The Determinants and Effects of Work-Related Training in Britain

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Preface

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Summary

This study uses data from the National Child Development Survey (NCDS) to look at the determinants and effects of work-related training among employees in Britain. Just over half of the individuals employed in 1991 in our NCDS sample undertook some form of work-related training between 1981 and 1991.

In looking at the determinants of training, we focus on employer-provided training courses and work-related training leading to a formal vocational qualification (both employer- and non-employer-provided). We find

- men have a substantially higher probability than women of undertaking employer-provided training and work-related training leading to a formal vocational qualification;
- more-highly-educated people have a greater probability of receiving both types of training.

Work-related training is also found to have a significant impact on the earnings prospects of individuals. We find

- employer-provided training has significant returns to individual workers — adding some 5 per cent to their real earnings over the 10-year period under study;
- individuals who obtained a middle or higher vocational qualification from their work-related training receive even higher pay-offs of between 5 and 10 per cent;
- the returns to employer-provided training are surprisingly transferable across employers;
- work-related training appears to be particularly important for the wage prospects of individuals with intermediate-level school qualifications, although these individuals are also less likely to obtain work-related training.

Blundell, Dearden and Meghir, *The Determinants and Effects of Work-related Training in Britain*

ERRATUM

Alison Booth has pointed out that the footnote appearing on page 14 of this report is incorrect. Variables were included in her training probit, which were not in her wage equation. The inclusion of these extra variables was pointed out in note (iii) of Table 1 in her paper. The coefficients and the significance of these additional explanatory variables were not reported or discussed in the paper.

The footnote should be replaced as follows:

[1] As Booth (1993, p. 167) points out ".... the same broad set of explanatory variables explains both training participation and earnings. Identification thus hinges on differences in functional form".

CHAPTER 1
Introduction

There is a general view in the UK that there needs to be an expansion of vocational and work-related training in order to increase the skill level of the work-force and to ensure stronger long-term economic performance. There is also evidence that the dramatic increase in wage inequality over the 1980s was in part due to the fact that the wages of more-highly-skilled people rose substantially faster than those of low-skilled workers (see, for example, Gosling, Machin and Meghir (1994)). Increasing the provision of work-related training for these low-skilled workers has been suggested as a possible way of stemming this rise in wage inequality. There has, however, been little empirical research on the determinants and effects of employer-provided and non-employer-provided qualification training in Britain, which are by far the most common forms of post-educational training. Most of the research that has taken place has focused on the impact of government training schemes such as the Youth Training Scheme (YTS) or formal educational qualifications.

With the focus of our research on employer-provided and work-related training leading to a recognised vocational qualification, there are some important questions that we will want to address in this study. What are the typical patterns of employer-provided training and qualification training in Britain? Who gets these different types of work-related training in Britain? In particular, is work-related training complementary with formal school education? What are the returns to work-related training and does the importance of work-related training vary for different types of individuals? Studying the returns to individual workers is not a substitute for the direct study of productivity effects, but in the absence of direct meas-

ures of productivity, we will use the real earnings growth as a gauge to the productivity impact. Presumably, any real wage increases will have to be paid out of productivity gains, so real wage increases should provide a lower bound on the likely size of productivity increases. In terms of the determinants of income inequality and household living standards, the impact of training on earnings is of direct interest.

Why should employers train workers? Clearly, employers see training as a mechanism for increasing output per employee and, in some cases, as part of an overall recruitment package. Training makes employees more able to cope with new technological advances but, despite these attractions to the employer and employee, there remain potentially important incentive issues. Standard theory predicts that firms will only bear the costs of firm-specific training, not of general training. It is easy to see, in more realistic models, that firms will be willing to do some general training (see, for example, the model of Stevens (1994)). However, as workers may leave firms after general training is complete, firms may not invest in training their workers to the optimal level. Workers themselves may be unable or unwilling to bear the short-term financial costs of general training. Together, these can result in a low-wage low-skill equilibrium.

It is interesting to ask to what extent these issues are important in the British context. Could there be underinvestment in employer- and non-employer-provided training? Does poaching of trained workers make training in general skills not worth while for the employer? Does an increasingly mobile and flexible work-force result in a reduction of the incentives for individuals and employers to train? Of course, mobility itself can be important for productivity — finding the correct 'match' is often considered to be one of the most important investments a young worker can make. This has been argued strongly in the US by Heckman (1993) (see also Topel and Ward

(1992)). On the other hand, constraints on mobility among young workers in Germany is thought to be an important characteristic of the labour market underpinning the success of the apprenticeship system. Is there evidence that Britain appears to undertrain its lower-educated workers relative to Germany and the US?

This study uses data from the British National Child Development Survey (NCDS) to look at these issues. Using historic data is always open to the criticism that the world is now very different. The introduction of National Vocational Qualifications (NVQs) and the increasing proportion of young people in education have no doubt changed the skill distribution of young workers, but the fundamental issues surrounding work-related training and the complementarity of such training with formal educational qualifications remain. Hence, we argue that these data do provide very important insights into the effectiveness of work-related training in Britain. The NCDS is a continuing longitudinal survey of persons living in Great Britain who were born between 3 and 9 March 1958. There have been five waves of the NCDS, the most recent survey being conducted in 1991 when the cohort members were aged 33 years. The NCDS has detailed information on the individual's family background, educational attainment and labour market experience. In this study, we use information from five waves of the NCDS, which were carried out when the cohort members were zero, seven, 16, 23 and 33 years of age. We focus on individuals who were employees in 1981 (when they were aged 23) and look at what factors were influential in determining whether or not an individual received training and the returns to this training over the 10-year period between 1981 and 1991.

Our base sample is all persons who were employees in 1981 in both the public and private sectors. We drop from this sample any individuals who were in full-time education in 1991, who had become self-employed in 1991 or who had participated in government training over the

period. Hence we only consider employees in 1981 who are employees, unemployed or not in the labour force in 1991.

In this report, we use the data for two main purposes. The first is to establish who actually receives training and whether different types of training are taken by different types of individuals. The second is to look at the impact this training has on the wage profile of these individuals over the 10-year period between 1981 and 1991, for those individuals who are still employees in 1991. We wish to learn from these data whether work-related training confers a significant earnings gain, whether this impact is larger for employer-provided training with the current rather than a past employer, and for what kind of employer-provided training there is a carry-over of returns from training with previous employers.

The NCDS data allow us to look at these issues in detail. In particular, they allow us to examine the interactions between formal education and different types of work-related training. Of particular interest is whether the training effects are significant for those with lower education. This is especially important as it is these workers who stand out in comparison with workers with similar formal educational qualifications who subsequently join the apprenticeship system in Germany. They also appear to have less job mobility than their counterparts in the US.

Chapter 2 looks at how work-related training operates in Britain and contrasts this with the systems operating in Germany and the US. It also partially reviews earlier studies of the determinants and effects of training in the UK and summarises the major findings of these studies. In Chapter 3, we discuss the major features of the data used in our analysis. The analytical framework we use for estimating the returns to training is discussed more fully in Chapter 4. Chapter 5 presents the results of our analysis, and conclusions are offered in Chapter 6.

CHAPTER 2
Training: How Does It Operate and What Does It Do?

2.1 Work-Related Training in Britain, Germany and the US

Work-related training in Britain has undergone a number of changes over the last 15 years, moving towards a nationally-recognised system of vocational qualifications (see Oulton and Steedman (1994) for a detailed discussion). This has reflected a concern with the adequacy of skills, especially among workers with intermediate and lower levels of formal school education. They are of particular interest since young workers in this group in many of Britain's industrial competitors would have received substantially higher levels of work-related training during the period of our study. The importance of work-related training for this group is also borne out by the results of our study.

Training in all its various forms has become more common in the UK over the last 15 years. Whereas in 1984 only 8.4 per cent of employees reported having received training over a four-week period, by 1992 this had risen to 13.5 per cent (see Green, Machin and Wilkinson (1996)). However, many of these courses are short-term, often only lasting a few days, and it is sensible to ask what kind of benefit to the firm and to the workers they provide. It is precisely these types of relatively short-term work-related courses — often leading to qualifications — that are the focus of our study.

In contrast to Britain, about 65 per cent of German youths participate in apprenticeship schemes lasting two to three-and-a-half years, which combine on-the-job work and training with off-the-site classroom training. Apprenticeship wages are typically only 22 to 33 per cent of the

corresponding professional wage (see Soskice (1994)). The scheme therefore acts like a youth sub-minimum wage. It is mainly large firms that train, although these firms often train for their smaller suppliers. Although much of the wage cost is borne by the employee and classroom teaching is subsidised by the state, net costs for the firm remain high and there is still an incentive issue surrounding the employer's willingness to supply general training for apprentices. The costs for German firms can be of the order of £4,500 (in 1990 prices) per trainee per year, according to Soskice. Moreover, more than 50 per cent of apprentices leave the training employer within five years and 30 per cent leave when the apprenticeship scheme is complete (see Winkelmann (1994), for example).

Apprenticeships in Germany, however, do more than provide firm-specific and general training; they also seem to be used as a low-wage means of screening employees. High wages and high firing costs for permanent employees increase the value of information about workers' abilities. Firms can reject workers they do not want to hire at little cost but poaching is limited by unions and social norms. Interestingly, Harhoff and Kane (1996) note that wages do not fully rise until some time after the apprenticeship is complete.

In some cases, notably the building industry, classroom training is funded by membership taxes that all firms in the industry are legally required to pay. Industry-wide recognised training certificates are awarded on successful completion. It is often argued that the more general training received on some apprenticeship schemes has left German workers more adaptable to taste and technology change in industry — the so-called 'flex-tech' effect coined by Piore and Sabel (1984) and explored in further detail in the comparative case studies of Steedman, Mason and Wagner (1991). There is also evidence that the larger firms operate an internal labour market to avoid firing

lower-productivity workers. Even though many workers do not stay with the firm in which they have served as an apprentice, the apparent lack of mobility among workers in Germany relative to the US reduces the chances of poaching. Moreover, as argued above, apprenticeships are used as a relatively low-cost way of screening the productivity levels of individual workers.

There are many characteristics of the German business sector and labour market that make the apprenticeship system workable. Indeed, the apprenticeship system may have remained in existence as a reaction to the high levels of protection and industry-wide unionism that exist in Germany. The organisation of unions and industry finance is probably the most compelling example of institutions that help sustain the apprenticeship system. Firms and suppliers typically have the same bank and union, providing precisely the types of pressures that allow firms to collect the returns on apprenticeship training from those who remain with the training provider.

In distinct contrast to Germany, the US has a more decentralised college-based and learning-by-doing system for training. In the 1980s, the US had the highest level of University- or Four-Year-College-based education (see Lynch (1994)). Nevertheless, only 30 per cent of younger workers had any formal vocational training. However, a combination of work and college has remained popular among young workers in the US. It is interesting to note that Harhoff and Kane (1996) find that the returns to workers of similar backgrounds in the US and Germany appear almost the same, although, in the US, college would have been the substitute for apprenticeship training. The labour market in the US is very different from that in Germany. Topel and Ward (1992) show that during the first 10 years of labour-force attachment, a young US male worker typically has seven jobs and achieves about 0.35 of his realised real wage growth through changing jobs. Heckman (1993) has made a strong case for the advan-

tages of 'job-shopping' as an important investment in matching specific skills. In the US, unemployment spells are short and there is much evidence of 'trial-and-error' learning.

The institutional structures in the British labour market and educational sectors do not align easily with those in either Germany or the US. As the recent comparisons in the European Commission's 1996 follow-up to the conclusions of the Essen European Council on employment policies highlight, Britain still places a high reliance on employer development of employee skills. The 'Investors in People' provision of loans to firms to support training investment is an important example of this. It operates alongside the NVQ system which provides a set of nationally-recognised vocational qualifications for individuals undertaking work-related training.

The presence of these institutional differences suggests that an attempt to directly mimic either the German or the US system would be unwise without a clear understanding of the effectiveness of the current practice in Britain. This is recognised in the recent detailed case-study comparisons between Britain, France, Germany and Holland reported in Mason, van Ark and Wagner (1994). What these authors and others recommend is a detailed understanding of the way work-related training operates within the British institutional structure. Most importantly, there is a need to understand the interrelationships between employer-provided training, training leading to recognised vocational qualifications and earlier formal education. This is precisely the motivation of our study.

2.2 Evidence from Earlier Research on Training in Britain

There have been a number of studies looking at the determinants of, and returns to, different types of training in the UK. A large majority of this literature focuses on the

impact of government training schemes or formal educational qualifications. Studies that have specifically focused on more general work-related training are less numerous. This section presents a partial review of some of this earlier literature, focusing on the studies of Greenhalgh and Stewart (1987), Booth (1991 and 1993) and Green (1993), as well as the comparative studies of Lynch (1992), Blanchflower and Lynch (1992) and Tan et al. (1992). These studies have looked at the determinants of non-government work-related training and/or the effects of such training in terms of the wage outcomes received by individuals.

From these studies, a number of general hypotheses can be drawn as to the determinants of non-government work-related training. The studies suggest that

- males have better access to training than females;
- training decreases with age;
- higher educational qualifications raise the probability of receiving training;
- industries with growing or changing technology provide more training;
- union members receive more training than non-union members;
- the probability of training decreases with job tenure;
- part-time workers receive less training than full-time workers;
- large establishments provide more training than small establishments;
- public sector establishments provide more training than private sector establishments;
- minority groups have a lower probability of receiving training;
- training probability is lower when unemployment is high.

It should be emphasised that the factors listed above are neither exhaustive nor universal. What is clear from the studies looking at this issue is that the determinants vary for different types of work-related training and that using highly-aggregated descriptions of 'training' misses important differences in the determinants of different forms of training.

Different types of training would also appear to increase an individual's wage prospects. In estimating the actual magnitude of the returns to training, we have to take into account the fact that participation in training is not randomly assigned across the population but is endogenous. There are two basic endogeneity issues associated with the evaluation of returns to training programmes. The first relates to self-selection and is generated through the collection of unobservable determinants of individual earnings and unobservable determinants of participation in training. These are essentially permanent differences among individuals in their propensity to participate in training which also affect earnings. A second source of endogeneity arises from the correlation between transitory fluctuations in the determinants of training and wages. This can arise when we observe a firm that is doing well and paying higher wages also deciding to increase its training levels, or when individuals who have recently received a bad productivity shock become eligible for training. For example, in the former case, all the impact of the firm 'doing well' would be attributed to training, thereby overestimating the direct impact of training.

These sources of bias in the evaluation of training programmes have been discussed in detail by Ashenfelter (1978), Ashenfelter and Card (1985) and Heckman and Robb (1985 and 1986a). The issues surrounding self-selection and the endogeneity of training have reinforced the popularity of experimental methods in evaluating such programmes (see Lalonde (1986), for example). The problem with this argument is that there do not always exist

experiments with which to evaluate the more important training schemes. This is especially the case in the UK, where randomised selection procedures onto training schemes are extremely rare. Indeed, for employer-provided training, it would be unlikely that sensible experiments could be performed. Instead, one has to rely on a careful statistical analysis of workers who have participated in training, doing one's best to form a realistic comparison group against which to assess the gains. This statistical approach has been at the heart of the work by Heckman and co-authors (see Heckman and Hotz (1989) and Heckman, Hotz and Dabos (1987), for example) and is the one adopted here.

Not all of the earlier studies discussed in this section adequately correct for these possible reasons for endogeneity of training. Those that do use either fixed-effect or instrumental variables (IV) estimation procedures. These methodological issues are discussed in Chapter 4. The results we present later in this report have been corrected for both sources of endogeneity. The way we do this is again discussed in detail in Chapter 4.

The study by Greenhalgh and Stewart (1987) uses data from the British National Training Survey (NTS) of 1975. The NTS defines 'training' as anything that may have helped an individual to learn to do his or her work. Greenhalgh and Stewart define this training as 'vocational' if it helped an individual learn to do his or her work and was undertaken in relation to current or subsequent employment. 'Non-vocational training' is defined as any adult and further education undertaken during the working lifetime.

