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The Labour Market for Teachers

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2.1 Introduction

In January 2003, there were 438,800 full time equivalent teachers in employment in the public sector in England. The labour market for teachers is worthy of attention not only by its size but also because of its effect on children's human capital acquisition and ultimately voter satisfaction. The teacher market, like some other public sector occupations, such as health professional, is peculiar since the State has both monopoly power in the provision of credentials and nearly monopsony power in the recruitment of teachers¹. Other characteristics of the teacher market affecting its equilibrium are that teaching is a highly unionised occupation where salaries are settled on a nationally agreed pay scale. Additionally, teaching is mostly a female occupation, which adds some further difficulties to the modelling of teacher's supply.

The market for teachers functions like any other labour markets, with schools acting as employers of teachers. Over the past 50 years, the UK has experienced recurrent crises in the recruitment and especially the retention of teachers. In 2002, the Department for Education and Skills reported that annual turnover and wastage of teachers for teachers had reached 16.5% and 9% respectively. Indeed, whilst the demand for teachers can be reasonably forecast, as summarised in Section 2, the problem of providing a steady flow of able recruits into teaching has bedevilled successive governments. In Section 3, we present the market trends over the period. Teacher shortages have been cyclical and a regular occurrence, and have invariably been accompanied by the low relative wages of teachers. Furthermore, while

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¹ The independent school sector constitutes only around 7% of the education system in the UK.

the national market for teachers appear in equilibrium, shortages may be sharp in particular subjects, such as maths, or in specific geographical locations like Inner London, where the 'outside option' in terms of an alternative career has been best.

In England, a teaching qualification can be obtained after a 4-year university degree in Education or after a 1-year post-graduate qualification following a university degree in any subject. Thus, teaching is competing with all other professional occupations open to graduates. Taking into account the changes in the graduate labour market and striking the right balance of relative teacher salaries, so as to provide the right number of willing and able recruits, remains problematic. Furthermore, managing the need for reform in education, in terms of national curriculum and methods of assessment, as well as improving the standards of teaching in schools, also impacts on teacher recruitment and retention and adds to the complexity of the task. The supply of teachers is more precisely defined in Section 4. While most of the attention has focused on the quantity of teachers, the issue of their quality is also crucial (see Chapter 2B). We thus discuss, the effectiveness of policies designed to increase teacher quality.

There have been many changes in the teaching profession over this period. In 1965, the Burnham Committee was set up to oversee arbitration procedures for pay and conditions negotiations. By 1991 this committee was replaced with the School Teachers Pay Review Body, which acts as an advisory committee to impose teacher's pay and conditions. In 1994 the Education Act established the Teacher Training Agency (TTA), which acts as the funding agency and oversees teacher training and recruitment. In 1998 the General Teacher Council (GTC) was established to monitor teacher qualification and registration. Most recently, in 2000 a system of performance related pay (PRP) for teachers was introduced as part of the Pay Performance and Management Reforms. The stated aim of this measure was to recruit, and retain, highly motivated skilled professionals into the teaching profession, allowing good performance to be rewarded and the best teachers to progress faster.

In this Chapter, we review our knowledge of the mechanisms affecting the teacher's market in England and assess the likely impact of the most recent reforms. The range of policies introduced by the Labour government, which came to power in 1997, have included many innovative but difficult reforms, which all have an impact on teacher supply. However the assessment of how they will affect this supply is uncertain. These reforms have affected the various component of the teacher supply from the training of teachers, to facilitating the returns of previous teachers. They include the waiving of training fees, provision of training salaries, the payment of Golden Hellos for new recruits, the new management and pay

reforms (including performance related pay (PRP)) for teachers, the more extensive use of classroom assistants, the reduction of teacher's hours of work and the provision of cheap accommodation in inner city acute shortage areas. Many of these policies may have a marked effect on the supply of teachers but there is little understanding of exactly what these effects might be. Within this context it is important for the government to know exactly how teacher recruitment and retention are influenced by labour market conditions and what role relative teacher pay has in determining supply and retention.

The main economic policy questions of interest in this Chapter are:

1) What policies would most effectively address the problems of recruitment and retention of teachers? The teacher market does not function in a vacuum. While the government has little possibility to influence specific labour markets, the state of the labour market in general and the relative positions of teachers compared to other qualified individuals is of crucial importance in determining the supply of teachers at all stages from training to the retention of experienced teachers. The effect of relative pay on the supply of teachers is documented in Section 5.

2) Teaching is predominantly a female occupation; the current ratio is 60/40, but this aggregate figure disguises a greater imbalance in primary schools. The feminisation of the occupation leads to further difficulties in modelling teacher supply, since it is to be expected that these women will at some points interrupt their career for childbearing reasons. What is the effectiveness of policies aiming at facilitating the return to this potential supply of trained teachers? In Section 6, we review some of the evidence concerning the supply of female teachers.

3) Evidence on the effect of the relative earning positions on the supply of teachers directly leads to questions on how to reward teachers effectively without wasting taxpayers' money. Whilst teachers unions stay attached to the principle of a National pay scale, various schemes provide some flexibility. The most controversial was the introduction of Performance Related Pay for teachers in 2000. The discussion on how to reward teachers is presented in Section 7.

4) While so far we have treated the market for teachers as a single market, it is in fact composed of a multitude of micro-market at the regional level but also by specific subject and grade. Acknowledging these differences creates further difficulties, especially with the constraint of a national pay scale. Some evidences on how to address shortages in specific subjects or geographical area are discussed in Section 8.

5) Finally, while most of the discussion and policies have been concerned with the wages of teachers, job characteristics are cited by most teachers as the main reason to quit or to think of quitting. This phenomenon is not specific to the UK but is particularly acute in this country, especially for younger teachers. We assess the relative impact of non-pecuniary conditions on recruitment and retention in Section 9.

