On Teachers Quality Decline

Francesco Amodio

Department of Economics, University of Bologna

5. July 2009

On Teachers Quality Decline

Francesco Amodio*

July 5, 2009

Abstract

Evidence suggests the average ability of teachers to have progressively declined in developed countries over the last decades. Many explanations have been proposed, all suggesting the idea of a lower attractiveness of teaching professions (both in monetary and non monetary terms) with respect to feasible alternative working opportunities. This should apply to women at least, because of the great expansion of job opportunities which interested female cohorts in the second half of the century. However, the long lasting problem of getting credible ability measures has often driven partial results.

Here two UK population samples of individuals born in different years are considered. Individuals were exposed to ability tests at early stages of their life, so that subsequent education paths are exogenous to test scores. Transformation in percentiles allows to get comparable measures of ability, and distributions for those who undertook the teaching career are obtained in the two samples. Consistently with previous literature, using difference-in-difference, we find evidence of teachers quality decline. A gender based analysis is performed in order to address gender differences and specific questions. Data on salaries, ditributions across jobs and social mobility are finally used in order to find possible explanations. Further questions arise.

Keywords: teachers quality, ability measure, NCDS, BCS, difference in difference.

*University of Bologna, Department of Economics, LMEC - francesco.amodio@hotmail.it.
Thanks to Andrea Ichino for invaluable supervising activity and opportunities of research training, Peter Shepherd and Brian Dodgeon from CLS (IOE, London), Tommaso Reggiani, Francesca Barigozzi, Francesco Manaresi, Margherita Fort, Giovanni Di Mauro and all partecipants to the PhD meeting at University of Bologna for useful suggestions and insights.

1 Introduction

"If you can read this, thank a teacher." (Anonymous)

Even the occasional reader won't find many difficulties in recognizing that teachers abilities are correlated with average students achievements. The real problem comes when the one is asked about what these capabilities really are. The existence of a unique and complete answer to this last question is far from being clear. Despite this, even individual experience suggests the idea that teachers are nowadays worst than they were years ago in terms of this vector of unspecified capability measures.

The issue of teachers quality has been addressed in literature in several contributions. In economics, it has been recognized to be relevant because of the effect teachers skills have on students accumulation of human capital. Standardized test scores and school and university grades have been widely used as proxies for teachers capabilities, showing evidence about teachers nowadays as increasingly being drawn from the lower part of the ability distribution with respect to what happened years ago. In particular, Corcoran, Evans and Schwab (2004) combine five US longitudinal surveys of high school students spanning more than four decades (from 1957 to 2000) and use standardized test scores to look at how the propensity to become teachers has changed over time. They focus on women cohort, finding evidence of a decline in the average ability of new female teachers when percentiles of standardized verbal and mathematical aptitude tests scores are used as measures of ability. Moreover, they find women near the top of the test score distribution became much less likely to enter the teaching profession than their peers near the middle of the distribution. They also suggest the same results to be weaker for men. Results seem to be consistent with evidence from other cross-sectional studies (Manski, 1985; Hanushek and Pace, 1995), which show that teachers do not compare favorably to their college graduates peers. The shared explanation for this relies on the idea of changes in the women labor market, as the increase in women labor market partecipation and the possibility for high skilled women to undertake top careers from which they

were previously excluded. Dolton (1990) uses data from a sample of UK individuals who graduated in 1980 and adopts a structuralist approach, defining an econometric model of occupational choice in order to look at the determinants of the decision to undertake the teaching career. He finds that relative earnings in teaching and non teaching occupations and the corresponding growth in earnings in the two choices had a marked effect on graduates choices.

The fundamental limitation of all these contributions in literature relies on the long lasting question of how to measure ability. As suggested from the beginning, it is far from being clear which kind of capabilities have to be taken into account for a correct assessment of teachers quality. Grönqvist and Vlachos (2008) have tried to overcome the problem using data from military draft tests in Sweden to include non cognitive capabilities in the analysis. They find social interactive ability to be relevant for increases in performance of low aptitude students, while cognitive abilities turn out to be relevant for high performing students achievements. Even if these are important results, they are still partial, as measures of non cognitive abilities relies on specific test scores which are far from being universally meaningful and objectively undoubtful.