Greenhalgh and Stewart use the data to look at the determinants and effects of on- and off-the-job vocational training. The survey was conducted in 1975–76 and has information on the retrospective work histories of more than 50,000 men and women in Great Britain. The authors find that women received substantially less full-time vo-

cational training than men, and that neither men nor women received much part-time training. They establish that the probability of receiving full-time training between 1965 and 1974 increased with 1965 occupational status (ranked by the average male hourly earnings in the occupation in 1975) for men and single women and declined sharply with age. The probability of receiving full-time vocational training was less for non-white males though more likely for non-white married females, decreased with the number of children for both men and women, and was generally higher for people who had higher qualifications in 1965.

Greenhalgh and Stewart also find that full-time vocational training yields significant returns, though the marginal benefit of training reaches zero once the individual has accumulated four weeks of vocational training, and that recent full-time vocational training results in larger returns for both single and married women than for men. Their dependent variable is not wages but occupational status. They deal with self-selection by exploiting the panel nature of their data using a first-difference model (the change in occupational status between 1975 and 1965).

Booth (1991) uses data from the 1987 British Social Attitudes Survey (BSAS). The survey has information on whether an individual has been on any formal job-related training courses or received any formal job-related training in the preceding two years, and on the number of full days spent in such training. It also identifies whether individuals have received any informal training in the last two years, including practice to learn work, special talks/lectures, work with more experienced workers, visits to different parts of the organisation, reading, on-the-job teaching and teaching in courses.

Booth confirms Greenhalgh and Stewart's (1987) finding that men have a much higher probability of receiving training than women. She also finds that training decreases

with age, that higher-level qualifications raise training probability, that caring for children reduces training probability, that larger establishments do more training and that public sector employees are much more likely to receive job-related training than their private sector counterparts.

Training incidence is found to have a large and significant impact on earnings, especially for women — the incidence of training increases earnings by 11.2 per cent for men and by 18.1 per cent for women. It is not possible from the BSAS to derive an hourly wage, and Booth has instead used gross or total annual earnings as her dependent variable. Also, in her estimation procedure, she treats training as exogenous and argues that this training effect may be overestimated because of self-selection.

Booth (1993) uses data from the 1980 British National Survey of Graduates and Diplomats (BNSG). The BNSG contains information about employer-provided training received by graduates from the time of their graduation in 1980 up until 1986–87 when the survey was undertaken. It has information on training received in up to four jobs. For each job, the survey asks how many days were spent away from work on training courses during the first year of the job. It also asks, for each job, whether the employer organised for the respondent to have any formal training, which is defined as training that was more than just learning while doing the job. For such training, the survey distinguished between on-the-job formal training, courses within the company or organisation, and courses outside the company or organisation.

In looking at the determinants of training, Booth focuses on any training received in the person's current job. She finds that the probability of men receiving this type of training decreases with age, is greater for non-whites, is higher for first-class degree holders (though is less prevalent among people who have subsequently done postgraduate education) and increases with employer size.

She finds that women receive less training in general than men and that the determinants of training are quite different for women. In particular, for women, the probability of training decreases with the number of children, and first-class degree holders receive less training than other types of graduates. For women as for men, however, there are large positive increasing coefficients on employer size.

Booth ascertains that training received in a person's current job, especially training courses taken outside the company or organisation, has a significant return for both men and women graduates. Earnings also increase significantly with the number of days spent on training courses in the first year of the individual's current job. However, training received in earlier jobs only offers a positive return for men. Booth interprets this as suggesting that training in earlier jobs is more portable for men than for women. She deals with the endogeneity of training by using both a Heckman two-step procedure based on her earlier training probits and a traditional fixed-effect model. She finds no evidence of self-selection using the Heckman procedure; however, her model does not appear to be properly identified.[1] In her fixed-effect model, the dependent variable is the change in real log gross annual earnings between 1980 and 1986. The estimates of the training effects for men in this model are generally larger (though less precisely determined) than her corresponding ordinary least squares (OLS) estimates. For women, the OLS results remain largely intact although the returns to outside training courses are now found to be negative (though not significant).

Green (1993) uses data from the UK General Household Survey (GHS). The data he uses are from 1987 and

[1] All the explanatory variables appearing in her training probits also appear in her wage equations.

distinguish 'training' from formal education, and hence participation in certain types of further education, including some day- or block-release education, is not counted as training. 'Training' in the GHS also includes 'self-instruction', and a specific example given to interviewers of this is 'teaching yourself to use a word processor over a period of time'. Clearly, therefore, the measures of training used by Green in his study are very different from those used by both Greenhalgh and Stewart (1987) and Booth (1991 and 1993).

Once again, the probability of receiving training is much larger for men than for women. For males, training (especially on-the-job training) declines significantly with age. For females, training declines with age but less dramatically, and off-the-job training increases with age to a peak in the mid-30s. People with higher education are more likely, and people with family responsibilities less likely, to receive training. People working in larger establishments, people in high-status occupations and recent recruits are all more likely to receive job-related training. Green, contrary to Booth (1991), finds no evidence that public sector employees, *ceteris paribus*, receive more training than private sector workers.

Tan et al. (1992) use data from the fourth wave of the NCDS (NCDS4), the US National Longitudinal Survey of Youth (NLSY) and the Australian Longitudinal Survey (ALS) to identify young male participation in company training and training from various outside sources. They use NLSY data to distinguish between company, business/technical, school or other training. The ALS is a panel survey of young Australians aged 16 to 25 in 1985 which commenced in 1985. The study uses data from the first four waves — that is, up until 1988. In each year of the survey, the respondents were asked about training received since the last interview. Tan et al. use the survey to identify participation in company training, off-the-job training at technical and business colleges, and further

schooling. NCDS4 was conducted in 1981 when the cohort members were 23 years old. Tan et al. use the monthly calendar data from the survey to create a longitudinal dataset with one record for each 12-month period. The survey allowed them to identify up to four job-related training events (lasting longer than 14 days) and four schooling courses. They use this information to distinguish company training, off-the-job training at colleges, industry centres and government skill centres, and school courses for qualification.

In general, the probability of getting most kinds of formal training rises with the level of schooling attainment, though the evidence for Australia is quite weak. Tan et al. find that the likelihood of company training is greater in high-total-factor-productivity industries in the US and Great Britain but not in Australia. They interpret these results as meaning that in the US and Great Britain, employers operating in a growing and technologically progressive environment rely more on company training for skills needs and place less reliance on outside sources of training. They find that unions are associated with more formal training from most sources. They identify marked differences across countries in the effects of work experience and tenure on training. Compared with British and Australian youth, they find that young men in the US received relatively little training when they first joined the work-force. However, as their time on the job increased, the likelihood of receiving additional company training remained high, whereas in Australia and Britain it diminished.

In all three countries, company-based training provided the largest returns, followed by off-the-job training. The wage effects of outside training (excluding schools) were about a half to two-thirds as large as those from company training. Tan et al. find, however, that the returns to training in the US were substantially larger than those in Britain and Australia. For instance, company training was

associated with an initial increase in wages of around 18 per cent in the US compared with around 8 per cent in Australia and 7 per cent in Britain. The authors treat training outcomes as exogenous; hence their estimates of the potential wage gains from training may be biased.

In another comparative study, Blanchflower and Lynch (1992) also use data from the NLSY in the US and from NCDS4. They use the NLSY data to identify whether individuals who were aged 25 in 1988 have had previous company training, previous off-the-job training, an apprenticeship, any company training with their current employer or off-the-job training during current employment, and whether they are still doing an apprenticeship. From the NCDS4 survey, they identify whether individuals have trained with their current firm or have completed an apprenticeship with no qualifications, City and Guild Craft qualifications, or City and Guild Advanced qualifications, or whether they are still completing an apprenticeship at the time of the 1981 survey.

Blanchflower and Lynch find that in Britain, people who received training with their current employer (outside an apprenticeship) received on average about 2 per cent higher hourly earnings, *ceteris paribus*. For both men and women, obtaining an apprenticeship also raised hourly earnings by around 2 per cent. For men, a City and Guild Craft Certificate conveyed an extra return of 2 per cent while a City and Guild Advanced Certificate conveyed a further 5 per cent return. No such positive certification effects are found for women. Blanchflower and Lynch find that, in the US in 1988, spells of training provided by previous employers provided no return to current wages, whereas having some company training with an individual's current employer increased wages by 8 per cent (though this effect is only marginally significant). Males and females who in the past had received off-the-job training received a wage premium of around 4 per cent. Having an apprenticeship raised earnings by 20 per cent

for men but had no effect for women. On the other hand, post-high-school education was found to have no effect on men's wages but large effects on women's. In their study, Blanchflower and Lynch treat training outcomes as exogenous.

The paper that comes closest to addressing the subject of our research is the influential analysis of work-related training in the US by Lynch (1992). This careful study also uses data from the NLSY. The NLSY questions on training depend on the specific year of the survey, and the surveys used by Lynch ask respondents whether, in addition to schooling, military and government-sponsored training programmes, they received any other types of training *for more than one month.* Respondents were asked about training they had received over the survey year (up to three spells) and the dates of training periods by source. The sources of training identified were business college, nursing programmes, apprenticeships, vocational and technical institutes, barber and beauty schools, correspondence courses and company training. Lynch uses this information to identify three types of training: company training (on-the-job training), apprenticeships, and training obtained outside the firm (off-the-job training). She also exploits the longitudinal nature of the data to distinguish between spells of training received whilst the person was with their current employer and those received in previous employment for each of the three types. She also distinguishes between completed and uncompleted spells of training received on the current job.

Because the NLSY only identifies spells of training that lasted at least four weeks (not necessarily full-time), Lynch's training variables are more likely to capture formal training spells rather than informal on-the-job training. She finds that females and non-whites are less likely to receive on-the-job training and apprenticeships, although females are more likely to receive off-the-job training. Off-the-job training decreases with tenure, whilst

on-the-job training increases with labour market experience. High-school graduates are more likely to receive all three kinds of training, and people with post-high-school education are more likely to receive both off- and on-the-job training. Union members are more likely to receive on-the-job training and apprenticeship training. Lynch finds that on-the-job training is less likely to occur in regions with relatively high unemployment rates but that the opposite is true for apprenticeship training. She also finds that individuals who have had on-the-job training with a previous employer are much more likely to receive on-the-job training in their current job.

Receiving on-the-job, off-the-job and apprenticeship training is found by Lynch to result in higher wages for young people, but on-the-job training only has a significant impact on wages if it was provided by the person's current employer, and she concludes that on-the-job training is quite firm-specific.

CHAPTER 3
The NCDS Data

The National Child Development Survey (NCDS) is a continuing longitudinal survey of persons living in Great Britain who were born between 3 and 9 March 1958. The survey has detailed information on each individual's educational background as well as a large amount of information on family background variables. It also has information on an individual's training history, which is the key focus of this report.

3.1 Training Measures in the NCDS

In our study, we define 'training' as non-government work-related training courses (WRTCs), and distinguish such courses from formal school and post-school education undertaken before individuals entered the labour market (which we refer to as 'education'). A person is said to have undertaken work-related training between 1981 and 1991 if they have undertaken any course designed to help them develop skills that might be of use in a job. Such WRTCs cover on- and off-the-job employer-provided training courses (EPTCs), which may or may not lead to a formal vocational qualification, as well as non-employer-provided training courses leading to a recognised vocational qualification. Qualification training courses are defined to be those that result in a recognised vocational qualification, and by definition this covers all non-employer-provided schemes as well as some employer-provided courses.

The 1991 NCDS first asks respondents: '. . . [s]ince March 1981 have you been on any courses that were meant to lead to qualifications?'. If the respondent has, it then moves on to ask detailed information about the two courses leading to the highest qualifications. It asks infor-

mation on when the course started, how long it was meant to last, the reason for taking the course, where the course was taken, whether it was full- or part-time, which qualification the course was meant to lead to, whether the respondent obtained qualifications from the course and, if they did, the nature of the qualifications. It also asks whether the course was provided by the respondent's employer at the time, whether any fees were provided by the employer, whether the course was completed, whether the person has started any job since leaving the course, whether the course was an entry requirement for any job the cohort member has had since, whether the respondent thought the course helped them get any job since, and about the respondent's overall satisfaction with the course.

The questionnaire then moves on to ask about other work-related training courses. In particular, it asks: '[s]ince March 1981 have you been on any training courses designed to help you develop skills that you might use in a job?' apart from the qualification courses that were asked about earlier. The questionnaire then establishes whether any of these courses lasted at least three days in total and, if so, how many training courses lasting at least three days the respondent has started since March 1981.

The survey then asks the same set of detailed questions that were asked about the two highest qualification courses in respect of the three most recent work-related training courses.

This means that we have detailed information on up to five WRTCs undertaken between 1981 and 1991. We also know whether individuals have undertaken additional WRTCs for which we do not have detailed information. We use the responses first to identify the number and duration of employer-provided training courses undertaken during the 10-year period.[2] In our sample, most of the training courses undertaken are EPTCs. On-the-job EPTCs are defined as those undertaken at the employer's

premises and off-the-job EPTCs as those taken at training colleges/centres that are not based at the employer's premises.

It has been argued that EPTCs are more likely to be firm-specific than other types of training courses. Hence any advantage in terms of a higher wage from undertaking an EPTC may depend on whether the person is still with the employer who trained them. We distinguish persons who are still with the employer who provided the most recent training course from those who have changed jobs since their last training course, to see whether EPTCs are more firm-specific than other types of training. We also separately identify training courses that commenced in the same month as a person started a new job, since these are more likely to just involve showing them what the job was when they first started.[3]

We also identify individuals who have obtained recognised vocational qualifications from any course (including EPTCs already identified) between 1981 and 1991. We distinguish between lower, middle and higher vocational qualifications. A description of these training qualification dummy variables is given in Table 3.1.

Our higher vocational qualification is approximately equivalent to a National Vocational Qualification (NVQ) level 4 or 5, our middle vocational qualification to an NVQ level 3 and our lower vocational qualification to an NVQ level 1 or 2. If an individual has done more than one qualification training course since 1981, these are sepa-

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[2]These number and duration variables are obviously censored if a person has undertaken other work-related training for which we do not have detailed information.

[3]We know from the NCDS the start month and year of all training courses and jobs. People for whom we do not have this information are dropped from our sample.

TABLE 3.1

Description of highest training qualification variables

Variable	*Description*
Training qualifications obtained since 1981:	
Higher vocational	University or CNAA first degree CNAA Post-graduate Diploma University or CNAA higher degree Full professional qualification Part of a professional qualification Polytechnic Diploma or Certificate (not CNAA validated) University or CNAA Diploma or Certificate Nursing qualification including nursery qualification Non-graduate teaching qualification Higher National Certificate (HNC) or Diploma (HND) BEC/TEC Higher Certificate or Higher Diploma City and Guilds Full Technological Certificate
Middle vocational	City and Guilds Advanced or Final Certificate Ordinary National Certificate (ONC) or Diploma (OND) BEC/TEC National, General or Ordinary Certificate or Diploma A level
Lower vocational	City and Guilds Craft or Ordinary Certificate Royal Society of Arts (RSA) awards, stage 1, 2 or 3 Other commercial or clerical qualification O level

rately identified, but only if the broad qualification obtained is different.

The NCDS4 survey also has a number of questions on work-related training received up until 1981. In the apprenticeship and training section of the questionnaire, there is information on formal apprenticeships, including whether the apprenticeship had been successfully completed by 1981. The training questions asked in this section identify whether the respondent has been on any training courses during any job that involved at least 14 days or 100 hours attendance at a college, training centre or skill centre, including training centres at the person's place of work. Questions are only asked about the first three such courses. These are the training questions used in the study by Tan et al. (1992).

There are, however, additional training questions asked in the employment section of the survey. We know whether the person received any training of any kind in their first job and, if they have held more than one job, in their 1981 job. If they did, they were asked whether the training they received was just showing them what the job was when they first started or whether it was more than this. If it was more than this, they were asked whether the training took place at a college or at a training centre (including a training centre at the person's place of work). In our study, we utilise the training questions from the employment section of the questionnaire rather than those from the training section in order to ensure that we obtain information on any training received in the person's 1981 job. These questions were also relied on by Blanchflower and Lynch (1992).