2.2. The Demand for Teachers in the UK

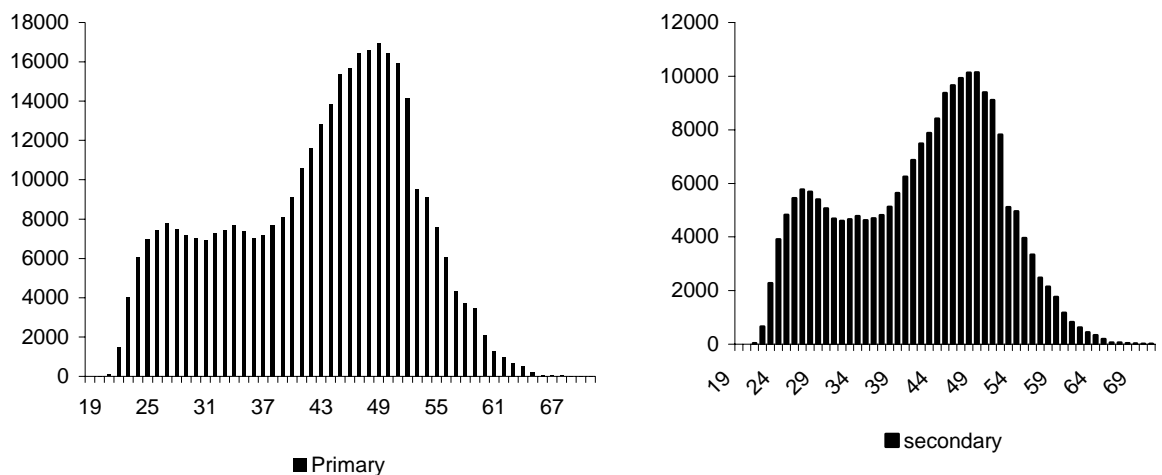
While most of the chapter is concerned with factors influencing the supply of teachers, we could not omit describing the determinants of the demand for teachers. Demand is less of a policy matter since the government has actually little leverage on the determinants of teacher's demand.

The first key element in the demand for teachers is the demographic pattern of school pupil numbers. To simplify, we consider that all pupils are educated in the public sector. The total number of primary and secondary pupils in UK schools from 1946 to 2000 has varied widely in a cyclical way from a low around 3.5 millions pupils in 1947 and 1985 to a high of nearly 5 millions in the mid-seventies. These trends were carried over to secondary schools causing a peak in the number of secondary school pupils in 1979. Additionally, the beginning of the period shows a large increase in secondary school attainment as compulsory school leaving age was raised from 14 to 15 (1947) and 16 (1973); the number of pupils growing from 1.1 millions in 1946 to 3 millions by 1972. The cyclical nature in the numbers of pupils has caused problems in the planning of the appropriate number of teacher places and their balance between primary and secondary specialisms. Indeed the dramatic changes in the school population can be seen by contrasting the position in 1960 with that in 1983. In 1960 there were 1.5 million more primary school children than secondary school children. By 1983 there were approximately the same number of children in secondary schools as there were in primary schools.

Since the trends in birth rate are largely outside the control of the government there is an important element of the demand for teachers, which is problematic. To a large degree, the government should be able to anticipate these changes; for the next 10 years, the demographic trends are almost flat with the number of pupils expected to stay close to its current level. However it may be more difficult to predict the geographical variation and plan, for example, for the appropriate reallocation of primary to secondary teachers as a cohort grows older.

The second demographic trend affecting the demand for teachers relates to the age distribution of teachers. Figure 1 reports the age distribution for primary and secondary teachers in 2000. The official retirement age is 65, but teachers can claim early retirement as early as 55. A drop in the distribution of teachers is observed at 55 and only a marginal number of teachers remain after they reach 60. England is characterised by an ageing teaching population, especially in primary education. The population aged 45 to 55 represents 40% of all the teachers, and the above 55 another 6%. Within the next 10 years, nearly 50% of the current teachers will have retired. Since, the number of pupils is not forecast to decrease sensibly, at the current level of recruitment into teaching a large shortage of teacher is predictable in the medium run. The government has a little leverage on this demand factor, by reforming pension rights for example. A change in the pension scheme in 1997 for example made it less financially advantageous for teachers to claim early retirement and lead to a 4 folds reduction in the proportion of teachers retiring before 60 (Eurydice, 2002). Similarly, incentives for teachers to remain past retirement age could be introduced to reduce the predicted shortage.

Figure 1: Age distribution of teachers in primary and secondary teachers, in 2000



Source: Database on Teacher Record (England)

Another demand factor which is largely determined by outside forces is the changing balance of the secondary school curriculum towards technology and computing which has naturally led to an increased need for teachers of these subjects.

Nevertheless, some of the main determinants of the demand for teachers are politically manipulable: mainly overall education expenditures and pupil-teacher ratio. A government

decides the overall level of public expenditure on education and determines nationally agreed scales for teachers' salaries as well as sets desirable targets for pupil-teacher ratios. However, since these instruments under the control of the government are often determined separately and subjected to different external pressures, it is possible that they are incompatible.

Several additional features add further complications to the demand for teachers. Firstly, the financial administration of education at a local level is performed by Local Education Authorities who have some degree of autonomy in their affairs. This means that although central government sets overall spending limits and determines teachers' salaries it does not have day-to-day control over how many teachers a local authority may employ. Furthermore, schools may be financially autonomous with devolved budgets (Education Reform Act 1988), hence it is at the level of the individual school where decisions about teacher recruitment are taken, based on the actual (or predicted) income from school rolls. Finally, it is the case that the determination of desired pupil-teacher ratios are influenced by educational criteria and salaries negotiated with trade unions. Therefore it is not surprising that the setting of salary scales, and attempts to meet target pupil-teacher ratios could be incompatible with the constraints of government spending limits. In these circumstances it is not surprising that a school's capital budget for buildings and equipment may therefore have to be cut, to 'balance the books'. This also gives rise to the huge variation in pupil-teacher ratios and per pupil funding across different regions of the country (see Chapter 2B) and compounds the difficulties with the assessment of the aggregate demand for teachers.

2.3 The Overall Market Position for Teachers 1946-2000.

Before describing the supply of teachers in the UK and its determinants, it is worth having a broad look at the teacher's market in the post war period. Not surprisingly, given all the complicating factors determining supply and demand, the calculation of the exact extent of the shortage (or surplus) of teachers is problematic. The government's own estimates of current shortages are sometimes based on the numbers of existing vacancies and are often inconsistent with figures relating to the shortfall of demand over supply based on using desired pupil teacher ratios and their own published pupil numbers². Figures based on vacancies also hide the use of non-qualified teachers; in 2002, 27,000 teachers, or 6% of the work force did not have Qualified Teacher Status (QTS). The use of non-qualified teachers

has increased by 50% in the last 6 years and has been facilitated so that overseas trained teachers for example can be hired for up to 4 years without QTS. In fact, out of the extra 24,000 teachers in the classroom since 1997, 13,000 are due to the increasingly reliance of non-qualified teachers.