Here two UK longitudinal datasets are used in order to find evidence of teachers quality decline. Two fully representative UK population samples of individuals born in 1958 and 1970 respectively are compared and attention is restricted to the teachers cohorts. The main contribution of this work is represented by the use of ability scores which comes from standardized tests to which individuals in samples where exposed when they were approximately 10 years old. This represents an important deviation from previous literature, since there ability measures went from tests administered at the high school level and university grades, while here subsequent individual education paths of children (end of secondary school, high school and university attainment) are exogenous to test results, thus making them representative of exogenous ability endowment. However, social background and parents' social class are not exogenous, and this will become crucial in the assessment of social

mobility issues within the exploration of possible explanations of results. Interestingly, our ability measure allows also to have ability scores for the whole population, without restricting the sample to high school and university graduates. Scores from the two surveys are transformed in percentiles, thus allowing for comparisons between their distribution in the two birth year cohorts. Limited dependent variable models and difference-in-difference are used in order to look at how the probability of being a teacher at approximately 33 years old changed over that 12 years time horizon conditionally on having an ability score above or below the sample median. Evidence shows, consistently with literature, that the probability of facing a teacher coming from the right side of the ability distribution has significantly decreased over time, while that of facing a teacher coming from the left side of the distribution has significantly increased. The same analysis is then progressively enriched with gender and social background variables to look at how that same probability changed conditionally on gender and parents' social class. Results rise social mobility issues in the exploration of possible explanations. DID analysis of relative earnings structures between teaching and non teaching professions within cohorts suggests teachers earnings not to have evolved significantly different from earnings from other professions conditionally on ability scores, thus making pecuniary factors play no role in the explanation of teachers quality decline.

The rest of the paper is organized as follows. A general overview of teachers and teaching careers in the UK, following mainly Dolton and Chevalier (2004), is provided in Section 2. Section 3 presents data in details. The empirical framework is presented in Section 4, while results are discussed in Section 5. In Section 6 exploration of explanations follows and Section 7 concludes.

2 Education and Teachers in UK

Before starting with the core of the analysis, here a general overview of the teachers cohort in UK is provided, following mainly Dolton and Chevalier (2004). In their

work, the authors try to disentangle and define the evolving characteristics of the labor market for teachers in the second half of the nineteenth century, focusing mainly on the supply side.

First, it is worth to recall that the labor market for teachers in UK, as in the majority of countries, is characterized by the state having nearly monopsony power in the recruitment of teachers, together with monopoly power in the provision of credentials. Education in the United Kingdom is a devolved matter with each of the countries of the United Kingdom having separate systems under separate governments: the UK Government is responsible for Education in England, the Scottish Government is responsible for Education in Scotland, the Welsh Assembly Government is responsible for Education in Wales and the Northern Ireland Executive is responsible for education in Northern Ireland. Teaching in UK is also a mainly female and a highly unionized occupation where salaries are settled on a national basis after centralized bargaining. Despite these peculiar characteristics, the market for teachers functions like any other labor markets, with schools acting as employers of teachers.

Over the last 50 years, UK has experienced serious problems in the recruitment and retainment of teachers, with cyclical shortage in teachers supply by subject or by geographical area. Excess demand for teachers appears to be a permanent feature. The problem has been exacerbated by cyclical trends in the number of students which affected primary and secondary schools in different ways, thus making the government unable to plan the appropriate number of teachers places. Moreover, even if central governments set overall spending limits and teachers wages, the number of employed teachers is determined by Local Education Authorities, which are responsible for the financial administration of education at a local level.

All teachers in UK must be qualified, meaning the Qualified Teacher Status (QTS) is needed. To gain QTS candidate teachers must complete the ITT (Initial Teacher Training) program, which involves at least 18 weeks practical experience in a school environment. There are a number of ways to complete ITT depending on your status

and level of education. In general, a teaching qualification can be obtained after a 4 year university degree in Education or after a 1 year post graduate qualification of education (PGCE) following a university degree in any subject. Newly qualified teachers must also register with the General Teaching Council (GTC) as a pre-requirement to work in the maintained sector and gain the Qualified Teacher Status.

3 The Data

The analysis is performed using data from two UK longitudinal datasets, the National Child Development Studies (NCDS) and the British Cohort Survey (BCS). In each of them, a fully representative sample of the UK population born in a given time interval is monitored at different points in time: individuals in the sample are followed from birth to adulthood and are exposed to questionnaires at different stages of their life. Both studies are nowadays administered by the Centre of Longitudinal Studies (CLS) of the Institute of Education, University of London, and they originally respond to the need of data for multidisciplinary research and policy purposes, coming to define an invaluable source for empirical research in various fields, as longitudinal studies allow to take into account individual experiences rather than just aggregate changes.

The NCDS sample contains individuals all living in UK and born in a particular week in March 1958. Its origins go back to the Perinatal Mortality Survey, administrated with the aim of disclosing the relationships between social and obstetric factors and stillbirth and death in early infancy. The original sample counted more than 17,500 individuals, and survivors have been followed at ages 7, 11, 16, 23, 33, 42, 46 and 50. Surveys have been carried out in by the National Childrens Bureau in 1965 (NCDS1), 1969 (NCDS2), 1974 (NCDS3), and 1981 (NCDS4); by the Social Statistics Research Unit (SSRU) of City University in 1991 (NCDS5); and by the CLS (formerly SSRU) and the National Centre for Social Research in 2000 (NCDS6). The birth cohort was augmented by including immigrants in school registers born in