We use this information to create dummy variables to identify EPTCs undertaken by people in the job they held in 1981 as well as in their first ever job if individuals have had more than one job by 1981.[4]

3.2 Education and Ability Variables

The NCDS has information on the individual's highest school qualification and post-school qualification as at 1981, generally acquired before entering the labour market, which we view as 'education' or 'schooling'. It also has the results from verbal and non-verbal ability tests taken when the person was seven, 11 and 16 years of age, as well as information on the number of years of full-time education.

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[4]People were deemed to have undertaken an EPTC if they had received any training of any kind from their employer in their first and/or current job and this was more than just showing the person what their job involved when they first started.

TABLE 3.2

Description of educational qualification variables

Variable	*Description*
Highest post-school qualification in 1981:	
Degree	University or CNAA first degree CNAA Post-graduate Diploma University or CNAA higher degree
Higher vocational	Full professional qualification Part of a professional qualification Polytechnic Diploma or Certificate (not CNAA validated) University or CNAA Diploma or Certificate Nursing qualification including nursery qualification Non-graduate teaching qualification Higher National Certificate (HNC) or Diploma (HND) BEC/TEC Higher Certificate or Higher Diploma City and Guilds Full Technological Certificate
Middle vocational	City and Guilds Advanced or Final Certificate Ordinary National Certificate (ONC) or Diploma (OND) BEC/TEC National, General or Ordinary Certificate or Diploma
Lower vocational	City and Guilds Craft or Ordinary Certificate Royal Society of Arts (RSA) awards, stage 1, 2 or 3 Other commercial or clerical qualification
Other	All other courses leading to some sort of qualification that are not identified above, including miscellaneous apprenticeship qualifications
None	No post-school qualification
Highest school qualification in 1981:	
A levels	At least one: GCE A level or Scottish Leaving Certificate (SLC) or Scottish Certificate of Education (SCE) or Scottish University Preliminary Examination (SUPE) at Higher Grade or Certificate of Sixth Year Studies
5+ O levels	At least five: GCE O level passes or Grades A–C or CSE Grade 1 or equivalent
O levels	One to four: GCE O level passes or Grades A–C or CSE Grade 1 or equivalent
CSEs	At least one: CSE Grade 2–5 or equivalent
None	No school qualification, including individuals with no formal schooling

We use this information to identify a person's highest school and post-school qualification, and follow as closely as possible the schema of Schmitt (1991) which has subsequently been used by the OECD (1994). A full description of our education variables is contained in Table 3.2.

We also construct measures of verbal and mathematical ability that are based on ability tests taken when the person was aged seven. We use the seven-year-old test results as these are much less likely to be affected by knowledge gained at school. From these verbal and mathematical ability tests, we construct 10 dummy variables that rank the individual's results in each of the tests by quintiles.[5] We also use data from the first wave of the NCDS to construct dummy variables identifying the teacher's assessment of the child's general knowledge and numerical and reading ability at the age of seven.

3.3 Family Background and Work History

We use the data from NCDS3 to construct variables identifying: the respondent's father's social class; whether the father had been unemployed in 1958, 1965 or 1974; whether the child's mother was in work in 1974; the years of full-time education undertaken by the child's mother and father by 1974;[6] variables identifying individuals who

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[5] We choose quintiles because 20 per cent of individuals in 1965 when the tests were taken obtained maximum marks in the verbal ability test. The quintiles refer to quintiles at the time the test was taken and not in our final sample.

[6] The variable measures the years of full-time education undertaken by the child's mother and father figure at the age of 16. This is constructed from a variable that identifies the age at which the parents left full-time education, assuming they started school at the age of five. If there is no mother or father figure, then parental years of education are set to zero. We separately identify individuals who have no mother or father figure and/or for whom parental education information is missing.

had no mother or father in 1974; whether the family was experiencing financial difficulties in 1974;[7] whether the child was living with both parents in 1974; and finally the number of siblings and older siblings the respondent had in 1974.

From the NCDS4 and NCDS5 surveys, we construct variables identifying: whether the respondent's first job, 1981 job or 1991 job was in the private sector; their first, 1981 and 1991 occupation; whether they were with a large employer in their first, 1981 or 1991 job;[8] whether they were union members in 1981 and/or 1991; whether they had been promoted in their 1981 and/or 1991 job; and their tenure in their 1981 and 1991 job. In addition, we use the data from 1981 and 1991 to construct real hourly gross wage data measured in January 1995 prices and the real gross weekly wage in the person's first ever job.[9] We also identify the age at which the individual first entered the labour market. Finally, we use the 1981 and 1991 surveys to construct regional dummy variables.

3.4 The Final Sample

This leaves us with a final sample of 1,735 males, of whom 1,601 were employed in 1991, and 1,661 females, of whom 1,180 were employed in 1991. Summary statistics for both the whole sample and the employed sample are given in Table A.1 in the Appendix for men and in Table A.2 for women. It should be noted that our sample under-

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[7] Following Micklewright (1988), this identifies individuals who received free school meals in 1974 or whose parents were seriously troubled financially in the year prior to the 1974 survey.

[8] We define a large employer to be one employing more than 500 individuals.

[9] We only have information on a person's gross weekly and not hourly wage when they first commenced work. We do know, however, whether this first job was full- or part-time.

represents individuals in the bottom quintiles of the verbal and mathematical ability tests taken when the person was aged seven.

CHAPTER 4
A Model for Training and Earnings

Our aim in this chapter is to derive an appropriate statistical model for evaluating the impact of different types of training on individual wage outcomes. There are a number of alternative approaches to the statistical analysis of the impact of training on wages. They relate primarily to the issue of correcting for biases that can result from the correlation of unobservable individual characteristics ('unobservables') with the incidence of training. We are in a particularly attractive position in this respect since the NCDS data give us observations on wages before and after recent training spells as well as information on previous training spells, current and past employer characteristics, schooling and family background, and the results of ability tests when the person was very young.

There are two possible sources of bias in evaluating training schemes. Both relate to the correlation of unobservables in the wage or earnings equation with the measures of training. For this discussion, it is best to envisage a wage equation in which the unobservable components — which generate the estimation problem in the first place — are decomposed into a permanent effect and a transitory shock. For the sake of interpretation, the permanent effect can be thought of as made up of unobserved ability and the transitory shock as an unexpected change in productivity or tastes.

The first source of bias relates to the possibility of correlation of training with unobserved *permanent* individual effects. This occurs where some individuals have unobservable attributes that mean not only that they benefit more from training but also that they are more likely to undertake training schemes. The second form of bias directly relates to the presence of temporary shocks to

wages that are correlated with the participation in training. Indeed, a 'good' productivity shock to the firm may lead to an increase in training investment, and then training becomes spuriously correlated with high wage growth — at least in the short run. To correct for the resulting upward bias in returns, we need 'instruments' for training that are uncorrelated with the shock but correlated with training. The detailed background variables and information on early work history in the NCDS are particularly appealing in this respect.

4.1 The Wage Equation

We can think of our data as containing three observations on earnings, the most recent being the earnings in 1991, then those in 1981 and then the earnings in the first job. This neatly splits our sample period into three — the period up to and including the first job (period 0), the period between the first job and including 1981 (period 1) and finally the period since 1981 including 1991 (period 2). Using these three period definitions, following Greenhalgh and Stewart (1987), we write the sequential evolution of wages over the whole period as

$$(4.1) \qquad w_{0i} = x'_{0i}\beta_0 + \sum_{j=1}^{c} \delta_{0j} OC_{0ji} + \sum_{k=1}^{m0} \alpha_{0k} D_{0ki} + \Psi_0(f_i + F_i'\zeta + \varepsilon_{0i})$$

$$(4.2) \qquad w_{1i} = x'_{1i}\beta_1 + \sum_{j=1}^{c} \delta_{1j} OC_{1ji} + \sum_{k=1}^{m0} \alpha_{1k} D_{0ki} + \sum_{k=1}^{m1} \gamma_{1k} D_{1ki} + \Psi_1(f_i + F_i'\zeta + \varepsilon_{1i})$$

$$(4.3) \quad w_{2i} = x'_{2i}\beta_2 + \sum_{j=1}^{c} \delta_{2j} OC_{2ji} + \sum_{k=1}^{m0} \alpha_{2k} D_{0ki} + \sum_{k=1}^{m1} \gamma_{2k} D_{1ki} + \sum_{k=1}^{m2} \psi_{2k} D_{2ki} + \Psi_2(f_i + F_i'\zeta + \varepsilon_{2i})$$

where

w_{ti} = log real hourly wage at time t of individual i, where $t = 0$ (time of first job), $t = 1$ (1981) or $t = 2$ (1991);

F_i = vector of family background variables from 1958 and 1974 waves of NCDS, and the results of ability tests at the age of seven;

x_{ti} = vector of exogenous job characteristics at time t of individual i, where $t = 0$, 1 or 2;

D_{0ki} = dummy variable indicating whether individual i received formal education of type k before first job;

D_{1ki} = dummy variable indicating whether individual i received training of type k after completing education, up until 1981;

D_{2ki} = dummy variable indicating whether individual i received training of type k between1981 and 1991;

OC_{tji} = vector of occupational dummy variables for occupation j at time t of individual i, where $t = 0$, 1 or 2;

f_i = unmeasured time-invariant 'permanent' personal attributes for individual i;

ε_{ti} = random error at time t for individual i, where $t = 0$, 1 or 2;

c = number of occupations;

$m0$ = number of educational courses;

$m1$ = number of pre-1981 work-related training courses.

The returns to training undertaken between 1981 and 1991 are given by the coefficients ψ_{2k} for $k = 1, 2, \ldots, m2$, where $m2$ is the number of different training schemes undertaken between 1981 and 1991. Clearly, the interpretation of the impact of training might depend on when the training took place. If a person who undertakes training just gets a once-off increase in the *level* of their wage and the training has no impact on subsequent wage *growth*, then issues of when the training took place over the period 1981–91 are unimportant. If, however, training affects both the initial level *and* subsequent growth of the wage, then training received earlier in a person's working career should have a greater impact than training received more recently, i.e. the ψ_{2k} will vary depending on the timing of training. This effect will be attenuated, however, by any depreciation in skills. In our empirical work, we will distinguish between training commenced earlier in the period and that commenced later in the period, to see whether these timing and depreciation issues are important.

We do not observe the initial hourly wage, but we do observe the first weekly wage and most of the other variables in this sequential model. The usefulness of this framework derives from our interest in eliminating correlation between the permanent individual effect, f_i, and the transitory shock, ε_{2i}, with participation in training by individual i between 1981 and 1991 which is represented by the D_{2ki} as well as by occupations OC_{2ji}. In the model above, we also allow the returns to the unobserved individual effect, f_i, to vary over time and these returns are given by the parameters Ψ_t. Finally, note that we have assumed that ability and family background characteristics, F_i, affect wages in the same way as the unob-

served human capital, f_i. The implication of this is that the growth of wages will not depend on them.

4.2 Controlling for Correlated Permanent Effects

If the unmeasured time-invariant individual fixed effects, f_i, are correlated with the D_{2ki} and the OC_{2ji} (or indeed with any variable on the right-hand side of equation (4.3)), then OLS estimation of equation (4.3) will yield coefficient estimates that are biased. A standard approach to the elimination of fixed effects is to assume that the return to this fixed effect is constant over time (that is, $\Psi_1 = \Psi_2 = 1$) and to take first differences, resulting in

$$\begin{aligned}(4.4)\qquad \Delta w_{2i} = &- x'_{1i}\beta_1 + x'_{2i}\beta_2 - \sum_{j=1}^{c}\delta_{1j}OC_{1ji} \\ &+ \sum_{j=1}^{c}\delta_{2j}OC_{2ji} + \sum_{k=1}^{m0}(\alpha_{2k} - \alpha_{1k})D_{0ki} \\ &+ \sum_{k=1}^{m1}(\gamma_{2k} - \gamma_{1k})D_{1ki} + \sum_{k=1}^{m2}\psi_{2k}D_{2ki} \\ &+ (\varepsilon_{2i} - \varepsilon_{1i}).\end{aligned}$$

In this specification, if pre-work training, D_{0ki}, affects wage outcomes in 1981 and 1991 identically, then $\alpha_{1k} = \alpha_{2k}$. Similarly, if $\beta_2 = \beta_1$, then $-x'_{1i}\beta_1 + x'_{2i}\beta_2 = \Delta x'_{2i}\beta_2$, which is the typical first-difference specification used in fixed-effect models.[10] Clearly, all these possibilities are testable restrictions of the model.

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[10]Similarly, if $\delta_{2j} = \delta_{1j}$, then $-\sum_{j=1}^{c}\delta_{1j}OC_{1ji} + \sum_{j=1}^{c}\delta_{2j}OC_{2ji} = \sum_{j=1}^{c}\delta_{2j}\Delta OC_{2ji}$.

A more general model, which we instead use in this report, allows the unobserved individual effects to affect wages differently over time. If we multiply equation (4.2) by $\tau_2 = \Psi_2/\Psi_1$ and take this away from equation (4.3), we get the *quasi-difference equation*

$$
\begin{aligned}
(4.5) \qquad \Delta w_{2i} = {} & (\tau_2 - 1)w_{1i} - \tau_2 x'_{1i}\beta_1 + x'_{2i}\beta_2 \\
& - \sum_{j=1}^{c} \tau_2 \delta_{1j} OC_{1ji} + \sum_{j=1}^{c} \delta_{2j} OC_{2ji} \\
& + \sum_{k=1}^{m0} (\alpha_{2k} - \tau_2 \alpha_{1k}) D_{0ki} \\
& + \sum_{k=1}^{m1} (\gamma_{2k} - \tau_2 \gamma_{1k}) D_{1ki} + \sum_{k=1}^{m2} \psi_{2k} D_{2ki} \\
& + \Psi_2(\varepsilon_{2i} - \varepsilon_{1i}).
\end{aligned}
$$

If $\tau_2 = 1$, then equations (4.4) and (4.5) will be identical. As far as the implications of the coefficient estimates are concerned, it is quite important to know whether shocks to wages are permanent and whether training affects the growth rate of wages as well as the level. To test the null hypothesis that shocks are permanent, we can test for the exogeneity of the lagged wage, w_{1i}. If shocks are permanent with no mean reversion, then $\varepsilon_{2i} - \varepsilon_{1i}$ will be serially uncorrelated, making past wages exogenous for the growth rate.

It is harder to test whether the growth of wages is affected by the levels of accumulated training with just two periods of observations, particularly when we allow for the possibility that $\tau_2 \neq 1$. In general, we will not be able to distinguish changing returns to human capital from

an interaction of age with training. Of course, we can test directly whether $\tau_2 = 1$, and if we also find that $\gamma_{2k} - \tau_2\gamma_{1k} = 0$, then we can conclude that the returns to earlier training have not increased and/or that past training has a levels effect only. To pre-empt, we find that $\alpha_{2k} - \tau_2\alpha_{1k} > 0$[11] and $\gamma_{2k} - \tau_2\gamma_{1k} = 0$. As a consequence, an interpretation of our results is that formal education affects the growth of wages, whereas employer-provided training only affects their level. This has very important implications for the meaning of the coefficients in terms of life-cycle returns.

If shocks are permanent, then clearly, within the context of this quasi-difference model, training is exogenous in the growth of wages equation. This is quite independent of whether training was obtained in response to a past shock. However, if shocks are not permanent, it is possible that training that took place within the 10-year interval is correlated with the ε_{1i}. Moreover, if shocks are serially correlated, training could also be correlated with the ε_{2i}. The same arguments stand for occupation. We assume that our education variables are exogenous for the wage growth equation. An implication of the way we have set up the model is that family background and ability variables can be excluded from the wage growth equation. Moreover, we assume that the first-job characteristics and wage rate (typically observed around the ages of 16 to 17) do not affect wage growth between the ages of 23 and 33 (1981–91).