Thus, we favour the second approach and calculate the demand for teachers using official desired pupil teacher ratios. Notwithstanding all the complexities described above we wish to quantify the aggregate demand for teachers in the UK annually. This we do by taking desired pupil-teacher targets, as published by the government, and multiplying them by actual pupil numbers; the full computational details for the calculation of this annual demand are provided by Bee and Dolton (1995). The supply of teachers is taken from the government's own data on the number of teachers in service. Following, this simple procedure, our own best estimates of the shortage suggests that in 2000 there was a national aggregate shortage of some 34,000 teachers³.

² For example, the official vacancy rate for teachers in the maintained sector was 1.3% in 2002, or about a shortage of 5,000 teachers.

³ Our figure of 34,000 and similar figures for earlier years are depicted in Figure 2. These trends were calculated using DfES released data relating to pupil numbers, desired pupil-teacher ratios and the number of teachers in work. Explicitly the demand for teachers is calculated by taking the number of pupils and dividing by the Government's published desired pupil teacher ratio. For example, in 2000, there were 4,278,123 primary school children (full-time equivalents). The Government target is that there would be 21.2 primary school children for every primary school teacher, implying that 210,798 primary school teachers are demanded. In 2000, there were in fact 183,762 primary school teachers, implying an excess demand for primary school teachers of 18,036. A similar analysis for secondary school teachers reveals that there was an excess demand of 15,952 teachers, giving the overall excess demand figure of approximately 34,000, as quoted above.

Figure 2: Excess Demand for Teachers: 1946-2001

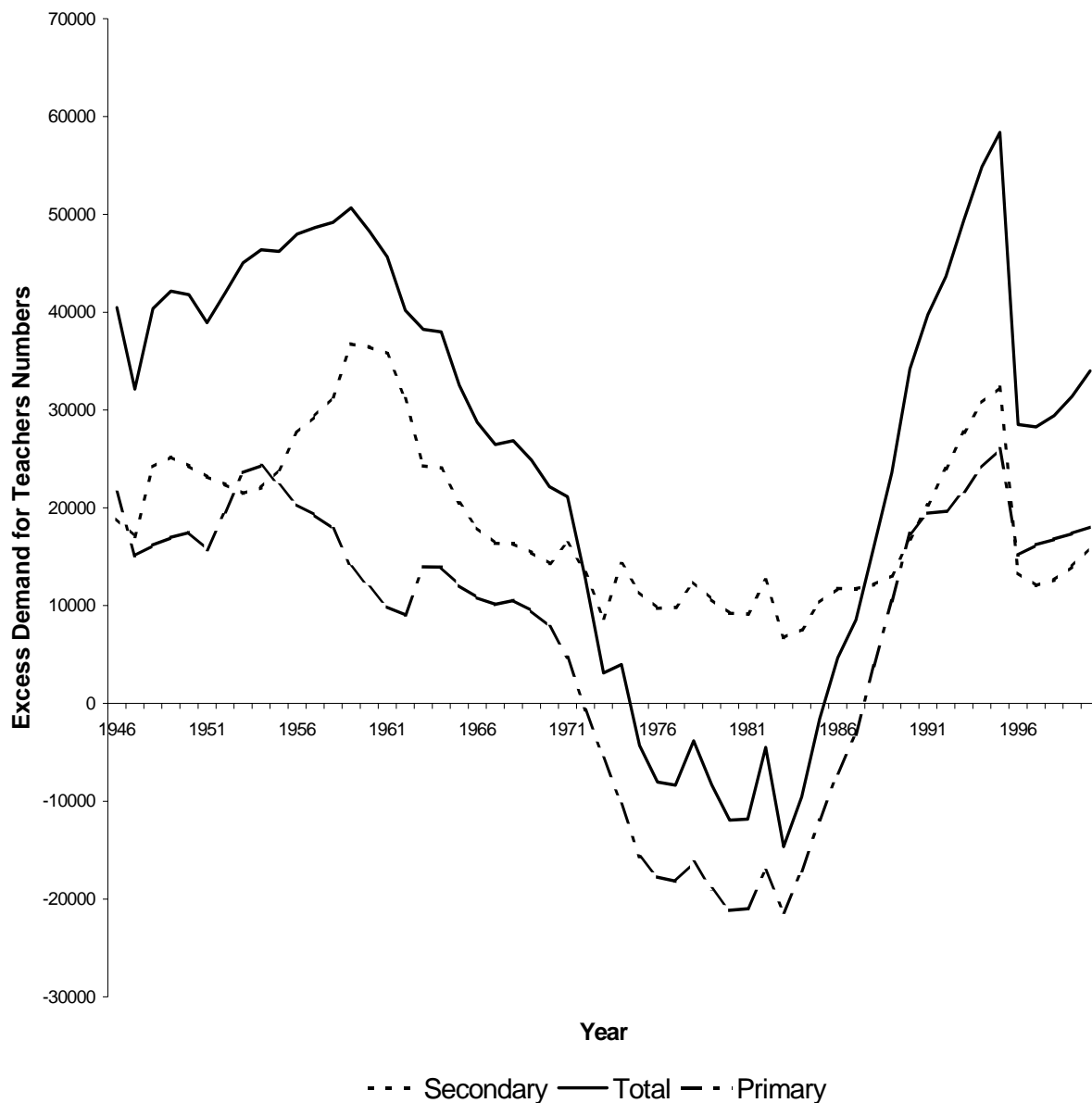


Figure 2 reveals the situation on the teacher's labour market for all years since 1946. The graph shows that there has been an excess demand for teachers almost continuously throughout this period. This has principally been for secondary school teachers, although the difference in the excess demand for primary and secondary school teachers disappeared towards the end of the 1990s. The Seventies are the only period where an excess supply of teachers was apparent. It can be noted that demand for teachers can change sharply from one year to the next. This is not due to demographic change, but to modification of the official desired pupil teacher ratio. The shortage of teachers in the UK appears to be a permanent feature; the remaining of the discussion is based on the description of the supply for teachers, its determinants and policies to increase it.

2.4. The Teacher Supply Situation in the UK

A] Quantity

All teachers in the UK must be qualified. Qualification is obtained after a 4 years degree (or 3+1) and a year spent in the classroom. Additionally, newly qualified teachers must register with the General Teaching Council (GTC) as a pre-requirement to work in the maintained sector and gained Qualified Teacher Status. A factor that may affect the decision to become a teacher is the recent expansion in the tasks conducted by teachers, from IT, to management but also management of the pupils. Ultimately the government has some control over the stock of teachers since it can determine how many places are provided on courses at universities to train teachers⁴. This however does not explain why people take up these places. Clearly there are many factors operating on the choice of whether to become a teacher or not. Teacher training courses are not always filled up, and attendance varies by subject. In the mid Nineties, there were 20% less students than targeted in Initial Teacher Training courses for secondary teachers, this shortage has fallen to 6% more recently; the shortage being the highest in Mathematics, Foreign Languages and Geography with shortfalls between 20% and 30% in 2000/01. Furthermore, some trainees drop out and others decide not to become teachers. Smithers and Robinson (2003) show that for 100 registered trainees, 88 pass the final examination, and 59 were teaching a year after. After 3 years, 53 of the original trainees were still in the classroom. Measures to increase the retention of trainees and new teachers have therefore been on the forefront of the agenda. The most prominent measures are repayment of student loans for up to 10 years and a hardship allowance for students in shortage subjects committing to become teachers, bursary for PGCE, golden hellos of £4,000 for new teachers in shortage subjects.