the relevant week in the target sample for the first three follow-ups (NCDS1, NCDS2 and NCDS3). In addition, in 1978, contact was made with the schools attended by members of the birth cohort at the time of the second follow-up in 1974 in order to obtain details of public examination entry and performance. Similar details were also sought from sixth-form colleges and further education colleges. At birth survey information was obtained from the mother and from medical records by the midwife. For the purposes of the first three NCDS surveys, information was obtained from parents (who were interviewed by health visitors), head teachers and class teachers (who completed questionnaires), the schools health service (who carried out medical examinations) and the subjects themselves. Even if birthday cards are sent every year in order to keep in touch with cohort members asking them to confirm their address, units in the sample have been lost over the years, so that the current sample counts 12,000 individuals who still partecipate to the survey. Correlates of non-response have been largely investigated by the CLS.

The BCS sample contains individuals all living in UK and born in a particular week in April 1970. It thus replicates to some extent the NCDS, but now defining a fully representative sample of the 12 years older UK population. The original survey in this case is the British Births Survey, which counted more than 17,000 individuals in the sample. At the moment, survivors have been followed at ages 5, 10, 16, 26, 30, 34 and 38. Data have been collected from a number of different sources. In the birth survey, information was collected by means of a questionnaire that was completed by the midwife present at the birth, and supplementary information was obtained from clinical records. The five year and ten year surveys were carried out by the Department of Child Health, Bristol University and the survey at these times was named the Child Health and Education Study (CHES). In 1975 and 1980, parents of the cohort members were interviewed by Health Visitors, and information was gathered from head and class teachers (who completed questionnaires), the school health service (which carried out medical examinations on each child), and the subjects themselves. In both 1975 and 1980, the cohort was augmented by the addition of immigrants to Britain who were born in the target week in 1970. The 1986 survey

was carried out by the International Centre for Child Studies and named Youthscan. In this sweep, sixteen separate survey instruments were employed, including parental questionnaires, school class and head teacher questionnaires and medical examinations (including measurement of height, weight and head circumference). The cohort members completed questionnaires, kept two four-day diaries (one for nutrition and one for general activity), and undertook some educational assessments. The 1996 follow-up was carried out by the Social Statistics Research Unit (SSRU) of City University. It was based on a postal survey of cohort members for whom a current address was available. The most recent follow-up was carried out by the Centre for Longitudinal Studies of the Institute of Education, University of London (formerly SSRU) and the National Centre for Social Research. In addition to the four major sweeps, sample surveys were carried out in 1972/1973 and in 1977. The current BCS sample is composed by 12,000 individuals.

Both studies are now funded by the UK Economic and Social Research Council (ESRC), an independent organization funded itself by the UK Government through the Department for Innovation, Universities and Skills. Data collection involves a variety of resources, from face to face to telephone interviews, self completions and assessments, in particular CAPI (Computer-assisted Personal Interviewing) and CASI (Computer-assisted Self Interviewing) techniques. ESRC plans to administrate future surveys for both studies every four years.

NCDS and BCS data turn out to be useful in addressing the issue of teachers quality decline for several reasons. First, cohort members of both studies have been exposed to standardized ability tests when they were approximately 10 years old[1]. Final scores are a credible measure of individuals ability endowment as subsequent individual education paths are exogenous to test results. This is crucial in the analysis, as all major empirical contributions in literature on teachers quality are based on school evaluations, such as SAT scores in US. However, social background is not exogenous, as it will be discussed later in details. Second, transformation in

[1]Tests were elaborated by pedagogists, sociologists and psychologists and presented in a children friendly format.

percentiles of test scores allows for comparison between distributions of test results in both NCDS and BCS cohorts and, in particular, distributions of those in the two samples who decided to undertake the teaching career. Occupation information is available in both datasets following Standard Occupational Classification (SOC) codes as established by the UK National Statistics. Table 1 presents average ability scores in percentiles of some given categories of workers in NCDS. Evidence suggests the here proposed ability measure to be effective, as average ability scores are consistent with reasonable expectations. In the teachers specific case, in order to make cross-cohort comparisons sensible, data on occupation and earnings are taken from sweep 5 of NCDS (cohort members aged 33) and sweep 6 of BCS (cohort members aged 34) and teachers are detected by category (primary school teachers, secondary school teachers, higher education teachers, further education teachers, special needs teachers). This allows to identify those in the NCDS sample (born in 1958) who were teachers at the age of 33 with those in the BCS sample (born in 1970) who were teachers at the age of 34, and comparisons of ability distributions in the two teaching cohorts follows. Information on social background is taken by observing parents' social class at the moment of ability tests.

Here ability measures are obtained by focusing on mathematical test results only. This may seem restrictive to the reader, as it is reasonable to think non-cognitive abilities to be relevant in teaching activities. But, being this work motivated by the wish of getting clear evidence on changes in the teaching cohort quality, non-cognitive abilities have been voluntary ruled out, as their essentials are far from being universally identified and disclosed and partial results would have followed if these were part of the analysis.