To control for the transitory shock bias, we need instruments that, while correlated with the training variables

[11] This condition is true for all school qualifications and if the person has undertaken a degree after leaving school. The coefficients on all other post-school qualifications (other than degrees) are zero.

D_{2ki}, are uncorrelated with the productivity shocks ε_{1i} and ε_{2i} in equation (4.5). The instruments we use are characteristics of the person's first job at the time they first commenced that job (x_{0i}), their weekly wage when they first started work interacted with the age they commenced work, and observed ability and family background (F_i). We can also use as instruments pre-1981 training and post-school qualification variables other than a degree, as they are found not to be significant in our quasi-difference model. Given these instruments, we can perform the usual generalised residual corrections of Heckman (1979) and Smith and Blundell (1986) for our quasi-difference specification.

CHAPTER 5
Results

5.1 An Initial Look at the Data

The aim of this chapter is to present our estimates of the determinants of and the returns to work-related training. We first identify individuals who have undertaken employer-provided training courses (EPTCs). Our information on EPTCs allows us to distinguish training that was undertaken while the individual was with their current employer from that undertaken with previous employers. We also distinguish EPTCs that were undertaken at the employer's premises (on-the-job EPTCs) from those undertaken away from the premises at a training centre (off-the-job EPTCs). We create variables identifying whether individuals obtained a lower, middle and/or higher vocational qualification as a result of an employer-provided or a non-employer-provided course(s). In our analysis, we further separately identify people who, during the 10-year period, have undertaken additional work-related training courses (WRTCs) for which we do not have detailed information. A description of the basic data relating to these variables is presented in Table 5.1 for men and Table 5.2 for women. The tables show the frequency distribution of training receipt for males and females who are employed in 1991, as well as real average hourly wages (in January 1995 prices) in 1981 and 1991.

From Table 5.1, we see that around 64 per cent of employed men in 1991 have received some form of work-related training between 1981 and 1991. The comparative figure for women (from Table 5.2) is 50 per cent. This difference is due almost entirely to men receiving more employer-provided training than women.

For men who are still employees in 1991, the average real hourly wage in January 1995 prices has increased

TABLE 5.1

Employed males' training and wages

Individuals who have undertaken:	Persons *No.*	Persons *(% of total)*	*Real hourly wage (Jan. 1995 prices)* 1981 *Mean*	1981 *(St. dev.)*	1991 *Mean*	1991 *(St. dev.)*
No WRTC since 1981	582	(36.35)	5.01	(2.26)	7.11	(3.44)
WRTC(s) since 1981	1019	(63.65)	5.29	(2.17)	9.31	(3.92)
With qualification	386	(24.11)	5.10	(1.35)	9.69	(4.01)
EPTCs since 1981:						
Any EPTC(s)	932	(58.21)	5.32	(2.24)	9.34	(3.91)
With qualification	224	(13.99)	5.00	(1.38)	9.60	(4.07)
Current job:						
On-the-job EPTC(s)	389	(24.30)	5.33	(1.78)	9.10	(3.17)
With qualification	42	(2.62)	4.98	(1.41)	8.60	(2.80)
Off-the-job EPTC(s)	488	(30.48)	5.39	(2.59)	9.77	(4.31)
With qualification	91	(5.68)	5.06	(1.48)	9.37	(3.72)
Previous jobs:						
On-the-job EPTC(s)	111	(6.93)	4.93	(1.36)	9.76	(4.27)
With qualification	15	(0.94)	4.97	(1.36)	9.43	(3.38)
Off-the-job EPTC(s)	247	(15.43)	5.36	(3.31)	10.25	(4.71)
With qualification	91	(5.68)	4.97	(1.25)	10.56	(4.80)
Beginning of new job	32	(2.00)	4.85	(1.15)	8.55	(4.48)
Non-employer-provided QTC(s)	182	(11.37)	5.25	(1.46)	9.64	(3.73)
Other WRTC(s)	328	(20.49)	5.79	(3.22)	10.43	(4.11)
Training qualifications since 1981:						
None	1215	(75.89)	5.21	(2.42)	8.14	(3.79)
Lower vocational	122	(7.62)	4.94	(1.32)	7.97	(3.53)
Middle vocational	38	(2.37)	5.13	(1.30)	9.35	(4.45)
Higher vocational	226	(14.12)	5.18	(1.36)	10.67	(3.87)
All employed persons	1601	(100.00)	5.19	(2.21)	8.51	(3.90)

from £5.19 to £8.51, an increase of around 64 per cent, or 5.1 per cent per annum. For women, the increase has been less dramatic, going from £4.47 in 1981 to £6.47 in 1991, an increase of just below 45 per cent, or around 3.8 per cent per annum.

The tables suggest that there are above-average returns to most types of work-related training for both males and

TABLE 5.2

Employed females' training and wages

Individuals who have undertaken:	Persons *No.*	*(% of total)*	*Real hourly wage (Jan. 1995 prices)* 1981 *Mean*	*(St. dev.)*	1991 *Mean*	*(St. dev.)*
No WRTC since 1981	590	(50.00)	4.23	(1.84)	5.38	(2.58)
WRTC(s) since 1981	590	(50.00)	4.71	(1.64)	7.57	(3.14)
With qualification	257	(21.78)	4.59	(1.60)	7.71	(3.28)
EPTCs since 1981:						
Any EPTC(s)	508	(43.05)	4.76	(1.67)	7.74	(3.16)
With qualification	132	(11.19)	4.60	(1.37)	8.24	(3.52)
Current job:						
On-the-job EPTC(s)	197	(16.69)	4.79	(1.59)	7.82	(2.56)
With qualification	21	(1.78)	4.99	(0.95)	9.19	(2.49)
Off-the-job EPTC(s)	213	(18.05)	4.72	(1.65)	8.10	(3.34)
With qualification	46	(3.90)	4.48	(1.46)	7.96	(4.68)
Previous jobs:						
On-the-job EPTC(s)	108	(9.15)	4.56	(1.51)	7.45	(3.11)
With qualification	29	(2.46)	4.23	(0.79)	8.33	(2.50)
Off-the-job EPTC(s)	134	(11.36)	4.84	(1.52)	8.02	(3.27)
With qualification	47	(3.98)	4.73	(1.62)	8.27	(2.77)
Beginning of new job	22	(1.86)	4.84	(1.93)	6.53	(2.06)
Non-employer-provided QTC(s)	145	(12.29)	4.57	(1.70)	7.27	(2.92)
Other WRTC(s)	148	(12.54)	4.84	(1.34)	8.51	(2.81)
Training qualifications since 1981:						
None	923	(78.22)	4.44	(1.80)	6.13	(2.92)
Lower vocational	92	(7.80)	4.37	(1.32)	6.23	(2.86)
Middle vocational	26	(2.20)	4.18	(1.08)	7.17	(2.19)
Higher vocational	139	(11.78)	4.82	(1.80)	8.79	(3.32)
All employed persons	1180	(100.00)	4.47	(1.76)	6.47	(3.07)

females. For example, men who have undertaken off-the-job EPTCs with their current employer have achieved higher-than-average wage growth over the 10 years to 1991. Their average real wage has increased from £5.39 in 1981 to £9.77 in 1991, an increase of just over 80 per cent. For women undertaking such courses, the same is true, although the level and growth of wages are less than

those achieved by men: the average real wage of such women has increased from £4.72 in 1981 to £8.10 in 1991, an increase of just over 70 per cent.

5.2 The Determinants of Training

In looking at the determinants of training, we focus on employer-provided training courses and training courses (employer- or non-employer-provided) that lead to a recognised vocational qualification (QTCs). The results of doing this are given in Table 5.3 for men and Table 5.4 for women. In the first column of each table, we use a simple probit specification to look at the determinants of receiving employer-provided training. In the second column, we rank all of the QTCs the person has undertaken and estimate an ordered probit model that looks at the determinants of the *highest* qualification obtained on such a training course.[12] Results for the whole sample are given in Table A.3 in the Appendix. To avoid problems of the simultaneous determination of training choices and other

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[12]Our left-hand-side variable represents the highest qualification training course undertaken between 1981 and 1991 (*QTC*). It takes the value 0 if a person has obtained no qualification, 1 if the highest training qualification obtained was a lower vocational qualification, 2 if the highest training qualification obtained was a middle vocational qualification, and 3 if the highest training qualification obtained was a higher vocational qualification. More formally in this model, the desired level of qualification training (QTC^*) is unobserved. What we do observe is

$QTC = 0$ if $QTC^* \leq \mu_1$

$QTC = 1$ if $\mu_1 < QTC^* \leq \mu_2$

$QTC = 2$ if $\mu_2 < QTC^* \leq \mu_3$

$QTC = 3$ if $QTC^* > \mu_3$.

In this model, the μs are unknown parameters to be estimated along with the other coefficients, and they are reported in Tables 5.3 and 5.4.

TABLE 5.3

Male training participation

Variable	EPTC *Coeff.*	EPTC *(S.E.)*	QTC *Coeff.*	QTC *(S.E.)*
Constant	–1.987	(0.572)		
Age when started first job:				
17 years	0.760	(0.748)	0.468	(0.815)
18–20 years	–0.317	(0.572)	–0.093	(0.698)
21–23 years	0.743	(0.460)	–0.452	(0.518)
Log real weekly wage first job × full-time ×:				
Age 15–16 years start first job	0.155	(0.090)	0.018	(0.104)
Age 17 years start first job	–0.017	(0.167)	–0.106	(0.174)
Age 18–20 years start first job	0.213	(0.125)	0.028	(0.139)
Age 21–23 years start first job	–0.046	(0.043)	–0.035	(0.040)
Log real weekly wage first job × part-time	–0.061	(0.107)	–0.223	(0.130)
Private sector first job	–0.020	(0.093)	–0.216	(0.096)
Large employer first job	–0.126	(0.101)	–0.203	(0.108)
Social class first job:				
Professional/Intermediate	0.206	(0.151)	0.238	(0.147)
Skilled non-manual	0.130	(0.118)	0.249	(0.124)
Skilled manual	–0.190	(0.097)	0.059	(0.112)
WRTCs by 1981:				
EPTC in first job	0.084	(0.094)	–0.209	(0.101)
EPTC in 1981 job	0.469	(0.075)	0.145	(0.080)
One job only 1981	0.019	(0.094)	–0.193	(0.100)
Private sector 1981	–0.142	(0.090)	–0.026	(0.095)
Large employer 1981	0.033	(0.094)	0.097	(0.099)
Union member 1981	0.159	(0.078)	0.100	(0.082)
Social class 1981 job:				
Professional/Intermediate	0.156	(0.143)	0.501	(0.159)
Skilled non-manual	0.339	(0.142)	0.299	(0.162)
Skilled manual	–0.129	(0.109)	0.071	(0.134)
Made redundant prior to 1989 (excl. last job)	–0.224	(0.089)	0.068	(0.096)
Undertaken interest course since 1981	0.111	(0.078)	0.190	(0.079)
Highest school qualification:				
CSEs	0.307	(0.125)	0.281	(0.154)
1–4 O levels	0.424	(0.132)	0.245	(0.160)
5+ O levels	0.436	(0.154)	0.192	(0.177)
A levels	0.629	(0.198)	0.585	(0.213)
Highest post-school qualification 1981:				
Other	0.033	(0.133)	0.237	(0.145)
Lower vocational	0.217	(0.136)	0.485	(0.143)
Middle vocational	0.219	(0.107)	0.573	(0.112)
Higher vocational	0.261	(0.134)	0.762	(0.128)
Degree	0.144	(0.211)	0.679	(0.196)
μ_1			1.930	(0.637)
μ_2			2.256	(0.638)
μ_3			2.392	(0.638)

Continued on next page.

TABLE 5.3 *continued*

	EPTC	*QTC*
Number of observations	1735	1735
P-value first-job characteristics	0.009	0.009
P-value ability variables	0.657	0.006
P-value 1981 regional variables	0.067	0.247
P-value 1974 family variables	0.077	0.074
Log likelihood	−1001.86	−1169.68
Pseudo R^2	0.1591	0.1141

labour market outcomes, the explanatory variables we use in the probits consist almost entirely of individual characteristics observed in waves of the NCDS prior to 1981. Clearly, these variables were, by definition, predetermined when training decisions between 1981 and 1991 were made.[13]

Broadly speaking, we use six categories of variables in explaining the determinants of training. These variables are largely in accordance with variables used in the studies reviewed in Chapter 2. The first category relates to the formal school and post-school education completed by the individual by 1981. Clearly, these need to be considered, since we can expect that earlier build-up of human capital may affect the ease with which new training is undertaken, the need to obtain further training and the type of training. The second group of variables relate to early family background and ability. Factors such as years of education undertaken by the person's mother and father are important since it is very likely that the parents influence their children directly or as role models.[14]

[13] In earlier versions of our work, we also used regional unemployment rates and industry dummy variables from 1981. These were found not to be significant and reduced our sample size significantly and therefore are not included here.

[14] The impact of these variables is not reported in Tables 5.3 and 5.4 for reasons of parsimony. We instead include the P-value from an F-test of their significance in the various equations. Full details of the regression results are

TABLE 5.4

Female training participation

Variable	EPTC *Coeff.*	EPTC *(S.E.)*	QTC *Coeff.*	QTC *(S.E.)*
Constant	–2.019	(0.657)		
Age when started first job:				
17 years	1.384	(0.762)	0.214	(0.851)
18–20 years	1.229	(0.580)	0.532	(0.624)
21–23 years	0.562	(0.515)	0.004	(0.583)
Log real weekly wage first job × full-time ×:				
Age 15–16 years start first job	0.146	(0.110)	0.095	(0.127)
Age 17 years start first job	–0.187	(0.146)	0.051	(0.161)
Age 18–20 years start first job	–0.109	(0.096)	–0.018	(0.097)
Age 21–23 years start first job	–0.025	(0.038)	–0.016	(0.039)
Log real weekly wage first job × part-time	–0.010	(0.087)	0.077	(0.090)
Private sector first job	–0.001	(0.092)	–0.018	(0.101)
Large employer first job	–0.003	(0.108)	–0.100	(0.121)
Social class first job:				
Professional/Intermediate	0.453	(0.165)	0.356	(0.180)
Skilled non-manual	0.365	(0.121)	0.186	(0.140)
Skilled manual	0.089	(0.191)	–0.062	(0.220)
WRTCs by 1981:				
EPTC in first job	–0.013	(0.102)	0.095	(0.110)
EPTC in 1981 job	0.433	(0.074)	0.253	(0.084)
One job only 1981	–0.142	(0.086)	–0.180	(0.101)
Private sector 1981	–0.199	(0.093)	–0.223	(0.104)
Large employer 1981	0.008	(0.101)	0.226	(0.111)
Union member 1981	0.268	(0.079)	–0.099	(0.090)
Social class 1981 job:				
Professional/Intermediate	0.556	(0.172)	0.647	(0.213)
Skilled non-manual	0.384	(0.144)	0.265	(0.191)
Skilled manual	0.285	(0.206)	0.673	(0.245)
Made redundant prior to 1989 (excl. last job)	0.171	(0.125)	0.104	(0.145)
Undertaken interest course since 1981	0.131	(0.072)	0.204	(0.081)
Highest school qualification:				
CSEs	0.318	(0.172)	0.522	(0.251)
1–4 O levels	0.291	(0.165)	0.491	(0.240)
5+ O levels	0.562	(0.180)	0.470	(0.254)
A levels	0.568	(0.207)	0.592	(0.275)
Highest post-school qualification 1981:				
Other	–0.175	(0.150)	0.111	(0.168)
Lower vocational	0.001	(0.108)	0.329	(0.120)
Middle vocational	0.090	(0.170)	0.515	(0.178)
Higher vocational	–0.048	(0.142)	0.531	(0.147)
Degree	0.199	(0.205)	0.576	(0.213)
μ_1			3.138	(0.750)
μ_2			3.477	(0.751)
μ_3			3.606	(0.751)

Continued on next page.