The flow of newly qualified teachers is not informative on the supply of teachers at a given point in time, defined by Zabalza *et al* (1979) as the total number of people serving as a teacher. This concept of supply may be justified by arguing that these are the number of people who present themselves for work in teaching at the agreed wage. However what such a definition ignores are all those individuals who are available for (and are seeking) work in teaching, but do not get a job⁵. These 'would-be' teachers therefore constitute potential available supply. However it is very difficult to gauge and measure their number.

Working with the above definition we can calculate supply as consisting of those entering the profession and those remaining in teaching from the previous year. The entrants

⁴ For example, it is clear that part of the reason for the increase in the supply of teachers after 1963 was the rise in the number of places on training courses.

⁵ See Dolton *et al.* (2003b) for a description of the various flows in and out of teacher supply.

may be further subdivided into those leaving teacher training courses, those completing the one-year postgraduate teaching certificate (PCGE) and re-entrants (who are ex-teachers returning to the job). Dolton et al. (2003b) reports that in 2000, 18,000 new entrants and 6,000 re-entrants joined the teacher workforce.

The difficulty is not only to recruit teachers but also to keep them in the classroom. Nearly one in two person registering on the initial teacher training course is not observed teaching within three years of finishing the course. This wastage adds to the costs of providing teacher training but also negatively affects child's performance (Dolton and Newson, 2003).

Factors, which are important in the overall supply of teachers are the relative earnings on offer in teaching and other careers, the relative growth in earnings prospects, the other labour market opportunities (ie relative unemployment in other careers) and the changing non-pecuniary conditions of work, the latter being an important determinant of the decision to exit teaching and the status of teachers in society. The effect of these factors on supply is discussed in details below.

B] Quality

Whilst, the quantity of teachers is easily observed, their quality is much more problematic. One of the most important, recurring debates in education is whether teacher quality is high enough, how it can be measured and if it matters at all. Assuming quality can be measured, the remaining puzzle is to ensure that teachers of good quality are recruited.

The issue of quality of teacher is notoriously difficult to assess and has been approximated by various measures of pupils' performance, or teacher's characteristics; these measures may lead to different assessment of the quality of a given teacher. Economists have taken an agnostic view on the determinants of teacher's quality and have mostly focused on test score improvement as a measure of an individual teacher's quality. The idea is that if the pupils from a given teacher always improve more than pupils of similar initial ability, then this teacher must have some idiosyncratic characteristics associated with quality of teaching. For example, Hanushek et al. (1998), following three cohorts of Texan pupils, find that variations in the average teacher quality within schools accounts for at least 7.5% of the variations in test score gains. While variation in test score between teachers is stable over time (Aaronson et al. 2002), suggesting that it truly captures idiosyncratic teacher's quality, only 10% of it is explained by observable characteristics such as qualification or experience (after the first 2 years).

It is unclear whether teachers with better personal academic records or qualifications are necessarily better teachers, but one may be concerned about recruiting teachers from the lower end of the ability distribution. There is some evidence in the UK (Chevalier et al (2001) or Nickell and Quintini (2002)) as in the US (Corcoran et al., (2003) or Lakdawalla (2001)), that current teachers are being drawn from a lower percentile in the educational achievement or ability distribution. For example, the likelihood that a female from the top decile of the SAT distribution become a teacher fell from 20% to less than 4% between 1964 and 1992 (Corcoran et al.). Lakdawalla (2001) argues that this decline in relative quality is caused by skill-biased technical change. Education is unique in its lack of technical progress, thus, as the price of skills rises in other sectors, more skilled workers leave education. Additionally, the skills expected of teachers have expanded with the creation of the quasi market for schools. The decentralisation of decision has increased the importance of managerial skills. In the class room, teachers are also Furthermore, women who still account for the bulk of the profession have seen an expansion of their career opportunities outside teaching over the period.

The issue of how one might recruit better/'smarter' teachers has been raised in the US literature. Ballou and Podgursky (1997) and Hanushek et al. (1999) rely on state or counties variations in relative pay and find no effect on test scores, whilst Figlio (1997) accounting for school and district characteristics concludes that district offering higher starting salaries recruit teachers from more selective institutions: a 1% increase in teachers' salary, increases the probability of recruiting a teacher from a selective institutions by 1.58 percentage point. Manski (1987) also finds using the National Longitudinal Survey of Youth that a 10% increase in teacher earning coupled with an threshold on SAT scores, would maintain the current supply of graduates choosing to become teacher but from a higher part of the SAT distribution. Attracting more able students to teaching is not the only difficulty. Since, individuals with higher ability commands higher wages, high ability teachers are at a higher risk of leaving the profession than less gifted teachers (Strinebrickner, 2001). To prevent these negative effects, the fast track program aims to recruit and retain the most able graduates by shortening the pay scale while providing them with extra training and supervision.

Recent UK political administrations would claim that they have tackled the problem of teacher's quality by increasing the provision of more in-service and other training days. Although this may improve the competence of the existing stock of teachers – it does nothing to draw in higher ability individuals into the profession. In fact, Ballou and Podgursky (1997)

suggest that increasing the credential required of teachers may have a negative effect on the quality of the pool of applicants, by increasing the cost of becoming a teacher. These barriers to entry while increasing pay have had no effect on the observed quality of recruited teachers in the US (Angrist and Guryan, 2003).

