Error
Prematched	0.285***	0.032	0.238***	0.033
ATT	0.198***	0.046	0.159***	0.052
ATU	0.323***	0.045	0.274***	0.066
ATE	0.315***	0.043	0.270***	0.064

Appendix Table C: Propensity Score Matching (PSM), NCDS Age 11, Wages 33

	Men		Women	
	Coefficient	Std. Error	Coefficient	Std. Error
Prematched	**0.237*** **	0.049	**0.154*** **	0.055
ATT	0.084	0.066	-0.015	0.080
ATU	0.009	0.059	0.088	0.112
ATE	0.005	0.062	0.093	0.117

Appendix Table D: Propensity Score Matching (PSM), BCS Age 11, Wages 30

	Men		Women	
	Coefficient	Std. Error	Coefficient	Std. Error
Prematched	0.299***	0.060	0.283***	0.061
ATT	0.182*	0.093	0.064	0.112
ATU	0.101	0.132	0.114	0.073
ATE	0.095	0.137	0.117	0.076

Notes: 5-nearest neighbours matching enforcing common support, using the STATA routine *psmatch2* (Leuven and Sianesi 2003). Standard errors bootstrapped with 200 repetitions. *** indicates statistical significance at the 1%, ** for 5% and * for 10%.