TABLE 5.4 *continued*

	EPTC	*QTC*
Number of observations	1661	1661
P-value first-job characteristics	0.074	0.366
P-value ability variables	0.043	0.315
P-value 1981 regional variables	0.980	0.433
P-value 1974 family variables	0.651	0.685
Log likelihood	–930.65	–931.03
Pseudo R^2	0.1465	0.1361

The third group of variables are those describing the training that the worker had received by 1981. The justification for these variables is similar to that relating to formal education. Next, we have a set of individual characteristics relating to the individual's regional and union status in 1981, and occupation in their first job and in 1981. These are important for a number of reasons. The region in which an individual lives may be important in determining access to certain types of training. The occupational variables reflect the access to training, the need to do training and also indirectly the wealth of the individual. Increased wealth is likely to make access to training easier than it is for individuals who are liquidity-constrained, since some forms of training will have to be financed by the individuals themselves (through lost earnings and/or directly through fees).

The fifth group of variables describe activities undertaken between 1981 and 1991 that may be associated with an individual's propensity to undertake certain types of training, particularly non-employer-provided qualification training. We identify individuals who were made redundant prior to 1989 (excluding their last job if they are currently unemployed) and those who have undertaken non-work-related interest courses between 1981 and 1991. A person who has unexpectedly been made redun-

available from the authors.

dant in a previous job may undertake non-employer-provided qualification training in order to reduce the chance of this occurring again in the future. The types of people who have undertaken non-work-related interest courses between 1981 and 1991 may also, on average, be more likely to enrol in non-employer-provided vocational qualification courses over the same period.

The final set of variables are the characteristics of the firm where the individual worked in their first job and in 1981. These are likely to affect training outcomes through different access opportunities. Setting up training courses may involve considerable fixed costs; therefore one might expect large employers and/or public sector employers to provide training more routinely.

The variables we use in explaining the determinants of training are broadly in accordance with previous studies looking at this question. The major difference between our study and previous studies is that we use individual characteristics that were determined before current training took place. Most of the studies reviewed in Chapter 2, for instance, include current employer size as a determinant of training. Current employer size is not a valid variable, however, if individuals choose the type of employer in order to obtain training. If this occurred, current firm size could lead to a serious simultaneity bias in the results. On the other hand, early firm characteristics are only informative if there is some degree of persistence in the data which would imply that past firm characteristics are correlated with current ones. Whether this is the case is an empirical question.

Looking at the coefficients on the formal education variables, we see that the chance of undertaking an EPTC grows with school educational qualifications: the lowest probability of such training being obtained is for those with no qualifications or just CSEs (and one to four O levels for women). Post-school qualifications have no significant effect on the probability of obtaining

employer-provided training (EPTC) but have a very strong effect on the chance of the individual participating in a training course leading to a qualification (QTC). These effects are similar for both males and females, and imply that people who have obtained formal qualifications prior to 1981 are much more likely to participate in QTCs after 1981.

Individuals who have undertaken EPTCs in 1981 are more likely to obtain either EPTC or QTC training between 1981 and 1991. Both EPTCs and QTCs are more likely to be taken up by skilled non-manual workers and professionals than by the lower-skilled workers. The characteristics of men's first job when they commenced that job are important determinants of whether they received employer-provided training and qualification training. Those men in the private sector in their first job received less training on average, though this is only significant for qualification training. Men who commenced their career with large employers also had a lower probability of receiving both types of training. Social class in the first job appears to be a particularly important determinant of both types of training, with those in higher social classes having a higher probability of receiving both types of training. This is also true for women. Other first-job characteristics are generally less important determinants of training for women.

Some of the characteristics of the individual's 1981 job are also important determinants of both types of training. Employer-provided training was more likely to be undertaken by men and women in higher social classes, by those working in the public sector and by union members in 1981. Qualification training was more likely to be undertaken by individuals in higher social classes and by women working in the public sector and/or with large firms in 1981.

Women who had been made redundant prior to 1989 were more likely to have undertaken both types of training

TABLE 5.5

Male and female employment

Variable	Males *Coeff.*	*(S.E.)*	Females *Coeff.*	*(S.E.)*
Constant	0.551	(0.840)	0.094	(0.594)
Age when started first job:				
17 years	0.820	(1.239)	0.453	(0.735)
18–20 years	0.908	(1.173)	1.821	(0.596)
21–23 years	–0.356	(0.661)	0.234	(0.464)
Log real weekly wage first job × full-time ×:				
Age 15–16 years start first job	0.030	(0.124)	0.145	(0.098)
Age 17 years start first job	–0.163	(0.275)	0.020	(0.148)
Age 18–20 years start first job	–0.098	(0.249)	–0.259	(0.112)
Age 21–23 years start first job	0.175	(0.091)	0.109	(0.042)
Log real weekly wage first job × part-time	–0.013	(0.153)	–0.021	(0.084)
Private sector first job	0.010	(0.142)	0.046	(0.094)
Large employer first job	0.221	(0.162)	–0.217	(0.109)
Social class first job:				
Professional/Intermediate	–0.217	(0.238)	–0.069	(0.168)
Skilled non-manual	0.186	(0.186)	–0.040	(0.112)
Skilled manual	0.094	(0.136)	–0.337	(0.170)
WRTCs by 1981:				
EPTC in first job	0.025	(0.137)	0.261	(0.103)
EPTC in 1981 job	0.250	(0.117)	0.176	(0.078)
One job only 1981	0.241	(0.147)	0.034	(0.086)
Private sector 1981	0.003	(0.130)	–0.228	(0.095)
Large employer 1981	–0.032	(0.141)	0.015	(0.105)
Union member 1981	0.040	(0.116)	0.144	(0.080)
Social class 1981 job:				
Professional/Intermediate	0.042	(0.219)	0.165	(0.162)
Skilled non-manual	0.007	(0.212)	–0.017	(0.127)
Skilled manual	–0.029	(0.143)	–0.083	(0.173)
Made redundant prior to 1989 (excl. last job)	–0.170	(0.126)	0.267	(0.126)
Undertaken interest course since 1981	0.157	(0.131)	–0.023	(0.073)
Highest school qualification:				
CSEs	0.458	(0.159)	0.021	(0.145)
1–4 O levels	0.544	(0.180)	0.205	(0.142)
5+ O levels	0.424	(0.219)	–0.008	(0.161)
A levels	0.757	(0.324)	–0.006	(0.195)
Highest post-school qualification 1981:				
Other	0.089	(0.194)	–0.021	(0.142)
Lower vocational	0.002	(0.211)	–0.058	(0.107)
Middle vocational	0.424	(0.177)	0.271	(0.191)
Higher vocational	0.827	(0.315)	0.028	(0.151)
Degree	0.507	(0.418)	0.261	(0.222)
Number of observations		1735		1661
P-value first-job characteristics		0.489		0.008
P-value ability variables		0.647		0.270
P-value 1981 regional variables		0.761		0.011
P-value 1974 family variables		0.031		0.553
Log likelihood		–393.02		–925.03
Pseudo R^2		0.1671		0.0746

(although these variables are not significant at conventional levels). Men who had been made redundant were less likely to have participated in employer-provided training courses. Finally, individuals who undertook non-work-related interest courses between 1981 and 1991 were also more likely to have undertaken EPTCs and QTCs during this period, though these variables are only significant for qualification courses.

In Table 5.5, we move on to document the impact earlier training and education have on the probability of being employed in 1991, again using a probit specification. Men and women who received employer-provided training in their 1981 job (and also, for women, their first job) are much more likely to be employed in 1991 than individuals who did not receive such training. The probability of being employed is also higher for men who had better education qualifications by 1981. Interestingly, this result does not carry through for women.

From the employer-provided training equations, following the method of Heckman (1979) and Smith and Blundell (1986), we construct a generalised residual or selection term, λ_{EPTC}, which will be included in our wage equations to control for the transitory shock bias discussed earlier. We also construct selection terms to control for the endogeneity of 1991 occupation, employment status and 1981 wage (λ_{OCC}, λ_{EMP} and λ_{w1}).[15]

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[15]The employment selection term is constructed from the employment probit equations shown in Table 5.5. The occupation selection term is calculated from an ordered probit on the 1991 occupational status of employed individuals, where the dependent variable takes the value 3 for professional/intermediate, 2 for skilled non-manual, 1 for skilled manual and 0 for all other occupations. The explanatory variables in this equation are identical to those for the training and employment equations. The wage selection term is simply the residual from regressing the log hourly wage in 1981 on the same set of exogenous explanatory variables used in the employment, occupation and

5.3 The Returns to Training

From the previous chapter, we can write the wage growth equation as

$$
\begin{aligned}
(5.1) \qquad \Delta w_{2i} = {} & (\tau_2 - 1)w_{1i} - \tau_2 x'_{1i}\,\beta_1 + x'_{2i}\,\beta_2 \\
& - \sum_{j=1}^{c} \tau_2 \delta_{1j} OC_{1ji} + \sum_{j=1}^{c} \delta_{2j} OC_{2ji} \\
& + \sum_{k=1}^{m0} (\alpha_{2k} - \tau_2 \alpha_{1k}) D_{0ki} \\
& + \sum_{k=1}^{m1} (\gamma_{2k} - \tau_2 \gamma_{1k}) D_{1ki} + \sum_{k=1}^{m2} \psi_{2k} D_{2ki} \\
& + \Psi_2(\varepsilon_{2i} - \varepsilon_{1i}).
\end{aligned}
$$

The pre-work training dummy variables, D_{0ki}, identify the individual's highest 'education' qualification — that is, their highest school and post-school qualifications obtained by 1981 when aged 23 years. The D_{0ki} variables therefore reflect formal educational qualifications (of type k) which have generally been obtained before the individual (denoted by i) commences work (i.e. at time $t = 0$). The D_{1ki} variables identify work-related training (of type k) received by the individual (denoted by i) between their first and 1981 job (i.e. at time $t = 1$). The D_{2ki} variables distinguish work-related training courses undertaken between 1981 and 1991 (i.e. at time $t = 2$). As indicated in the previous chapter, we find that $\gamma_{2k} - \tau_2 \gamma_{1k} = 0$ for all of

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training equations. The occupation and wage regression results are available from the authors.

our pre-1981 work-related training variables. We also find that $\alpha_{2k} - \tau_2\alpha_{1k} = 0$ for all of our post-school qualifications other than a degree. These variables are therefore excluded from our quasi-difference wage equations and form part of our instrument set.

In the estimates from the quasi-difference equations presented below, we allow for the endogeneity of the 1981 wage, w_{1i},[16] as well as employment and occupation.[17] We then look at the returns to employer-provided training and qualification training. Here we assume that the latter is a long-run individual decision and hence its incidence is not correlated with transitory shocks — although its timing may be; since we take a 10-year period, it is highly unlikely that endogeneity is a problem. Employer-provided training may well be endogenous, as discussed above. As was evident in the reduced-form equations presented in Tables 5.3 and 5.4, the instruments we exclude from the wage equations have significant explanatory power. In the male equation for employer-provided training, the first-job characteristics, the 1974 family background variables and earlier employer-provided training identify the model. For women, the 'ability' variables seem to identify the model together with the first-job characteristics and earlier employer-provided training.

As we discussed in Chapter 4, it is an open question whether training should be treated as endogenous or not. First, if all shocks to wages are permanent, the quasi-difference specification eliminates endogeneity bias. This is quite independent of whether entry into training was induced by a wage shock in the past. Second, even if

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[16]The 1981 wage will always be endogenous unless the shocks to wages are purely permanent.

[17]We do this by including the three selection terms λ_{EMP}, λ_{OCC} and λ_{w1} in all of our quasi-difference wage equations.

shocks are transitory, the fact that we are considering wage growth over a very long time period (10 years) implies that training that took place in between could potentially be taken as exogenous. This will be the case if past events are only weakly correlated with events that led to a subsequent training decision.[18]

Finally, note that the sample selection we use allows us to measure the returns to training without contamination of who pays for it. Suppose trainees are paid less during training to cover the cost of the course. Measuring the wage during an EPTC and comparing it with pay rates later would almost certainly lead to an overestimate of the training effect on productivity and pay. By comparing wages far apart, we get over this problem quite convincingly.

5.3.1 The basic estimates of returns to training

The results of our quasi-difference specification for men and women are given in Tables 5.6 and 5.7 respectively. In the first column of each table, we present the results that control for the correlation of training with the unobserved fixed effects only. In the second column, we also control for the effects of productivity shocks in 1981 and 1991. This is achieved using the assumption that the entry characteristics of the person's first job, family background variables, ability variables, training prior to 1981 and post-school qualifications obtained prior to 1981 (other than degrees) do not affect wage *growth* directly. This

[18] For example, suppose that in the fifth year in between our two observations a real wage fall led to entry into training (lower opportunity cost of training). Training would be endogenous in our equation if this shock were correlated with the unobservables in either 1981 or 1991. Since the training incidents we observe are distributed over the entire 10-year period, we cannot exclude this possibility.

TABLE 5.6

Male returns to training

	Quasi-difference wage equations			
Variable	*Coeff.*	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.409	(0.191)	0.412	(0.192)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.036	(0.018)	0.041	(0.024)
Off-the-job EPTC(s)	0.066	(0.017)	0.072	(0.024)
Previous jobs:				
On-the-job EPTC(s)	0.057	(0.036)	0.062	(0.037)
Off-the-job EPTC(s)	0.054	(0.025)	0.060	(0.029)
Beginning of new job	–0.001	(0.068)	–0.001	(0.068)
Other WRTCs	0.067	(0.021)	0.067	(0.021)
Only one job since 1981	0.007	(0.018)	0.007	(0.018)
QTC(s) since 1981:				
Lower vocational	–0.025	(0.026)	–0.024	(0.027)
Middle vocational	0.042	(0.046)	0.042	(0.046)
Higher vocational	0.085	(0.024)	0.085	(0.024)
w_1	–0.147	(0.122)	–0.150	(0.123)
Number of observations		1601		1601
Controlling for transitory shocks		No		Yes
Log likelihood		–331.05		–330.96
P-value Sargan statistic		0.610		0.606
R^2		0.4989		0.4989

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are given in Table A.4 in the Appendix.

assumption is sufficient to identify the model.[19] All the wage equations contain regional dummy variables, occupation dummies, union membership dummies, employer-size dummies and private sector dummies. Occupation,

[19] For all our wage equations, we report the P-value of the Sargan statistic, which tests the validity of our over-identifying assumptions. These over-identifying instrument validity tests are always easily passed in all our quasi-difference models.

TABLE 5.7

Female returns to training

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.555	(0.191)	0.524	(0.190)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.048	(0.025)	0.003	(0.032)
Off-the-job EPTC(s)	0.096	(0.025)	0.046	(0.032)
Previous jobs:				
On-the-job EPTC(s)	0.046	(0.036)	0.005	(0.039)
Off-the-job EPTC(s)	0.062	(0.032)	0.010	(0.041)
Beginning of new job	0.051	(0.053)	0.047	(0.053)
Other WRTCs	0.063	(0.027)	0.066	(0.027)
Only one job since 1981	0.133	(0.023)	0.128	(0.023)
QTC(s) since 1981:				
Lower vocational	0.011	(0.033)	0.011	(0.033)
Middle vocational	0.069	(0.049)	0.064	(0.049)
Higher vocational	0.104	(0.033)	0.103	(0.033)
w_1	–0.410	(0.142)	–0.376	(0.142)
Number of observations		1180		1180
Controlling for transitory shocks		No		Yes
Log likelihood		–284.86		–282.47
P-value Sargan statistic		0.596		0.633
R^2		0.5039		0.5059

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are given in Table A.5 in the Appendix.

employment and lagged wages are treated as endogenous in all specifications. Full details are given in Tables A.4 and A.5 in the Appendix.

To compute the estimated return to training, the coefficients need to be cumulated. For example, to evaluate the estimated return to taking on-the-job EPTC(s) with a current employer and off-the-job EPTC(s) with a previous employer, one has to add together the coefficients on each of these variables. Similarly, if a person has undertaken an off-the-job EPTC and also obtained a higher vocational

qualification from this training, then the effect is obtained by adding the coefficients on the two variables.

For men, the returns to training presented in Table 5.6 are significantly different from zero. Off-the-job EPTCs with the current employer have higher returns than on-the-job EPTCs. This is consistent with the fact that they probably involve more formal training.