2.5 Pay and labour market conditions

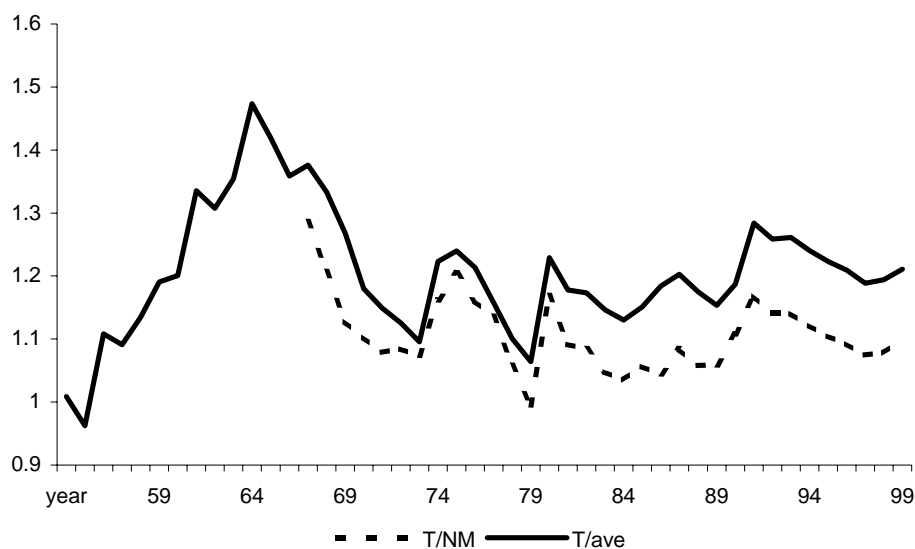
The main element in the strategy to increase recruitment and retention has been through financial incentives. Pay is determined nationally after a bargaining process under the supervision of the Teacher Pay Review Body. From 2003, the pay scale increases linearly through 6 points from £18,000 to £26,000. Teachers, subject to satisfactory performance judged by their head of school, can expect to receive a yearly increment. Hence, the maximum pay can be reached within 6 years of gaining Qualified Teacher Status. Conditional on accepting extra duties or satisfying quality criteria, teacher wages can subsequently increase up to £47,500 for Advanced Skills Teachers or £88,000 for Head of Schools.

The position relating to the earnings of teachers in the UK is not clear. Looking at real wages for teachers two periods can be distinguished. In both periods the evolution follows sharp picks followed by periods of decline. However, whilst from the mid Sixties until the mid-Eighties, the trend was mostly downwards, the situation has changed dramatically in the last 15 years. For example, a female teacher starting salary would have been £14,300 in 1986 (in 2003 pounds) compared to £18,000 nowadays, similarly the earnings of a teacher in her early thirties have increased from £20,800 to £26,000 over the same period⁶.

Looking at relative wage, however, provides another picture of the evolution of teachers' wages. The trend in the average real earnings of teachers disguises an important factor in teachers' pay: namely what induces an individual graduate to enter teaching is not pay in teaching but relative pay when comparing earnings in teaching with potential 'foregone' earnings associated with an alternative career. A perspective on this issue is revealed by calculating the relative earnings of teachers compared with average non-manual earnings. Since average non-manual earnings represent a reasonable proxy for an index of the opportunity cost of becoming a teacher, it is a valid exercise to compute this trend in relative pay over the 1948-2000 period.

⁶ The average earnings of male teachers follow a similar pattern. Relatively speaking, compared to other occupations, the level of pay discrimination in teaching by gender is low, particularly in starting wages. This is

Figure 3: Relative Teachers' Wages- 1955-2000



The decline of relative earnings of teachers is graphed in Figure 3⁷. Since 1992 teacher's pay has fallen by 6% relative to average non-manual earnings (although the decline had 'bottomed out' by the late 1990s). Examination of the trend in Figure 3 reveals that the pattern of teacher pay exhibits a cyclical repetitive pattern, namely a period of sustained decline, followed by a dramatic increase, usually as a result of a major report which investigates the crisis in teacher supply. Figure 3 clearly shows the process of 'catch-up' following a decline in relative earnings, the most notable example being the average pay rise of 29% following the Houghton report in 1974. This was followed by 4-5 years of decline in real teachers pay before the Clegg Commission award of 1980 to restore 1974 relativities with a '9% plus £6 on account' pay award. Comparing teachers' earnings to those of other public servants, teachers' pay has also declined by 11% relative to the earnings of policeman since 1981 and by 25% relative to nurses since 1973. Hence it is no surprise that recruitment into teaching is at a low ebb and the A level scores of intending teachers are falling.

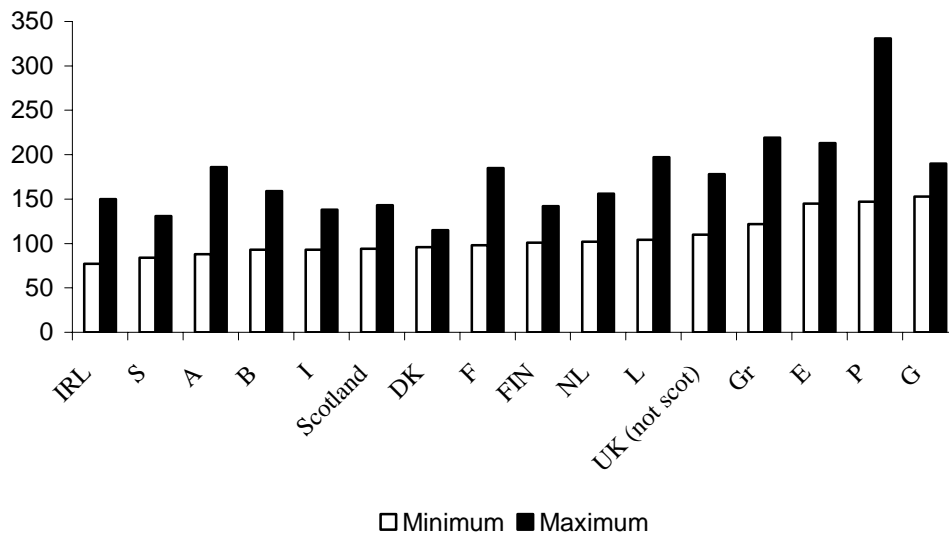
true in the sense that after controlling for measured characteristic differences there is very little 'unjustified' differences in wage treatment.

⁷ Data on earnings are available from two sources, the October survey of earnings and, since 1968, the New Earnings Survey (NES). With respect to average earnings of all employees, the two surveys give similar estimates over the period that they are both in existence, and so the reported average earnings is a simple average of the two estimates. For specifically non-manual earnings, the DfES's *Labour Market Trends* (formerly the *Employment Gazette*) reports an index based upon the October Survey until 1970, and from then onwards, the NES. However, the resulting estimate is considerably above the estimate of non-manual earnings supplied by the NES, thus, we only display teachers' earnings relative to the non-manual average from 1968 onwards using the NES.