4 The Empirical Framework

The main scope of the analysis is the evaluation of changes between the two birth year cohorts in the average probability of becoming a teacher, conditionally on the

adopted measure of ability endowment and other individual characteristics. The object of primary interest is then

$$E(teach_{70} - teach_{58}|S) \tag{1}$$

where *teach* is a dummy variable which takes value one if the observed individual is a teacher at approximately 33 years old (and zero if the declared occupation is different from teaching), the indexes 70 and 58 apply to individuals born in 1970 and 1958 respectively, thus belonging to the BCS or the NCDS surveys; S is a dummy variable which takes value one if the observed individual has an ability test score above the sample median and zero otherwise. In this way it is possible to see of how much percentage points the average probability of being a teacher at approximately 33 years old changed between the two birth year cohorts conditionally of being above or below the cohort median. In order to get the above specified object, the following limited dependent variable regression model is adopted

$$teach_i = \beta_0 + \beta_1 S_i + \delta_0 D70_i + \beta_2 S_i D70_i + u_i \tag{2}$$

where $D70_i$ is a dummy equal to one if the individual is born in 1970, thus belongs to the BCS survey. The objects of interests are thus estimated through a linear combination of estimates of the above specified regression parameters, as

$$\begin{aligned} E(teach_{70} - teach_{58}|S = 1) &= \delta_0 + \beta_2 \\ E(teach_{70} - teach_{58}|S = 0) &= \delta_0 \end{aligned} \tag{3}$$

The subsequent gender based analysis is performed adopting the same basic framework, but now adding a dummy gender variable F (equal to one if the individual is female). In this way it is possible to investigate over possible gender differences in the changes of the average probability of being a teacher conditionally on the ability endowment. The main object of interest is now

$$E[(teach_{70} - teach_{58}|F = 1) - (teach_{70} - teach_{58}|F = 0)|S] \tag{4}$$

and the following limited dependent variable regression model is adopted

$$teach_i = \gamma_0 + \gamma_1 S_i + \gamma_2 F_i + \gamma_3 S_i F_i + \lambda_0 D70_i + \gamma_4 S_i D70_i + \gamma_5 F_i D70_i + \gamma_6 S_i F_i D70_i + \nu_i \tag{5}$$

so that estimates of the parameters are linearly combined to get

$$\begin{aligned} E(teach_{70} - teach_{58}|S = 0, F = 0) &= \lambda_0 \\ E(teach_{70} - teach_{58}|S = 0, F = 1) &= \lambda_0 + \gamma_5 \\ E(teach_{70} - teach_{58}|S = 1, F = 0) &= \lambda_0 + \gamma_4 \\ E(teach_{70} - teach_{58}|S = 1, F = 1) &= \lambda_0 + \gamma_4 + \gamma_5 + \gamma_6 \end{aligned} \tag{6}$$

In the exploration of possible explanations, information about social background is included in the analysis, as it has been already discussed it is endogenous to ability test scores. Still following the above regression specification, a fully saturated model is adopted in order to re-estimate the DID objects of interest now conditionally on parents social class together with ability endowment and gender. This should help in the exploration of social mobility issues.

Similarly, DID are used in order to look at changes in the relative structure of teachers earnings with respect to non teachers in the sample. The idea is that of a cross-cohort comparison between average within-cohort differences between earnings of teachers and earnings of non teachers. In this way it is possible to capture significant cross-cohort differences and changes in the relative structure of teachers earnings with respect to non teachers ones. Being w hourly earnings, the DID object of interest is

$$E[(w|teach = 1) - (w|teach = 0)|D70 = 1] - E[(w|teach = 1) - (w|teach = 0)|D70 = 0] \tag{7}$$

which can be easily shown to be equal to

$$E[(w_{70} - w_{58}|teach = 1) - (w_{70} - w_{58}|teach = 0)] \tag{8}$$

and computable conditionally on S. The following multiple linear regression model is thus adopted

$$w_i = \theta_0+\theta_1 teach_i+\theta_2 S_i+\theta_3 S_i teach_i+\phi_0 D70_i+\theta_4 teach_i D70_i+\theta_5 S_i D70_i+\theta_6 S_i teach_i D70_i+\mu_i \tag{9}$$

so that estimates of the parameters are combined in order to get

$$\begin{aligned} E(w_{70} - w_{58}|teach = 0, S = 0) &= \phi_0 \\ E(w_{70} - w_{58}|teach = 1, S = 0) &= \phi_0 + \theta_4 \\ E(w_{70} - w_{58}|teach = 0, S = 1) &= \phi_0 + \theta_5 \\ E(w_{70} - w_{58}|teach = 1, S = 1) &= \phi_0 + \theta_4 + \theta_5 + \theta_6 \end{aligned} \tag{10}$$

Differences by gender and social background are investigated here too after adding a dummy gender variable as before and computing the above objects of interest conditionally on gender and parents' social class, too.