Looking more closely at Table 5.6, the return to doing an off-the-job EPTC with a person's current employer is around 6.6 per cent,[20] compared with 3.6 per cent for an on-the-job EPTC. If this employer-provided training also results in a higher vocational qualification being obtained, then the return is close to 15 per cent[21] for an off-the-job EPTC and around 12 per cent for an on-the-job EPTC, compared with 8.5 per cent for a person who has obtained this qualification on a non-employer-provided course.[22] This suggests that obtaining a vocational qualification on an employer-provided course provides a much bigger return to men than obtaining it on a non-employer-provided course. Table 5.1 shows that just over half of all vocational qualifications acquired by men between 1981 and 1991 were obtained as a result of employer-provided courses.[23]

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[20] The percentage return to different types of training is approximately given by multiplying the appropriate coefficient(s) by 100.

[21] We obtain this figure by looking at the results in the first column of the table (not controlling for transitory shocks), adding the coefficient for off-the-job EPTC(s) with a person's current employer (0.066) and that on the higher vocational qualification (0.085), and multiplying this by 100, which gives 15.1 per cent.

[22] The returns to all vocational qualifications obtained on non-employer-provided courses are simply given by the coefficients on QTC variables. If more than one type of qualification has been obtained, then the coefficients on the qualifications need to be added together.

[23] These results are broadly consistent with the results found by Arulampalam, Booth and Elias (1995), also using the NCDS. Direct comparisons are not

A significant result for men from this table is the importance of training with a previous employer. For men, the returns are more or less the same whether it took place in the current or a previous job. This implies that EPTCs provide relatively general skills. In this context, it is likely that the worker pays a significant proportion of the costs of the course, at least implicitly through lower wages at the time of training. Because of this, our point of measuring the returns using wages before and after training over a 10-year period becomes even more important. One worry might be that the EPTCs (particularly those on the job) are simply induction courses associated with a new job. We include all such courses separately with the variable 'beginning of new job'. This coefficient is zero. Finally, just over 20 per cent of men (see Table 5.1) undertook additional work-related training between 1981 and 1991 for which we have no information. The return to doing such additional courses is around 6.7 per cent.

For men, it is noticeable that adjustment for productivity shocks in 1981 and 1991 is unnecessary. This is evident from the fact that the results do not change when we instrument EPTC participation (apart from an expected small loss in precision). For them, the main biases in evaluating the effects are washed out by the (quasi-) differencing procedure. Note that the lagged wage is not significant for men.[24] Nevertheless, if we treat the lagged

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possible because of definitional differences in the training variables used. They find that, among men experiencing some form of training or education course between 1981 and 1991, employer provision of the most recent course has a large significant impact on earnings. They find, however, that non-employer provision of the most recent training course or highest qualification course has no effect. Our results, which distinguish between different types of qualifications, suggest a significant positive return if a higher vocational qualification was obtained on such a course.

[24] Indicating that additive time effects are sufficient to capture the effects of

wage as exogenous, it becomes highly significant, indicating a rejection of the hypothesis that all shocks are permanent — this is important for the interpretation of the results.

Many of the results for women are quite different from those for men. For women, the lagged wage level is very significant — this is in line with the fact that the female labour market has changed dramatically during the 1980s. Based on our interpretation of this model, the result implies that the macroeconomic effects are likely to have very different impacts on different types of women. The evidence of selection by the size of productivity shocks in 1981 and 1991 is also quite strong. Without practically any loss in precision, the instrumented returns to employer-provided training are much smaller. Only off-the-job EPTCs with the current employer and higher vocational courses seem to have significant returns, although women who have undertaken additional work-related training between 1981 and 1991 receive a return of around 6.7 per cent (even when we control for transitory shocks). In contrast to men, women who did not switch jobs (e.g. had their children before 1981 or delayed childbirth after 1991) experienced higher wage growth. This may be due to the fact that these women have comparatively longer experience than women who have changed jobs.

It is important to note that training prior to 1981 is excluded from the quasi-difference wage equations for both men and women. These variables were found to be insignificant in the wage growth equation. However, previous school education and degrees are found to be significant, as documented in the full table of results in the Appendix. A reasonable interpretation of this is that the

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the macroeconomic shocks.

depreciation of training counterbalances the increasing returns to skills that have occurred over the 1980s. Formal education, on the other hand, has an impact on wage growth. In comparing the impact of training with the returns to formal education, it is important to take into account the impact of formal education on wage level *and* growth.

5.3.2 Does the duration of training matter?

The NCDS data allow us to identify the duration in weeks of the different types of EPTCs. The data descriptions of this split for men and women are presented in Tables 5.8

TABLE 5.8

Employed males' training duration and wages

			Real hourly wage (Jan. 1995 prices)			
		Persons	1981		1991	
Individuals who have undertaken:	*No.*	*(% of total)*	*Mean*	*(St. dev.)*	*Mean*	*(St. dev.)*
EPTCs since 1981:						
Current job:						
On-the-job EPTC(s)	389	(24.30)	5.33	(1.78)	9.10	(3.17)
≤ 1 week	121	(7.56)	5.13	(1.50)	9.14	(3.66)
> 1 week, ≤ 1 month	180	(11.24)	5.34	(2.07)	9.04	(3.23)
> 1 month	88	(5.50)	5.55	(1.43)	9.16	(2.20)
Off-the-job EPTC(s)	488	(30.48)	5.39	(2.59)	9.77	(4.31)
≤ 1 week	160	(9.99)	5.48	(3.96)	9.53	(4.68)
> 1 week, ≤ 1 month	169	(10.56)	5.41	(1.56)	10.67	(4.95)
> 1 month	159	(9.93)	5.30	(1.53)	9.05	(2.81)
Previous jobs:						
On-the-job EPTC(s)	111	(6.93)	4.93	(1.36)	9.76	(4.27)
≤ 1 week	43	(2.69)	4.89	(1.23)	9.69	(4.56)
> 1 week, ≤ 1 month	43	(2.69)	4.96	(1.51)	9.82	(4.69)
> 1 month	25	(1.56)	4.95	(1.38)	9.79	(2.94)
Off-the-job EPTC(s)	247	(15.43)	5.36	(3.31)	10.25	(4.71)
≤ 1 week	69	(4.31)	4.97	(1.38)	9.53	(4.25)
> 1 week, ≤ 1 month	60	(3.75)	6.32	(6.22)	10.51	(5.76)
> 1 month	118	(7.37)	5.10	(1.33)	10.55	(4.35)
All employed persons	1601	(100.00)	5.19	(2.21)	8.51	(3.90)

TABLE 5.9

Employed females' training duration and wages

Individuals who have undertaken:	Persons *No.*	Persons *(% of total)*	*Real hourly wage (Jan. 1995 prices)* 1981 *Mean*	1981 *(St. dev.)*	1991 *Mean*	1991 *(St. dev.)*
EPTCs since 1981:						
Current job:						
On-the-job EPTC(s)	197	(16.69)	4.79	(1.59)	7.82	(2.56)
≤ 1 week	60	(5.08)	4.56	(1.49)	7.47	(2.45)
> 1 week, ≤ 1 month	92	(7.80)	4.96	(1.82)	7.73	(2.59)
> 1 month	45	(3.81)	4.75	(1.13)	8.46	(2.58)
Off-the-job EPTC(s)	213	(18.05)	4.72	(1.65)	8.10	(3.34)
≤ 1 week	84	(7.12)	4.75	(2.03)	8.12	(3.24)
> 1 week, ≤ 1 month	43	(3.64)	4.93	(1.43)	8.04	(2.58)
> 1 month	86	(7.29)	4.59	(1.31)	8.10	(3.77)
Previous jobs:						
On-the-job EPTC(s)	108	(9.15)	4.56	(1.51)	7.45	(3.11)
≤ 1 week	30	(2.54)	4.75	(2.31)	6.60	(2.86)
> 1 week, ≤ 1 month	34	(2.88)	4.83	(1.24)	8.16	(3.64)
> 1 month	44	(3.73)	4.21	(0.84)	7.48	(2.72)
Off-the-job EPTC(s)	134	(11.36)	4.84	(1.52)	8.02	(3.27)
≤ 1 week	32	(2.71)	4.75	(1.23)	7.30	(2.78)
> 1 week, ≤ 1 month	38	(3.22)	4.98	(1.61)	7.91	(3.11)
> 1 month	64	(5.42)	4.79	(1.60)	8.45	(3.56)
All employed persons	1180	(100.00)	4.47	(1.76)	6.47	(3.07)

and 5.9 respectively. The cell sizes for women are small and, in what follows, we focus on the impact on men. The impact of splitting by duration on our estimates of the returns to training are presented in Table 5.10. For on-the-job EPTCs, the returns seem to be highest for the courses that last over a month. This is further evidence that these courses are not simple induction courses provided to accompany job changes, but are substantial training courses.

For off-the-job EPTCs, returns seem to fall when we move to the courses with longest duration. Quite strikingly, courses undertaken while working with a previous employer have a more or less identical return structure to

TABLE 5.10

Duration and male returns to training

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.428	(0.190)	0.438	(0.191)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)				
≤ 1 week	0.008	(0.027)	0.021	(0.030)
> 1 week, ≤ 1 month	0.029	(0.023)	0.046	(0.029)
> 1 month	0.127	(0.033)	0.146	(0.039)
Off-the-job EPTC(s)				
≤ 1 week	0.048	(0.025)	0.063	(0.028)
> 1 week, ≤ 1 month	0.108	(0.028)	0.126	(0.033)
> 1 month	0.073	(0.025)	0.092	(0.031)
Previous jobs:				
On-the-job EPTC(s)				
≤ 1 week	0.024	(0.048)	0.031	(0.048)
> 1 week, ≤ 1 month	0.065	(0.066)	0.082	(0.067)
> 1 month	0.132	(0.052)	0.146	(0.053)
Off-the-job EPTC(s)				
≤ 1 week	0.070	(0.042)	0.085	(0.044)
> 1 week, ≤ 1 month	0.024	(0.050)	0.042	(0.052)
> 1 month	0.082	(0.031)	0.099	(0.035)
Beginning of new job	0.002	(0.068)	0.002	(0.068)
Other WRTCs	0.057	(0.022)	0.056	(0.022)
Only one job since 1981	0.005	(0.018)	0.005	(0.018)
QTC(s) since 1981:				
Lower vocational	–0.031	(0.027)	–0.030	(0.027)
Middle vocational	0.030	(0.047)	0.029	(0.047)
Higher vocational	0.075	(0.025)	0.074	(0.025)
w_1	–0.166	(0.122)	–0.176	(0.123)
Number of observations		1601		1601
Controlling for transitory shocks		No		Yes
Log likelihood		–323.63		–323.10
P-value Sargan statistic		0.688		0.673
R^2		0.5035		0.5038

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are available from the authors.

that of courses undertaken with a person's current employer. What these results seem to show is that duration does matter, with the very short courses having the lowest returns.

5.3.3 Does the timing of training matter?

In the results presented so far, we have assumed that work-related training affects only the level and not the

TABLE 5.11

The timing of training and employed males' wages

			Real hourly wage (Jan. 1995 prices)			
		Persons	1981		1991	
Individuals who have undertaken:	*No.*	*(% of total)*	*Mean*	*(St. dev.)*	*Mean*	*(St. dev.)*
EPTCs since 1981:						
Current job:						
On-the-job EPTC(s)	389	(24.30)	5.33	(1.78)	9.10	(3.17)
Since 1989	303	(18.93)	5.32	(1.87)	9.21	(3.29)
Before 1989	173	(10.81)	5.50	(2.11)	8.97	(2.48)
Off-the-job EPTC(s)	488	(30.48)	5.39	(2.59)	9.77	(4.31)
Since 1989	317	(19.80)	5.55	(3.05)	10.21	(4.52)
Before 1989	266	(16.61)	5.28	(1.45)	9.38	(3.99)
All employed persons	1601	(100.00)	5.19	(2.21)	8.51	(3.90)

TABLE 5.12

The timing of training and employed females' wages

			Real hourly wage (Jan. 1995 prices)			
		Persons	1981		1991	
Individuals who have undertaken:	*No.*	*(% of total)*	*Mean*	*(St. dev.)*	*Mean*	*(St. dev.)*
EPTCs since 1981:						
Current job:						
On-the-job EPTC(s)	197	(16.69)	4.79	(1.59)	7.82	(2.56)
Since 1989	144	(12.20)	4.75	(1.69)	7.77	(2.52)
Before 1989	104	(8.81)	4.86	(1.17)	8.04	(2.66)
Off-the-job EPTC(s)	213	(18.05)	4.72	(1.65)	8.10	(3.34)
Since 1989	143	(12.12)	4.75	(1.84)	7.88	(2.82)
Before 1989	106	(8.98)	4.67	(1.16)	8.67	(3.68)
All employed persons	1180	(100.00)	4.47	(1.76)	6.47	(3.07)

growth of wages. If, however, it affects both the level and the rate of growth of wages, then earlier training should have a larger impact than later training. If, on the other hand, training affects the level of wages temporarily and as training skills depreciate, wages return to their old path, then we might expect more recent training to affect wages more than more distant training courses.

From the NCDS data, we know when the respondent started their EPTCs, and we distinguish between courses commenced prior to 1989 and those started in 1989, 1990 or 1991.[25] This data split is described in Tables 5.11 and 5.12 for men and women respectively. Again, the sample sizes for women are rather low and we focus on the impact on the returns for men.

In Table 5.13, we present results on where we interact the training variables with whether training took place before or since 1989. Earlier off-the-job training is worth less than more recent off-the-job training, which is consistent with the idea that skills may depreciate with time. For on-the-job training, the estimates are too imprecise to draw definitive conclusions.[26]

5.3.4 Promotion, tenure and the returns to employer-provided training

Although our results control for the possibility that the measured returns to EPTCs are simply the effect of a job change, we have not excluded the possibility that they just capture the effects of tenure or promotion. It is quite difficult to control for these effects in a completely satisfactory way, since both tenure and promotion are also endogenous.

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[25] We tried a number of timing splits but the results were fairly robust to different specifications.

[26] Arulampalam, Booth and Elias (1995) also find evidence of depreciation.

TABLE 5.13

Timing and male returns to training

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.418	(0.191)	0.421	(0.192)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)				
Since 1989	0.042	(0.020)	0.045	(0.023)
Before 1989	0.035	(0.022)	0.037	(0.024)
Off-the-job EPTC(s)				
Since 1989	0.063	(0.020)	0.066	(0.023)
Before 1989	0.034	(0.021)	0.038	(0.025)
Previous jobs:				
On-the-job EPTC(s)	0.060	(0.036)	0.063	(0.037)
Off-the-job EPTC(s)	0.057	(0.025)	0.061	(0.029)
Beginning of new job	–0.000	(0.068)	–0.000	(0.068)
Other WRTCs	0.056	(0.022)	0.055	(0.022)
Only one job since 1981	0.008	(0.018)	0.008	(0.018)
QTC(s) since 1981:				
Lower vocational	–0.025	(0.027)	–0.024	(0.027)
Middle vocational	0.046	(0.046)	0.046	(0.046)
Higher vocational	0.084	(0.024)	0.084	(0.024)
w_1	–0.152	(0.122)	–0.154	(0.122)
Number of observations		1601		1601
Controlling for transitory shocks		No		Yes
Log likelihood		–330.55		–330.49
P-value Sargan statistic		0.594		0.593
R^2		0.4992		0.4992

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are available from the authors.