Undoubtedly it is relative earnings, which have the biggest influence on the aggregate level of potential teacher supply. In practice the position with respect to relative wages is complicated further by the relative structure of earnings in teaching and alternative occupations.

Relative teachers' pay in England and Wales compares reasonably well with other European countries, especially at entry level. The pay structure is also characterised by a shorter scale (down to 6 points) so career progression is rapid. The maximum pay reported in Figure 4, does not include performance related pay, that teacher at the maximum of the pay scale can apply for, nor any allowance for additional duties, and thus does not truly reflect the maximum expected earnings of a senior teacher. It is also difficult to find comparable figures on the status of the teacher's market in European countries, thus we do not relate the relative wages to teachers' shortage in Europe. Additionally, the differences in regulation across European countries would make such a comparison uninformative.

Figure 4: Maximum and Minimum teacher pay in Europe, as proportion of per capita GDP, 2000/01



Source: Eurydice (2003)

Notwithstanding the complexity of the econometric model, which would ideally describe the working of the market for teachers, and the associated specification and potential bias problems, it is possible to discern quite clear evidence of economic forces operating in the market. Such evidence has, in turn, important consequences for government policy initiatives, which may endeavour to manipulate the outcome in the market. Various overviews of the teacher labour market (see Court et al (1995) and Smithers and Robinson (2000) have accorded differing status to the importance of labour market conditions to the problems of shortages and recruitment. However some synthesis is possible.

A perspective on the decision to enter the teaching profession is most appropriately provided by the analysis of cross section data on individuals (recording career decisions, pay, educational achievements and other socio-demographic characteristics). The data used in such studies permit the examination of the potential supply of teachers by the analysis of the individual decisions that 'would-be' teachers make along with those graduates who choose an alternative career. Hence the model to be estimated can be firmly grounded in the theory of occupational choice. In this model the expected utility of career alternatives are evaluated before a job choice is made⁸. Most commonly, researchers estimate a (reduced form) earnings equation made possible by the observation of individual earnings and associated regressors. The earnings equations for teachers that have been estimated by Dolton (1990) and others have often been in the context of a model which has occupational choice

determined endogenously. Such a model has been estimated by a number of authors, including Zabalza *et al* (1979), Manski (1987), Dolton (1990) and Hanushek and Pace (1993).

Relative earnings in teaching compared to the non-teaching alternative have a marked effect on graduate choice of occupation. In particular, the lower are relative wages (or wage growth) in teaching, the less likely is a graduate to choose that career. These earnings effects operate on initial choices and choices made later in an individual's career. Dolton (1990) also found that there is considerable inertia to remain in teaching, and suggested that this effect may be partially due to the different individuals' subjective evaluation of the relative pecuniary and non-pecuniary rewards to teaching. Chevalier *et al.* (2001) overview the market position for teachers in the UK from 1966 to the mid 1990s using graduate cohort data from 5 separate cohorts of university graduates, 1960, 1970, 1980, 1985 and 1990. The use of this data allows them to simulate the effect of possible teacher pay rises over time. They find that relative wages in teaching compared to alternative professions have a significant impact on the likelihood of graduates choosing to teach, although the impact depends upon the market situation at the time. The wage effect on the supply of teachers is strongest at times of low relative teachers' wages, or following a period of decline in those wages. It is also strongest for those individuals who have more recently graduated. For example, increasing wages of teachers by 10% would have led to an increase of nearly 10% in the supply of teachers in the mid Eighties but only 2% in the mid Sixties or early Nineties.

Using counterfactual analysis Dolton and Mavromaras (1994) predict what the 1980 cohort of graduates would have done had they faced the labour market of the 1970s and vice versa. The results suggest that both male and female graduates from 1980 would have been more likely to enter teaching when faced with the 1970 environment than they were in their own market. This effect is symmetrical in that the graduates of 1970 would have been less likely to make teaching their occupational choice had they faced the 1980 market. Decomposition analysis of the differences between the two cohorts suggest that these effects are partly explained by the different characteristics of the two cohorts, but that the changing remunerative conditions in the market had a very important role in the results.

There is striking evidence of a significant positive association between the rate of adjustment of teachers' relative earnings and the level of market excess demand. Work by Bee and Dolton (1995), using data over a long time span and under a variety of market

⁸ See Dolton (2003b) for a full explanation of this model and its variants.

conditions, find clear econometric evidence that teachers' salary conditions are responsive to market forces even in the context of a mainly government administered market like that in the UK. An increase in excess demand by 10% leads to wage rising by 3.7% at the following period. It is also not surprising, given this result, that when the role of market excess demand on teachers' pay was assessed using cross section data on teacher earnings, it was found to be hugely statistically significant. Work by Court et al (1995) using the Labour Force Survey also found that aggregate labour market conditions, particularly in terms of unemployment levels, were also important in the supply of teachers. The most recent evidence from Dolton et al (2003) supports these findings with time series data over the whole post war period. Notably they find that the supply of graduates to teaching is counter-cyclical with most graduates' perception of teaching (and willingness to enter the profession) improving when graduate prospects are poor in alternative occupations and when graduate unemployment is high.

Whilst relative pay affects the decision to become a teacher, it also affects career choices. Modelling the decision to leave teaching by Dolton and Van der Klaauw (1995a) shows the importance of relative earnings in turnover decisions. The results suggest that the higher the relative earnings of teachers, the less likely they are to leave teaching. The importance of relative wages in teacher turnover decisions is examined by simulating a uniform 10% increase in relative monthly earnings. This leads to a 9% reduction in the total exit probability at 5 years of tenure, or a total retention rate of 69%. A 25% increase raises the percentage of teachers still in teaching after 5 years to 73%. Considering the cost of providing teacher training, the cost-efficiency of offering higher earnings for teachers appears nevertheless doubtful. A rapid back of the envelope calculation reveals that at the current pay scale, the present value of the gross earnings of a lifetime teacher is just short of £800,000. Assuming, that the pay increase leads to 10% more qualified teachers to join the profession for their lifetime, unless the present value of the training costs is in excess of £80,000 such measures would not be cost-efficient. However, in situation of shortage of teachers, such a pay increase may still need to be implemented to keep current teachers in.

To some extent the supply concept described above understates the potential supply of graduates in that there are a large number of trained teachers not in work but who could choose to work if the conditions were right. Their presence is an important qualification to the supply concept we have discussed. Dolton et al (2003) estimate that this pool of inactive teachers is around 900,000 in 2000, out of which a quarter could be attracted back to teaching under the right conditions. Modelling of the return to teaching can be undertaken by

estimating a hazard model of the time until return to teaching. The results in Dolton and Van der Klaauw (1995b) indicate that the higher are relative earnings in teaching the higher the hazard and hence the conditional probability of returning to the teaching profession. Recently, rules regarding retired teachers have been softened to facilitate their returns to the classroom without loss of pension, training for returning teachers is also provided as well as financial support during the training phase (up to £1,500 for 10 weeks).