5 Teachers Quality Decline

Before starting with the discussion of estimation results, it is worth to have a look at Figure 1. It reports the distribution of abilities in the teachers cohort in both the 1958 and 1970 samples. As it can be immediately noticed, even if in both samples a peak in density is observed on the right side of the ability distribution, the 1970 line lies below the 1958 line on this side, meaning the density of teachers having a high ability score born in 1970 is lower than the density of high ability teachers born in 1958. The opposite holds on the left side of the ability distribution, with the 1970 line lying above the 1958 line. This means that a student who faces a teacher born in 1970 is more likely to face an individual coming from the left side of the ability distribution with respect to a student who faces a teacher born in 1958 (by the same token, the same student is less likely to face an individual coming from the right side of the ability distribution). This provides a preliminary evidence about

teachers quality decline.

Table 2 provides estimation results for the above specified limited dependent variable regression model, where the outcome is the *teach* dummy, equal to one if the individual declares to be a teacher at approximately 33 years old. The first column refers to the model in (2). Both the δ_0 and the β_2 coefficients turn out to be highly significant and equal respectively to 0.25 and -0.38. Following (3), this means that the average probability of being a teacher at approximately 33 years old for an individual having an ability score below the birth year sample median and born in 1970 turns out to be 0.25 percentage points higher with respect to an individual still having an ability score below the birth year sample median but born in 1958[2]. By the same token, the same probability for an individual having a test score above the birth year sample median born in 1970 turns out to be 0.13 percentage points lower with respect to peers born in 1958[3]. Evidence suggests teachers quality to have declined in our samples.

Findings refer to average probabilities of becoming a teacher. One could argue that results are driven by an increase in the aggregate demand of teachers over the period, so that less qualified candidate teachers born in 1970 went into the teaching profession as a response to the need of a higher number of teachers. If this is the case, significant changes in the density of teachers should be observed across the two samples. Evidence is against this hypothesis. Another possible objection to the previous findings relies on composition effects, as changes in the density of teachers per category could lead to changes in average quality, even if the total number of teaching professionals remained unchanged. Again, it is worth to look at changes in the density of teachers per category across the two samples. Evidence shows two teaching categories to have been interested by significant changes: the density of secondary school teachers and special needs teachers declined over the period. It is thus worth to re-estimate twice the model in (2) but now having as outcome

[2]Confidence Interval at the 95 per-cent level: (0.08;0.42).

[3]$E(teach_{70} - teach_{58}|S = 1) = \delta_0 + \beta_2 = -0.13$; Confidence Interval at the 95 per-cent level: (-0.22;-0.04).

a dummy equal to one if the individual became respectively a secondary school teacher and a special need teacher. Special needs teachers account for a marginal component of the teaching professionals cohort so results are not meaningful, while it is important to focus on secondary school teachers, as they represents between the 40 and the 50 per cent of the whole teachers cohort. In this case estimation results are consistent with previous general findings thus suggesting the idea of this category as the driving one for the effect found above.

The second column in Table 2 provides estimation results for the model in (5), where a gender dummy variable is added in order to look at gender differences conditionally on ability. We can notice the γ_4 coefficient to be negative and significant, consistently with results in column one. However, the λ_0, the γ_5 and the γ_6 coefficients are not significant. Following the proposed specification, this should lead us to reject the hypothesis of gender differences in teachers quality decline, as objects in (6) are not significantly different between genders. Figure 2 reports differences across birth year cohorts in the density of teachers over the whole ability score support, displayed separately per gender. This allows to go over the limitation the adoption of S as representative of the ability endowment gives to the analysis in this specific case. It can be noticed that (i) consistently with previous findings, differences in densities are positive on the left side of the ability support, while they are negative on the left side; (ii) differences are more negative for male teachers with respect to female teachers on the right side of the ability support, and this is in sharp contrast with US reported findings, which show the decline in density of teachers coming from top ability deciles to interest women more than men; (iii) differences are highly positive for women coming from the center-left side of the ability support with respect to their male peers.

If evidence of no gender differences in teachers quality decline is here bought, then the idea of women gender specific labor market changes as the main determinant of teachers quality decline should be abandoned. This is not completely true, as it could be that women labor market changes had the same effects on both gender

cohorts. As Figure 2 suggests, a more detailed analysis is needed.