It is clear from the raw data that people who have received employer-provided training in their current job are much more likely to have been promoted in their current job and have much longer job tenure. For individuals who have received employer-provided training in their current job, 70 per cent of men and women have been promoted in their current job, compared with only 46 per

TABLE 5.14

Effect of promotion and experience on male training returns

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.395	(0.188)	0.400	(0.189)
Tenure (years) in current job	0.005	(0.003)	0.005	(0.003)
Promoted in current job	0.051	(0.018)	0.052	(0.018)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.027	(0.018)	0.038	(0.023)
Off-the-job EPTC(s)	0.053	(0.017)	0.064	(0.023)
Previous jobs:				
On-the-job EPTC(s)	0.069	(0.036)	0.077	(0.037)
Off-the-job EPTC(s)	0.066	(0.025)	0.076	(0.029)
Beginning of new job	–0.001	(0.067)	–0.001	(0.067)
Other WRTCs	0.065	(0.021)	0.065	(0.021)
Only one job since 1981	–0.045	(0.030)	–0.045	(0.030)
QTC(s) since 1981:				
Lower vocational	–0.029	(0.026)	–0.028	(0.026)
Middle vocational	0.048	(0.046)	0.048	(0.046)
Higher vocational	0.085	(0.024)	0.085	(0.024)
w_1	–0.135	(0.122)	–0.140	(0.123)
Number of observations		1601		1601
Controlling for transitory shocks		No		Yes
Log likelihood		–321.56		–321.30
P-value Sargan statistic		0.495		0.487
R^2		0.5048		0.5049

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are available from the authors.

cent of men and 31 per cent of women who have not received such training. Average job tenure in the person's current job is also significantly higher for individuals who have received some employer-provided training in their current job (9.5 years for men and 8.9 years for women) than for those who have not received such training (6.8 years for men and 5.1 years for women).

In Tables 5.14 and 5.15, we have re-estimated our wage equations for men and women respectively, and included

TABLE 5.15

Effect of promotion and experience on female training returns

	Quasi-difference wage equations			
Variable	*Coeff.*	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.514	(0.190)	0.484	(0.190)
Tenure (years) in current job	0.010	(0.003)	0.010	(0.003)
Promoted in current job	0.106	(0.022)	0.105	(0.022)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.015	(0.026)	–0.026	(0.032)
Off-the-job EPTC(s)	0.066	(0.025)	0.019	(0.031)
Previous jobs:				
On-the-job EPTC(s)	0.070	(0.036)	0.032	(0.039)
Off-the-job EPTC(s)	0.079	(0.033)	0.030	(0.041)
Beginning of new job	0.049	(0.053)	0.045	(0.054)
Other WRTCs	0.048	(0.027)	0.051	(0.027)
Only one job since 1981	0.017	(0.037)	0.011	(0.037)
QTC(s) since 1981:				
Lower vocational	0.025	(0.033)	0.025	(0.032)
Middle vocational	0.070	(0.050)	0.065	(0.049)
Higher vocational	0.098	(0.033)	0.097	(0.033)
w_1	–0.407	(0.142)	–0.377	(0.142)
Number of observations		1180		1180
Controlling for transitory shocks		No		Yes
Log likelihood		–265.79		–263.66
P-value Sargan statistic		0.507		0.539
R^2		0.5197		0.5214

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are available from the authors.

the individual's tenure in years in their current job and a dummy variable identifying whether they have been promoted in their current job. Because of endogeneity problems, the estimated coefficients on the tenure and promotion variables are biased. However, it is reassuring to find for men that when we include these variables, the returns to employer-provided training in the person's current job, although slightly smaller, are still positive and significant in all the cases where they were before. The

promotion effect on current wages is quite large and significant, but the tenure effect is very small and insignificant. In any case, introducing these variables does not greatly reduce the employer-provided training effects: it does not seem to be the case that employer-provided training is a proxy for promotion.

For women, both the tenure and promotion variables are highly significant. More importantly, their inclusion reduces markedly the returns to an off-the-job EPTC with the current employer, while it increases the returns from training obtained with a previous employer. After controlling for tenure and promotion, the results for women seem to have become in some respects closer to those for men. Nevertheless, the effects are not particularly significant.

5.3.5 School qualifications and the returns to training

In this final results section, we address the following simple question. Is it the case that individuals with at least some basic qualifications have higher returns to work-related training courses? To answer this question, we estimate the basic quasi-difference model for the sub-sample of those with O levels, the school qualifications obtained at the age of 16. Summary statistics for these individuals are given for men and women respectively in Tables A.6 and A.7 in the Appendix.

The results for men are presented in Table 5.16. They have to be viewed in the light of much smaller sample sizes. The returns to off-the-job EPTCs with the current employer remain unchanged, but the returns to on-the-job EPTCs increase from 4.1 per cent to 8.4 per cent. The returns to training with a previous employer fall, and even become negative for on-the-job EPTCs, but, in view of the very large increase in the standard error, it is hard to interpret this result. The returns to higher vocational training almost double.

TABLE 5.16

The returns for men with O levels

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.306	(0.287)	0.316	(0.287)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.067	(0.028)	0.084	(0.037)
Off-the-job EPTC(s)	0.055	(0.025)	0.075	(0.037)
Previous jobs:				
On-the-job EPTC(s)	–0.035	(0.060)	–0.021	(0.061)
Off-the-job EPTC(s)	0.016	(0.040)	0.032	(0.046)
Beginning of new job	0.066	(0.107)	0.069	(0.108)
Other WRTCs	0.058	(0.033)	0.057	(0.033)
Only one job since 1981	–0.031	(0.026)	–0.030	(0.026)
QTC(s) since 1981:				
Lower vocational	–0.020	(0.035)	–0.020	(0.035)
Middle vocational	0.039	(0.058)	0.041	(0.059)
Higher vocational	0.133	(0.038)	0.133	(0.039)
w_1	–0.003	(0.184)	–0.012	(0.184)
Number of observations		754		754
Controlling for transitory shocks		No		Yes
Log likelihood		–147.98		–147.67
P-value Sargan statistic		0.494		0.474
R^2		0.3635		0.3640

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are given in Table A.8 in the Appendix.

Amongst the results for women, presented in Table 5.17, the only notable change is the returns to vocational training. Both the middle and higher vocational courses have much higher returns for women who have obtained O levels.

These results clearly suggest that work-related training has a particularly significant impact on the wage prospects of individuals with only intermediate levels of schooling. These individuals, however, are much less likely to re-

TABLE 5.17

The returns for women with O levels

Variable	Quasi-difference wage equations			
	Coeff.	*(S.E.)*	*Coeff.*	*(S.E.)*
Constant	0.212	(0.331)	0.172	(0.328)
EPTCs since 1981:				
Current job:				
On-the-job EPTC(s)	0.043	(0.034)	–0.031	(0.046)
Off-the-job EPTC(s)	0.098	(0.035)	0.027	(0.040)
Previous jobs:				
On-the-job EPTC(s)	0.045	(0.053)	–0.020	(0.061)
Off-the-job EPTC(s)	0.158	(0.050)	0.080	(0.062)
Beginning of new job	–0.008	(0.088)	–0.008	(0.089)
Other WRTCs	0.080	(0.038)	0.091	(0.038)
Only one job since 1981	0.159	(0.033)	0.149	(0.033)
QTC(s) since 1981:				
Lower vocational	–0.028	(0.042)	–0.030	(0.042)
Middle vocational	0.129	(0.064)	0.118	(0.062)
Higher vocational	0.137	(0.048)	0.136	(0.048)
w_1	–0.277	(0.224)	–0.233	(0.222)
Number of observations		596		596
Controlling for transitory shocks		No		Yes
Log likelihood		–143.95		–141.36
P-value Sargan statistic		0.512		0.529
R^2		0.4653		0.4699

Note: All wage equations control for 1981 and 1991 region, employer size, union membership and occupation. We also include dummy variables that identify the person's highest school qualification and whether they had a degree in 1981. 1991 occupation, 1981 wage and 1991 employment status are treated as endogenous in both equations. Full details of the regression equations are given in Table A.9 in the Appendix.

ceive work-related training than better-educated individuals (see Tables 5.3 and 5.4).

CHAPTER 6
Conclusions

In this report, we have looked at the determinants and effects of different types of work-related training. The analysis has considered a sample of men and women from the National Child Development Survey. We focused on employer-provided and qualification training courses (both employer-provided and non-employer-provided) undertaken over the 10-year period to 1991 when the individuals were aged 33. We concentrated on those individuals who were employees in 1981 and 1991.

We found that more-educated people have a greater probability of receiving both types of training, which confirms previous British and US research looking at the determinants of training. We also found that men have a substantially higher probability of receiving both employer-provided and qualification training courses than women in our sample. Another finding was that people who had received employer-provided training before 1981 were more likely to receive such training between 1981 and 1991. Similarly, people who had undertaken post-school qualification courses before 1981 were more likely to have undertaken such courses between 1981 and 1991.

We discussed a number of alternative ways of eliminating spurious correlation between participation in training and observed returns to training. These methods allowed us to take account of unobservable individual characteristics and circumstances that determine wages but which may also be correlated with participation in different types of training and hence bias our estimates of the returns to training.

With respect to the estimated returns, our results suggested that, for men, undertaking an employer-provided

training course confers a significant wage advantage. This was more pronounced if the training took place off the job and resulted in a higher-level vocational qualification. What is perhaps more surprising is that employer-provided training with a previous employer results in only marginally smaller returns. These results were found to be robust to promotion and tenure effects. For women, the results suggested a somewhat smaller impact of employer-provided training but a relatively larger impact from courses leading to qualifications.

The returns to training were found to be complementary with formal education, but the highest returns were found to accrue to those with only intermediate levels of education. This group is of particular interest since we have also shown that they are relatively less likely to be receiving training in comparison with the more-highly-educated workers in Britain. They also appear to get less training than similarly-educated workers in Germany and the US.

APPENDIX

TABLE A.1: Summary statistics for males

Variable	Whole sample 1735 observations		Employed sample 1601 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Employed 1991	0.923	(0.267)		
w_2			2.054	(0.412)
w_1	1.588	(0.307)	1.594	(0.308)
Δw_2			0.460	(0.420)
Undertaken WRTC since 1981	0.614	(0.487)	0.636	(0.481)
With qualification	0.235	(0.424)	0.241	(0.428)
WRTCs since 1981:				
Current job:				
On-the-job EPTC(s)			0.243	(0.429)
With qualification			0.026	(0.160)
Off-the-job EPTC(s)			0.305	(0.460)
With qualification			0.057	(0.232)
Previous jobs:				
On-the-job EPTC(s)			0.069	(0.254)
With qualification			0.009	(0.096)
Off-the-job EPTC(s)			0.154	(0.361)
With qualification			0.057	(0.232)
EPTC	0.557	(0.497)	0.582	(0.493)
With qualification	0.131	(0.338)	0.140	(0.347)
Non-employer-provided QTC(s)	0.115	(0.319)	0.114	(0.318)
Beginning of new job	0.020	(0.139)	0.020	(0.140)
Other WRTCs	0.196	(0.397)	0.205	(0.404)
Only one job since 1981	0.390	(0.488)	0.405	(0.491)
QTC(s) since 1981:				
Lower vocational	0.092	(0.289)	0.093	(0.291)
Middle vocational	0.031	(0.172)	0.029	(0.169)
Higher vocational	0.134	(0.341)	0.141	(0.348)
Private sector 1991			0.705	(0.456)
Large employer 1991			0.236	(0.425)
Union member 1991			0.455	(0.498)
Social class 1991 job:				
Professional/Intermediate			0.427	(0.495)
Skilled non-manual			0.126	(0.332)
Skilled manual			0.317	(0.465)
Years in 1991 job			7.838	(5.673)
Promoted in 1991 job			0.557	(0.497)
WRTCs by 1981:				
EPTC in 1981 job	0.539	(0.499)	0.558	(0.497)
EPTC in first job	0.307	(0.461)	0.302	(0.459)
Highest school qualification 1981:				
None	0.138	(0.345)	0.119	(0.324)
CSEs	0.180	(0.384)	0.179	(0.384)
1–4 O levels	0.225	(0.418)	0.230	(0.421)
5+ O levels	0.238	(0.426)	0.241	(0.428)
A levels	0.220	(0.414)	0.231	(0.422)
Highest post-school qualification 1981:				
None	0.417	(0.493)	0.399	(0.490)
Other	0.076	(0.264)	0.075	(0.263)
Lower vocational	0.137	(0.344)	0.137	(0.344)
Middle vocational	0.167	(0.373)	0.174	(0.379)
Higher vocational	0.099	(0.299)	0.106	(0.308)
Degree	0.105	(0.307)	0.110	(0.313)

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TABLE A.1 continued

Variable	Whole sample 1735 observations		Employed sample 1601 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
One job only 1981	0.359	(0.480)	0.372	(0.483)
Private sector 1981	0.663	(0.473)	0.660	(0.474)
Large employer 1981	0.252	(0.434)	0.256	(0.437)
Union member 1981	0.537	(0.499)	0.538	(0.499)
Social class 1981 job:				
Professional/Intermediate	0.239	(0.427)	0.248	(0.432)
Skilled non-manual	0.217	(0.412)	0.224	(0.417)
Skilled manual	0.402	(0.491)	0.397	(0.489)
Years in 1981 job	3.598	(2.461)	3.641	(2.463)
Promoted in 1981 job	0.381	(0.486)	0.389	(0.488)
1991 region:				
North	0.063	(0.243)	0.062	(0.242)
North-West	0.111	(0.315)	0.109	(0.312)
Yorkshire and Humberside	0.096	(0.294)	0.092	(0.289)
West Midlands	0.096	(0.295)	0.098	(0.297)
East Midlands	0.077	(0.266)	0.077	(0.267)
East Anglia	0.041	(0.199)	0.043	(0.203)
South-West	0.075	(0.263)	0.076	(0.264)
South-East	0.240	(0.427)	0.239	(0.427)
London	0.047	(0.212)	0.049	(0.217)
Wales	0.062	(0.241)	0.061	(0.239)
Scotland	0.092	(0.289)	0.093	(0.291)
1981 region:				
London	0.098	(0.297)	0.100	(0.300)
South-East	0.200	(0.400)	0.198	(0.399)
South-West	0.068	(0.252)	0.069	(0.254)
Wales	0.062	(0.241)	0.061	(0.240)
West Midlands	0.092	(0.289)	0.094	(0.292)
East Midlands	0.077	(0.267)	0.079	(0.269)
East Anglia	0.033	(0.180)	0.034	(0.182)
Yorkshire and Humberside	0.086	(0.281)	0.084	(0.277)
North-West	0.114	(0.318)	0.112	(0.315)
North	0.073	(0.260)	0.072	(0.259)
Scotland	0.097	(0.296)	0.096	(0.295)
Maths ability age 7:				
Bottom quintile	0.169	(0.375)	0.163	(0.370)
Second quintile	0.180	(0.384)	0.174	(0.379)
Third quintile	0.209	(0.406)	0.212	(0.409)
Fourth quintile	0.210	(0.407)	0.212	(0.409)
Top quintile	0.232	(0.422)	0.238	(0.426)
Reading ability age 7:				
Bottom quintile	0.193	(0.394)	0.181	(0.385)
Second quintile	0.221	(0.415)	0.225	(0.418)
Third quintile	0.205	(0.404)	0.206	(0.405)
Fourth quintile	0.207	(0.406)	0.211	(0.408)
Top quintile	0.173	(0.379)	0.176	(0.381)

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TABLE A.1 continued

Variable	Whole sample 1735 observations		Employed sample 1601 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Teachers' rating at age 7:				
Avid reader	0.053	(0.224)	0.054	(0.227)
Above-average reader	0.231	(0.422)	0.239	(0.427)
Average reader	0.441	(0.497)	0.445	(0.497)
Excellent number skills	0.048	(0.215)	0.049	(0.217)
Good number skills	0.203	(0.403)	0.212	(0.409)
Average number skills	0.441	(0.497)	0.446	(0.497)
Outstanding general knowledge	0.037	(0.189)	0.037	(0.190)
Good general knowledge	0.240	(0.427)	0.250	(0.433)
Average general knowledge	0.473	(0.499)	0.473	(0.499)
Father's years of education	8.176	(4.152)	8.206	(4.150)
Father's education not known	0.178	(0.382)	0.176	(0.381)
No father 1974	0.048	(0.213)	0.046	(0.210)
Mother's years of education	8.308	(3.924)	8.338	(3.920)
Mother's education not known	0.163	(0.370)	0.162	(0.368)
No mother 1974	0.160	(0.367)	0.159	(0.366)
Father's occupation 1974:				
Professional/Intermediate	0.209	(0.406)	0.213	(0.410)
Skilled non-manual	0.093	(0.290)	0.097	(0.296)
Skilled manual	0.356	(0.479)	0.349	(0.477)
Father unemployed 1958, '65 or '74	0.186	(0.389)	0.182	(0.386)
Mother employed 1974	0.582	(0.493)	0.590	(0.492)
Financial difficulties 1974	0.099	(0.299)	0.092	(0.289)
Lived with both parents 1974	0.646	(0.478)	0.658	(0.475)
Number of siblings	1.884	(1.801)	1.857	(1.770)
Number of older siblings	0.945	(1.361)	0.929	(1.343)