Teaching is also characterised with a relatively high union rate. There is good evidence to suggest that union density affects the outcome of teacher wage negotiations. Thomas and Deaton (1977) failed to find this result using early, limited time series data covering only a few years. However Bee and Dolton (1995), using a much more comprehensive time series data set, find that the power of teacher unions, as measured by union density, has a significantly positive impact on wage negotiations; an increase in the union density by 10% increase wages by 2%. Dolton and Robson (1995) also suggest that the concentration of this power into fewer unions representing the membership has a significant positive impact on wage negotiations. These two results suggest that, despite the fact that teacher wage negotiations have taken place centrally⁹ rather than through the pressures of competitive market forces, it has been the case that trade union power (as measured by the proportion of teachers in a union (density) and the relative distribution of the membership concentration) have both been important factors in determining the negotiated wage outcomes.

There are many caveats regarding the conclusions of the econometric estimation on both the time series and cross section data. Notably statistical results and their reliability are limited by the accuracy and detail, which is available in the government time series sources and the limited available cross section or cohort data. Most evidence presented are concerned with only one component of the supply of teachers either new, returnee or current teachers, and do not provide the total effect on the supply of a change in the relative wage of teachers. Most importantly, the policy implications of the results described must be tempered by the fact that the market for teachers is very different in the primary and secondary sectors of education, between men and women teachers and between teachers of different subjects in secondary schools or in different part of the country. We discuss further these differences in the teacher's market below.

2.6 Feminisation of the teacher supply

⁹ The Burnham Committee operated up until 1987 and was replaced by the Teacher Pay Review Body.

Another important factor in the supply of teachers is that it is a career, which is relatively popular with women graduates. A crucial aspect of the distinction between male and female occupational choice is that often women are simultaneously making decisions about starting a family and hence deciding whether to participate in the labour market. This is particularly true in teaching since it is argued that a teaching career has a complementarity with family formation. This is because of the relatively low number of hours, which have to be spent at school and their convenient location in the day, the timing and quantity of holidays, and the ease with which one can return to teaching after a career interruption. This important complementarity merits closer examination. Dolton and Make peace (1993) have modelled this question explicitly. They find that the choice of teaching as a career is intimately related to the decision to participate in the labour market. This is true in the sense that unobserved factors, which make a woman more likely to select a career outside teaching, make her less likely to participate in the labour market and vice versa. This implies a positive correlation in the teaching occupational choice decision and the decision to work. This large feminisation of the profession adds some difficulties to the planning of the supply of teachers as most women will at some points interrupt their career for childbearing reasons; twelve percents of primary teachers who resigned do so for maternity or family care reasons (Smithers and Robinson, 2003). Strinebrickner (2001) also estimate that relative to men, women are more likely to exit teaching. Policies to facilitate work and childrearing such as subsidised childcare or reduced workload have therefore a large scope for increasing teacher supply¹⁰.

Therefore we should think in terms of a particular kind of structural econometric model of female labour supply. Reducing the problem to manageable dimensions this is usually modelled as women facing a participation decision of whether or not to be active in the labour market at a particular point in time¹¹. Such a decision may be endogenous to the choice of being a teacher, i.e. simultaneously determined with equations describing occupational choice.

Dolton and Mavromaras (1994) find that women are more likely to choose a career in teaching than men over most of the array of pay conditions. That is, they are more likely to change their minds and become teachers in the event of a 10% increase in relative wages of teachers. Further analysis of the role of non-pecuniary factors in the choice of occupation has

¹⁰ A childcare allowance of up to £150 a week per child is offered to returnee teachers undertaking a training course for up to 12 weeks.

¹¹ Formally this would be a 'reduced form' in an econometric model.

been conducted by Dolton, Makepeace and Van der Klaauw (1989). They show that such factors are very important in the choice of teaching as an occupation, and in particular these factors seem to be more important for female than male graduates. This may partly be due to the different choice of degree subject which women take and partly due to the fact that many female teaching salaries will be second incomes in a household which are correspondingly less important than the first salary to the partnership in terms of career decisions. The differences between the occupational choices of male and female graduates in the UK is brought into focus by asking the question of what occupations men would have chosen had they (with identical characteristics) made their choices according to the equation which best describes women's choices and vice versa. The answer provided by Dolton, Makepeace and Van der Klaauw (1989) and Dolton and Kidd (1995) (using a later cohort) is that men would be more likely to choose teaching if they chose like women and women would be more likely to choose to enter commerce and business occupations if they choose like men.

2.7 How to reward teachers?

While the evidence regarding the effect of pay on the supply of teachers are consistent, there are not informative on designing the optimal pay package that will guarantee a supply of high quality teachers. Numerous authors advocate the lack of efficiency of across the board pay increase (see Odden and Kelley, 1997 for example). Since 1997, the labour government has experimented with various financial incentives at all points of the supply, from training to returnee teachers. It appears that the latest 'crisis' has been reached, and that the Performance Related Pay is the latest mean of providing a boost to teachers' earnings. What is new this time is that the wage increases are not across the board and are made dependent upon teachers demonstrating effective performance in their jobs.

The performance management arrangement has two main elements. Firstly each teacher is appraised annually by her senior line manager on the basis of previously agreed objectives. At the second performance review stage, the assessment is used by the head teacher as a basis for teacher pay decisions in the coming year. In this process, the assessment of classroom teachers is based on the degree to which objectives agreed at the start of the cycle have been met, classroom observation by the senior manager and information gathered about performance via the process of monitoring and evaluation. The assessment process should use objectives set by classroom teachers in conjunction with their senior managers which

should relate to: improved teacher performance, target setting for expected pupil performance, and continued teacher professional development.

However, PRP does not apply to all teachers by only to the most experienced who have reached ‘the threshold,’ at the top of the pay scale for classroom teachers (approximately six or seven years into their careers). The idea is that individuals who can prove themselves to be effective teachers, assessed against a set of nationally agreed criteria, will ‘cross the threshold’, receiving an immediate £2,000 pay rise, and access to a new higher pay scale for classroom teachers. Around 80% of teachers who were eligible for the threshold payment when PRP was introduced in 2000 applied for it, and around 97% actually received it.