The third and last column in Table 2 provides estimation results for a fully saturated model in which the limited dependent variable *teach* is regressed over S, F and a variable which conveys information about individual social background. The inclusion of this last variable is motivated by the fact that the ability measure here used throughout the analysis comes from tests to which cohort members were exposed when they were approximately 10 years old. Thus, social background is endogenous to ability scores and a measure of parents' social class should contain the relative information. The variable $fsocclass$ used in the model refers to father's (or male head) social class. It takes values from 1 to 6, following the social status classification proposed in both NCDS and BCS surveys, where 1 corresponds to the highest social class and 6 to the lowest one. The inclusion of social background in the model yields a critical change in results, as estimates of the coefficients of interest turn out to be no more significant. Estimates also change in value, meaning that the $fsocclass$ variable is able to partially capture the variability of S, thus confirming the evidence of social background being endogenous to the probability of getting an ability score above the median. If only the $fsocclass$ variable is used as regressor, estimates of the coefficients suggest a kind of replacement effect, with the density of teachers coming from lower social classes to have increased over the period at the expense of the density of teachers coming from higher social classes. However, these results cannot be taken as given. What should be done is to look at changes in the density of social backgrounds across the two samples, in order to disentangle changes in densities which interested the teachers cohort only from the ones which interested the overall sample. This DID exercise performed per each value of the parents' social class variable does not provide striking results, even if it shows the density of individuals coming from the highest social classes to have decreased more within the teachers cohort with respect to the overall sample, while the same quantity has increased if lower social classes are considered.

These last findings suggest social mobility issues to be in place within the set of

possible explanations of teachers quality decline. In order to understand to which extent we are addressing teachers cohort specific questions or instead general trends of the period, a cross-cohort analysis of distributions of earnings individuals across jobs should follow.

6 Earnings, Distribution Across Jobs and Social Mobility Issues

Evidence from the NCDS and BCS data is consistent with the hypothesis of teachers quality decline. The next step is to investigate over the possible explanations. First, out of non monetary and vocational determinants of the decision to undertake the teaching career, it is worth to look at the evolution of relative structures of earnings from teaching and non teaching professions. The idea is that of looking at earnings from teaching compared with earnings from non teaching professions within each birth year cohort, and then to compare results in order to address changes over the 12 years time here considered period. This can be also done conditionally on S, so that it is possible to look at how the attractiveness in monetary terms of the teaching career changed over the two samples within categories of ability.

Hourly net earnings data are used in the estimation of the multiple linear regression model in (9) and results are reported in Table 3. Apart from the ϕ_0 coefficient, positive as reasonably to expect, all other coefficients are not significant. Still reasoning in DID terms, following (10), this means that (i) earnings have evolved not significantly different between categories of ability as defined by S; (ii) earnings from the teaching profession have evolved not significantly different from earnings from other occupations. This should lead to abandon the idea of lower wages for teachers as an explanation of teachers quality decline, and this seems not to be true even conditionally on the ability endowment. However, results in these case have not to be taken as given. If average earnings have increased by an amount which is not

significantly different between categories, this does not mean that the relative earnings structure has remain unaltered, as the increase in percentage terms could be different between groups and ratios turn out to be changed. Data shows the average hourly net earnings of teachers to have increased by approximately 50 per cent, so as average earnings of non teachers. In this case it is possible to definitely conclude the relative earnings structure of teachers earnings with respect to non teachers to have remained unaltered, thus confirming the previous statements about lower wages of teachers as not being in place as a possible explanation of teachers quality decline. But, if the focus is on average earnings per categories of ability as defined by S, evidence suggests the gap to have reduced.

This last reasoning rise the need of a cross-cohort comparison of distributions of individuals across jobs conditionally on the ability endowment. The most intuitive way to have a general idea of changes in such distributions is to look at occupation codes. The SOC codes are numerical strings in the range (100;999) associated to each occupation following a ranking criteria which assigns lower numbers to occupations on the very left side of the earnings distribution, then progressively assigning higher numbers until the very right side is reached. Conditionally on S, even without looking at earnings, which should be depurated of inflation if considered in absolute terms, this characteristic of the SOC classification allows to have an intuitive interpretation of the average numerical string as representative of average earnings position. The average occupational code for individuals having an ability score below the sample median and born in 1958 is 583 while it is 511 for individuals born in 1970 and still having an ability score below the sample median. The same average is instead 416 for individuals born in 1958 with an ability score above the sample median, and it becomes 382 for individuals born in 1970 and still having an ability score above the sample median. This suggests individuals with low ability scores to have gained more positions in the earnings scale with respect to individuals with high ability score, and it is consistent with hourly net earnings data. Average hourly net earnings of individuals having an ability score below the sample median

increased from 4.64 to 9.86 £[4], while the same quantity for individuals having an ability score above the median increased from 6.65 to 11.76 £[5]. The ratio between average hourly net earnings of individuals with ability score below and above the median is thus increased, meaning the gap has reduced.

These last results suggest the teaching profession to have been interested by the same changes in the ability distribution which interested all professions on the right side of the earnings distribution. Following the here proposed specification, evidence of quality decline is observed among managers, engineers, etc. and, being social background endogenous to ability scores, this rises social mobility issues.

What would be required here is an investigation over how the average probability of getting a high ability score changed over the period conditionally on social background and gender. This would have been simple if absolute test score scales were the same in both samples, but, unfortunately, this is not the case. However, as for the teachers cohort in the previous section, it is possible to look at densities of social backgrounds across the two samples in order to disentangle changes in densities which interested the sub-group of those who got an ability score above the cohort median from changes which interested the overall sample. Results show the density of those coming from lowest social classes to have decreased less within those who got an ability score above the cohort median with respect to the overall sample, but differences vanish if higher social classes are progressively considered.

7 Conclusions

Results from the analysis show the probability of becoming a teacher to have increased over the period for individuals with lower ability scores, while the same probability has decreased for individuals with high ability scores. Additionally, given the regression model specification here used, results are not significantly dif-

[4]Confidence Intervals at 95 per-cent level are (4.23;5.04) and (8.27;11.44) respectively.
[5]Confidence Intervals at 95 per-cent level are (5.64;7.67) and (10.69;12.83) respectively.

ferent across genders. Evidence shows changes in the relative structure of teachers earnings with respect to non teachers ones to have been not significant in the period, so that explanations related with changes in the attractiveness of the teaching career in monetary terms should not be in place.

The analysis has shown individuals with lower ability scores to have been interested by a higher increase in average earnings over the period with respect to individuals with high scores, and, given the position of teachers earnings in the overall earnings distribution, this suggests the teaching profession to have been interested by the same changes in the ability distribution which interested professions on the same side of the earnings distribution.

Findings follow the adoption of an ability measure which should account for mathematical reasoning capabilities. Given the characteristics of tests exposure, individual high school and university educational paths are exogenous to ability scores, but social background is endogenous. Thus, what turns out to be crucial in the exploration of possible explanations is the analysis of changes in the relationships between social background, ability score and gender over the period. Further questions arise related to the efficiency of the education system in filling in ability gaps of pupils which follow heterogeneity in social backgrounds, how this affects the functioning of education as a signaling mechanism for ability, and, finally, the impact on social mobility.

References

[1] Angrist, Joshua D. and Pischke, S., *Mostly Harmless Econometrics: An Empiricist's Companion.* Princeton University Press, 2009.

[2] Bacolod, Marigee P., *Do Alternative Opportunities Matter? The Role of Female Labor Markets in the Decline of Teacher Supply and Teacher Quality 1940-1990.* The Review of Economics and Statistics, Vol. 89, issue 4, pp. 737-751, 2007.

[3] Ballou, Dale and Podgursky, M., *Teacher Pay and Teacher Quality.* Kalamazoo, Michigan: W.E. Upjohn Institute for Employment Research, 1997.

[4] Corcoran, Sean P. , Evans, W. N. and Schwab, R. M., *Changing Labor-Market Opportunities for Women and the Quality of Teachers, 1957-2000.* The American Economic Review, Vol. 94, No. 2, pp. 230-235, 1994.

[5] Chevalier, Arnaud, Dolton, P. J. and McIntosh, S., *Recruiting and Retaining Teacers in the UK: An Analysis of Graduate Occupation Choice from the 1960s to the 1990s.* Centre for the Economics of Education, London School of Economics, Mimeo, 2001.

[6] Dolton, Peter J., *The Economics of UK Teacher Supply: The Graduate's Decision.* Economic Journal, No. 100, pp. 91-104, 1990.

[7] Dolton, Peter J. and Chevalier, A., *The Labour Market for Teachers.* Working Papers 200411, School Of Economics, University College Dublin, 2004.

[8] Dolton, Peter J. and Makepeace, G., *Female Labour Force Participation and the Choice of Occupation: The Supply of Teachers.* European Economic Review, No. 37, pp. 1393-1411, 1993.

[9] Dolton, Peter J. and Mavromaras, K. G., *Intergenerational Occupation Choice Comparisons: The Case of Teachers in the UK.* Economic Journal, No. 104, pp. 841-863, 1994.

[10] Eide, Eric R., *The Teacher Labour Market and Teacher Quality.* Oxford Review of Economic Policy, No. 20, pp. 230-244, 2004.

[11] Gilpin, Gregory and Kaganovich, M., *The Quantity and Quality of Teachers: A Dynamic Trade-off.* CESifo Working Paper 2516, CESifo GmbH, 2009.

[12] Grönqvist, Erik and Vlachos, J., *One Size Fits All? The Effects of Teacher Cognitive and Non-cognitive Abilities on Student.* Working Paper Series 779, Research Institute of Industrial Economics, 2008.

[13] Hanushek, Eric A. , Kain, J. F., O'Brien, D. M. and Rivkin, S. G., *The Market for Teacher Quality.* NBER Working Papers 11154, National Bureau of Economic Research, Inc., 2005.

[14] Hanushek, Eric A. , Kain, J. F. and Rivkin, S. G., *Do Higher Salaries Buy Better Teachers?* NBER Working Papers 7082, National Bureau of Economic Research, Inc., 1999.