It is unclear whether PRP is the appropriate vehicle to solve problems in recruitment and retention of teachers. Whilst it may help keeping experienced teachers in the classroom its introduction may not motivate young graduates to join the profession since it increases uncertainty regarding future pay. Dolton et al (2003) also discuss the reasons why PRP may not be adequate for teachers, since the outcome of interest, pupils achievements, is multi-dimensional and depends on the effort of a group of teachers rather than a single individuals (Holmstrom and Milgrom, 1991).

Evaluation of PRP in the UK is not possible since the scheme was introduced nationally. Evidence from around the world tend not to be in support of performance related pay schemes. With the exception of Lavy’s (2002) evaluation of an Israeli school-based tournament, there is little international evidence that financial incentives for teachers improve students’ outcomes. In fact, over time, most performance related pay for teachers scheme have collapsed (Murnane and Cohen, 1986).

2.8 Geographic and subject specific

The fact that teachers’ pay and conditions of service are determined for the whole market presents problems with the supply of particular subject teachers or teachers in specific geographical areas. In practice there are large specific market differences found within each subject and region of the country. This could lead to a position where there is an aggregate excess supply of teachers, but a shortage in some subjects, such as maths, physics, the sciences, languages, craft, technical and computing subjects. These differences are found at all level of the teachers’ career, from training to wastage. As shown above, training places in mathematics and languages are year after year, not fully taken, despite a wealth of financial incentives, whilst other subjects like Physical Education are always over-subscribed. As outside options for teachers with high ability in math or languages tend to be higher, they are

also more likely to leave the profession. Smithers and Robinson (2003) confirms that teachers in maths, ICT, languages and English were disproportionately more likely to resign. Evidence suggests that education has been characterised by declining real rates of return in recent years. For example, Walker and Zhu (2001) estimate returns to university degree and find that for women, a math degrees increases earnings by 39% compared to individuals with 2 A-levels. Returns for Education graduates were only 22%. This means that the opportunity cost of teaching may be a lot higher for a maths graduate than a history graduate in terms of foregone earnings in alternative jobs.

As with other public service professions, there have also been shortages of teachers in certain areas of the country, most markedly in inner London and the south east of England. Official vacancy rates are 2 to 3 times higher than the national average in London despite London being the area relying the most on temporarily filled position. Chevalier et al. (2001) estimate that a graduate with mean characteristics is 15 percentage points less likely to be a teacher if he lives in London. Teachers in London are also more likely to leave or transfer to other schools than teachers in other geographical area (Smithers and Robinson, 2003). Official turnover and wastage rates in 2002 were respectively 20% and 11% in London compared to 15% and 9% for England. The recruiting difficulties in London are thought to stem from the higher living cost in the capital. From April 2003, a specific salary scale has been defined for London replacing the previous London allowance. On the lower pay scale, teachers in London are paid about £3,500 more than in the rest of the country; the pay differential for teachers on the PRP scale is up to £6,000.

Budget permitting, schools in fact have the possibilities to add some flexibility to teacher salary. A range of recruitment and retention allowances, with a total value ranging from £1,000 to £5,400, can be offered to assist towards relocation, travel to work or provision of care for dependents. These allowances can be offered in case of recruitment difficulties. Thus, it will be possible for a school to offer this allowance to a new or established math teacher but not to other teachers in the same school. However, it is possible that recruiting difficulties in London have more to do with the job conditions inner cities schools than living cost.

2.9 Non pecuniary conditions

A recent cause for much concern in the supply of teachers in the UK has been the non-pecuniary conditions of work. It has variously been suggested that the extra burdens of the

National Curriculum, and the rigours of the OFSTED inspection procedures which involve increasingly detailed monitoring of pupil progress systems has caused an excessive increase in the administrative burden of paper work which is required of teachers. It has been suggested that this is an important reason for the high exit rate out of the profession. Indeed it is possible that this administrative burden may also have deterred new applicants. There was such concern over this issue that the government commissioned an independent report into teacher working conditions (Coopers and Lybrand, 1998). This report suggests that teachers are more over-burdened with paperwork than they could or should be. Interviewed of teachers leaving the profession also confirms that heavy workload and school characteristics ranked higher than salary as a reason for quitting (Smithers and Robinson, 2003). Other evidence from Chevalier et al (2002) suggests that teachers are less satisfied in their jobs with respect to key attributes associated with the conditions of work than comparable graduates working in other fields. Teachers are particularly dissatisfied with pay and hours worked; compared with other graduates, teachers are 12 percentage points more likely to claim to be dissatisfied with the number of hours worked. Compare to other employees, teachers hours of worked are concentrated during term time with workload of 52 hours. For over 40% of the leavers surveyed by Smithers and Robinson (2003) nothing could have made them stay. For the others, change in workload or school characteristics were more likely to be cited than salary as an inducing factor to stay.

2.10 Conclusion

An important perennial problem for any state education system is how to insure a steady supply of quality teachers. In the UK we have not solved this problem, and shortage of teachers are likely to be recurrent in the medium term as the current population of teacher retires. The issue is how to provide enough reward to induce high quality individuals to become teachers and stay in the profession. Despite an array of financial incentives, teaching training places do not fill up, especially in subjects where the returns are high outside teaching. Recently, the trainee shortages have been reduced, but it is unclear whether this is due to the introduction of financial incentives or a tightening of the labour market. However, half of the original trainees are not in the classroom three years after gaining after the end of the course. The wastage of teachers is observable at all career points but is especially high early on in the career. This is usually thought to stem from the relatively low pay of teachers. It is nevertheless unclear whether teachers are currently low paid and by how much a higher pay will release the shortage. Specifically how should the system reward those teachers with

the hardest jobs in the most expensive areas to live in the UK? In addition how should the state system recruit teachers in areas of expertise with the highest opportunity wage? In the Chancellor of the Exchequer's budget of 2003 he announced that there would be regionally indexed pay for public sector workers. Over the years there have been various attempts at differential pay for teachers. At present this seems to have been jettisoned in favour of the Performance Related Pay system described earlier in this chapter. While moves to relax the rigid wage structure of teachers are welcome, it is unclear whether a performance related system is adequate for teaching, since it is a multi agent, multi output occupation. Finally, while most governments' policies to retain teachers have concentrated on financial incentives, surveys of teachers reveal that earnings are not the main determinants of their dissatisfaction; heavy workload and school characteristics, such as pupil behaviour are the main reasons given to justify the decision to exit the occupation. Additionally, whilst teaching is still seen as a family friendly occupation, policies to help combining childrearing and work have a large potential to reduce wastage and increase return to the classroom.

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