[15] Hanushek, Eric A. and Pace, R. R., *Who chooses to teach (and why)?* Economics of Education Review, Elsevier, Vol. 14(2), pp. 101-117, 1995.

[16] Lakdawalla, Darius, *The Economics of Teacher Quality.* Journal of Law and Economics, No. 49, pp. 285-329, 2006.

[17] Leigh, Andrew K. and Ryan, C. A., *How and Why has Teacher Quality Changed in Australia?* CEPR Discussion Papers 534, Centre for Economic Policy Research, Research School of Social Sciences, Australian National University, 2006.

[18] Manski, Charles F., *Academic Ability, Earnings, and the Decision to Become a Teacher: Evidence From the National Longitudinal Study of the High School Class of 1972.* NBER Working Papers 1539, National Bureau of Economic Research, Inc., 1985.

[19] Temin, Peter, *Teacher Quality and the Future of America.* NBER Working Papers 8898, National Bureau of Economic Research, Inc., 2002.

[20] Wikipedia, *Education in the United Kingdom.* http://en.wikipedia.org, as of May, 4, 2009, 12:15 GMT.

[21] Wooldridge, Jeffrey M., *Econometric Analysis of Cross Section and Panel Data.* MIT Press, 2002.

[22] Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach.* 3rd edition, Thompson South-Western, 2006.

[23] Zabalsa, Antoni, Turnbull, P. and Williams, G., *The Economics of Teacher Supply.* Cambridge University Press, 1979.

Tables and Figures

Table 1

Categories	**Average Ability Score**
Biological Scientists and Biochemists	80.07
Actuaries, Economists and Statisticians	85.50
Computer Analysts and Programers	79.19
Waiters and Waitresses	32.27
Farm Workers	37.44
Coal Mine Labourers	33.77

Table 2

	(1)	(2)	(3)
S	0.845*** (0.068)	0.834*** (0.122)	0.586** (0.234)
F		0.365*** (0.136)	0.453** (0.211)
$fsocclass$			-0.163*** (0.061)
$S * F$		0.037 (0.148)	0.036 (0.157)
$F * fsocclass$			-0.03 (0.045)
$S * fsocclass$			0.033 (0.058)
$D70$	0.249*** (0.087)	0.199 (0.16)	-0.102 (0.364)
$S * D70$	-0.38*** (0.1)	-0.369** (0.179)	-0.478 (0.356)
$F * D70$		-0.078 (0.193)	0.352 (0.329)
$fsocclass * D70$			0.068 (0.094)
$S * F * D70$		0.012 (0.217)	0.042 (0.235)
$F * fsocclass * D70$			-0.095 (0.076)
$S * fsocclass * D70$			0.062 (0.09)
observations	15430	15430	13363
pseudo R^2	0.0555	0.0790	0.0937

Table 3

	(1)
$teach$	2.996 (5.315)
S	2.055*** (0.707)
$S * teach$	-3.073 (5.634)
$D70$	5.143*** (0.801)
$teach * D70$	2.662 (7.133)
$S * D70$	-0.095 (1.094)
$S * teach * D70$	-1.966 (7.797)
observations	12443
R^2	0.0086

Figure 1

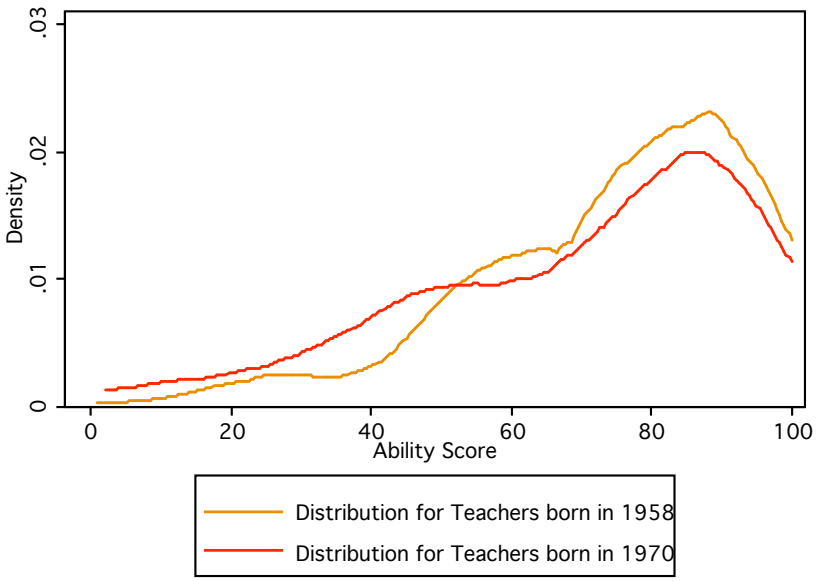

Figure 2