TABLE A.2: Summary statistics for females

Variable	Whole sample 1661 observations		Employed sample 1180 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Employed 1991	0.710	(0.454)		
w_2			1.762	(0.463)
w_1	1.423	(0.329)	1.441	(0.328)
Δw_2			0.321	(0.438)
Undertaken WRTC since 1981	0.431	(0.495)	0.500	(0.500)
With qualification	0.184	(0.388)	0.218	(0.413)
WRTCs since 1981:				
Current job:				
On-the-job EPTC(s)			0.167	(0.373)
With qualification			0.018	(0.132)
Off-the-job EPTC(s)			0.181	(0.385)
With qualification			0.039	(0.194)
Previous jobs:				
On-the-job EPTC(s)			0.092	(0.288)
With qualification			0.025	(0.155)
Off-the-job EPTC(s)			0.114	(0.317)
With qualification			0.040	(0.196)
EPTC	0.365	(0.482)	0.431	(0.495)
With qualification	0.092	(0.289)	0.112	(0.315)
Non-employer-provided QTC(s)	0.107	(0.309)	0.123	(0.328)
Beginning of new job	0.017	(0.131)	0.019	(0.135)
Other WRTCs	0.099	(0.298)	0.125	(0.331)
Only one job since 1981	0.317	(0.465)	0.267	(0.443)
QTC(s) since 1981:				
Lower vocational	0.076	(0.266)	0.092	(0.288)
Middle vocational	0.020	(0.142)	0.025	(0.155)
Higher vocational	0.101	(0.302)	0.118	(0.323)
Private sector 1991			0.559	(0.497)
Large employer 1991			0.194	(0.396)
Union member 1991			0.400	(0.490)
Social class 1991 job:				
Professional/Intermediate			0.415	(0.493)
Skilled non-manual			0.378	(0.485)
Skilled manual			0.054	(0.227)
Years in 1991 job			6.009	(5.579)
Promoted in 1991 job			0.404	(0.491)
WRTCs by 1981:				
EPTC in 1981 job	0.374	(0.484)	0.401	(0.490)
EPTC in first job	0.179	(0.384)	0.188	(0.391)
Highest school qualification 1981:				
None	0.090	(0.287)	0.085	(0.279)
CSEs	0.154	(0.361)	0.139	(0.346)
1–4 O levels	0.289	(0.453)	0.303	(0.460)
5+ O levels	0.208	(0.406)	0.202	(0.401)
A levels	0.259	(0.438)	0.271	(0.445)
Highest post-school qualification 1981:				
None	0.511	(0.500)	0.500	(0.500)
Other	0.066	(0.248)	0.064	(0.246)
Lower vocational	0.149	(0.356)	0.138	(0.345)
Middle vocational	0.044	(0.205)	0.048	(0.215)
Higher vocational	0.122	(0.328)	0.131	(0.337)
Degree	0.108	(0.311)	0.119	(0.324)

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TABLE A.2 continued

Variable	Whole sample 1661 observations		Employed sample 1180 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
One job only 1981	0.332	(0.471)	0.336	(0.473)
Private sector 1981	0.586	(0.493)	0.553	(0.497)
Large employer 1981	0.200	(0.400)	0.203	(0.403)
Union member 1981	0.459	(0.498)	0.490	(0.500)
Social class 1981 job:				
Professional/Intermediate	0.262	(0.440)	0.288	(0.453)
Skilled non-manual	0.544	(0.498)	0.531	(0.499)
Skilled manual	0.064	(0.245)	0.056	(0.230)
Years in 1981 job	3.242	(2.449)	3.257	(2.423)
Promoted in 1981 job	0.367	(0.482)	0.376	(0.485)
1991 region:				
North	0.044	(0.205)	0.046	(0.209)
North-West	0.119	(0.323)	0.125	(0.330)
Yorkshire and Humberside	0.102	(0.303)	0.104	(0.306)
West Midlands	0.090	(0.286)	0.099	(0.299)
East Midlands	0.058	(0.233)	0.051	(0.220)
East Anglia	0.045	(0.206)	0.047	(0.211)
South-West	0.076	(0.265)	0.083	(0.276)
South-East	0.259	(0.438)	0.234	(0.423)
London	0.051	(0.220)	0.052	(0.222)
Wales	0.049	(0.217)	0.045	(0.207)
Scotland	0.107	(0.309)	0.115	(0.319)
1981 region:				
London	0.125	(0.331)	0.122	(0.327)
South-East	0.196	(0.397)	0.171	(0.377)
South-West	0.066	(0.248)	0.073	(0.260)
Wales	0.049	(0.215)	0.047	(0.211)
West Midlands	0.089	(0.285)	0.095	(0.293)
East Midlands	0.060	(0.237)	0.056	(0.230)
East Anglia	0.037	(0.188)	0.040	(0.196)
Yorkshire and Humberside	0.092	(0.289)	0.094	(0.292)
North-West	0.124	(0.330)	0.132	(0.339)
North	0.051	(0.220)	0.048	(0.215)
Scotland	0.111	(0.315)	0.122	(0.327)
Maths ability age 7:				
Bottom quintile	0.167	(0.373)	0.162	(0.368)
Second quintile	0.213	(0.409)	0.208	(0.406)
Third quintile	0.209	(0.407)	0.201	(0.401)
Fourth quintile	0.203	(0.403)	0.214	(0.410)
Top quintile	0.208	(0.406)	0.216	(0.412)
Reading ability age 7:				
Bottom quintile	0.099	(0.298)	0.098	(0.298)
Second quintile	0.166	(0.372)	0.152	(0.359)
Third quintile	0.215	(0.411)	0.212	(0.409)
Fourth quintile	0.255	(0.436)	0.253	(0.435)
Top quintile	0.266	(0.442)	0.286	(0.452)

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TABLE A.2 continued

Variable	Whole sample 1661 observations		Employed sample 1180 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Teachers' rating at age 7:				
Avid reader	0.099	(0.299)	0.105	(0.307)
Above-average reader	0.326	(0.469)	0.334	(0.472)
Average reader	0.455	(0.498)	0.453	(0.498)
Excellent number skills	0.031	(0.173)	0.032	(0.177)
Good number skills	0.202	(0.402)	0.211	(0.408)
Average number skills	0.480	(0.500)	0.484	(0.500)
Outstanding general knowledge	0.023	(0.150)	0.021	(0.144)
Good general knowledge	0.199	(0.400)	0.220	(0.415)
Average general knowledge	0.588	(0.492)	0.576	(0.494)
Father's years of education	8.260	(4.238)	8.320	(4.182)
Father's education not known	0.179	(0.384)	0.173	(0.378)
No father 1974	0.055	(0.229)	0.058	(0.235)
Mother's years of education	8.412	(3.974)	8.487	(3.890)
Mother's education not known	0.162	(0.369)	0.153	(0.361)
No mother 1974	0.163	(0.369)	0.151	(0.358)
Father's occupation 1974:				
Professional/Intermediate	0.234	(0.423)	0.231	(0.422)
Skilled non-manual	0.081	(0.273)	0.086	(0.281)
Skilled manual	0.347	(0.476)	0.350	(0.477)
Father unemployed 1958, '65 or '74	0.180	(0.384)	0.171	(0.377)
Mother employed 1974	0.587	(0.493)	0.604	(0.489)
Financial difficulties 1974	0.086	(0.281)	0.090	(0.286)
Lived with both parents 1974	0.664	(0.472)	0.669	(0.471)
Number of siblings	1.806	(1.659)	1.797	(1.638)
Number of older siblings	0.889	(1.244)	0.864	(1.190)

TABLE A.3: Training participation

Variable	EPTC		QTC	
	Coeff.	(S.E.)	Coeff.	(S.E.)
Constant	−2.133	(0.408)		
Age when started first job:				
17 years	1.083	(0.514)	0.372	(0.555)
18–20 years	0.643	(0.370)	0.341	(0.416)
21–23 years	0.521	(0.317)	−0.141	(0.360)
Log real weekly wage first job × full-time ×:				
Age 15–16 years start first job	0.136	(0.065)	0.072	(0.076)
Age 17 years start first job	−0.122	(0.108)	−0.018	(0.113)
Age 18–20 years start first job	0.002	(0.073)	−0.004	(0.077)
Age 21–23 years start first job	−0.023	(0.028)	−0.020	(0.027)
Log real weekly wage first job × part-time	−0.053	(0.066)	−0.037	(0.071)
Private sector first job	−0.021	(0.064)	−0.102	(0.067)
Large employer first job	−0.047	(0.072)	−0.190	(0.078)
Social class first job:				
Professional/Intermediate	0.301	(0.107)	0.309	(0.110)
Skilled non-manual	0.214	(0.080)	0.210	(0.088)
Skilled manual	−0.095	(0.082)	0.033	(0.095)
WRTCs by 1981:				
EPTC in first job	0.028	(0.066)	−0.054	(0.072)
EPTC in 1981 job	0.461	(0.051)	0.205	(0.056)
One job only 1981	−0.066	(0.061)	−0.154	(0.068)
Private sector 1981	−0.170	(0.063)	−0.143	(0.067)
Large employer 1981	−0.013	(0.067)	0.162	(0.072)
Union member 1981	0.206	(0.054)	−0.001	(0.059)
Social class 1981 job:				
Professional/Intermediate	0.302	(0.106)	0.513	(0.122)
Skilled non-manual	0.281	(0.096)	0.225	(0.116)
Skilled manual	−0.034	(0.091)	0.175	(0.112)
Made redundant prior to 1989 (excl. last job)	−0.098	(0.071)	0.087	(0.078)
Undertaken interest course since 1981	0.113	(0.052)	0.165	(0.055)
Highest school qualification:				
CSEs	0.301	(0.098)	0.287	(0.126)
1–4 O levels	0.342	(0.099)	0.282	(0.125)
5+ O levels	0.509	(0.108)	0.270	(0.134)
A levels	0.554	(0.134)	0.508	(0.155)
Highest post-school qualification 1981:				
Other	−0.045	(0.096)	0.160	(0.106)
Lower vocational	0.049	(0.079)	0.357	(0.086)
Middle vocational	0.167	(0.085)	0.493	(0.090)
Higher vocational	0.155	(0.093)	0.658	(0.092)
Degree	0.237	(0.142)	0.587	(0.138)
Male	0.747	(0.060)	0.341	(0.063)
μ_1			2.520	(0.457)
μ_2			2.841	(0.458)
μ_3			2.968	(0.458)
Number of observations	3396		3396	
P-value first-job characteristics	0.003		0.002	
P-value ability variables	0.548		0.156	
P-value 1981 regional variables	0.456		0.923	
P-value 1974 family variables	0.560		0.137	
Log likelihood	−1981.92		−2149.82	
Pseudo R^2	0.1547		0.1060	

TABLE A.4: Detailed male wage equations

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Constant	1.567	(0.093)	0.409	(0.191)	0.412	(0.192)
w_1			−0.147	(0.122)	−0.150	(0.123)
EPTCs since 1981:						
Beginning of new job	−0.007	(0.066)	−0.001	(0.068)	−0.001	(0.068)
Current job:						
On-the-job EPTC(s)	0.029	(0.020)	0.036	(0.018)	0.041	(0.024)
Off-the-job EPTC(s)	0.069	(0.018)	0.066	(0.017)	0.072	(0.024)
Previous jobs:						
On-the-job EPTC(s)	0.065	(0.036)	0.057	(0.036)	0.062	(0.037)
Off-the-job EPTC(s)	0.061	(0.026)	0.054	(0.025)	0.060	(0.029)
Other WRTCs	0.081	(0.022)	0.067	(0.021)	0.067	(0.021)
Only one job since 1981	0.026	(0.019)	0.007	(0.018)	0.007	(0.018)
QTC(s) since 1981:						
Lower vocational	−0.040	(0.028)	−0.025	(0.026)	−0.024	(0.027)
Middle vocational	0.047	(0.046)	0.042	(0.046)	0.042	(0.046)
Higher vocational	0.077	(0.024)	0.085	(0.024)	0.085	(0.024)
Only one job 1981	−0.001	(0.020)	−0.020	(0.017)	−0.020	(0.017)
Highest school qualification:						
CSEs	0.021	(0.030)	0.065	(0.034)	0.064	(0.034)
1–4 O levels	0.055	(0.032)	0.084	(0.037)	0.084	(0.037)
5+ O levels	0.033	(0.037)	0.088	(0.035)	0.086	(0.035)
A levels	0.146	(0.041)	0.183	(0.047)	0.182	(0.047)
Highest post-school qualification 1981:						
Other	0.082	(0.033)				
Lower vocational	0.082	(0.031)				
Middle vocational	0.038	(0.025)				
Higher vocational	0.052	(0.032)				
Degree	0.104	(0.036)	0.075	(0.033)	0.075	(0.033)
Occupation 1991 job:						
Professional/Intermediate	0.235	(0.029)	0.289	(0.105)	0.285	(0.106)
Skilled non-manual	0.111	(0.035)	0.162	(0.073)	0.160	(0.074)
Skilled manual	0.043	(0.025)	0.068	(0.051)	0.066	(0.052)
Private sector 1991	0.023	(0.018)	0.009	(0.019)	0.008	(0.019)
Union member 1991	0.023	(0.017)	0.011	(0.019)	0.011	(0.019)
Large employer 1991	0.104	(0.019)	0.083	(0.019)	0.083	(0.019)
Occupation 1981 job:						
Professional/Intermediate			−0.001	(0.058)	−0.001	(0.058)
Skilled non-manual			−0.024	(0.051)	−0.023	(0.051)
Skilled manual			−0.043	(0.034)	−0.042	(0.035)
Private sector 1981			0.021	(0.020)	0.022	(0.020)
Union member 1981			−0.060	(0.023)	−0.060	(0.023)
Large employer 1981			−0.013	(0.023)	−0.013	(0.023)
WRTCs by 1981:						
EPTC in 1981 job	0.071	(0.018)				
EPTC in first job	0.028	(0.021)				
Maths ability age 7:						
Second quintile	0.028	(0.029)				
Third quintile	0.012	(0.028)				
Fourth quintile	0.043	(0.029)				
Top quintile	0.072	(0.031)				
Reading ability age 7:						
Second quintile	0.012	(0.025)				
Third quintile	−0.017	(0.030)				
Fourth quintile	−0.012	(0.032)				
Top quintile	−0.033	(0.036)				

Continued next page ...

TABLE A.4 continued

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Teachers' rating at age 7:						
Avid reader	0.029	(0.050)				
Above-average reader	0.071	(0.033)				
Average reader	0.046	(0.026)				
Excellent number skills	0.045	(0.045)				
Good number skills	0.009	(0.029)				
Average number skills	0.019	(0.023)				
Outstanding general knowledge	0.110	(0.054)				
Good general knowledge	0.081	(0.031)				
Average general knowledge	0.051	(0.024)				
Father's years of education	0.016	(0.007)				
Father's education not known	0.115	(0.084)				
No father 1974	−0.012	(0.048)				
Mother's years of education	−0.010	(0.008)				
Mother's education not known	−0.075	(0.104)				
No mother 1974	−0.070	(0.060)				
Father's occupation 1974:						
Professional/Intermediate	−0.001	(0.029)				
Skilled non-manual	−0.015	(0.033)				
Skilled manual	−0.004	(0.024)				
Father unemployed 1958, '65 or '74	0.055	(0.040)				
Mother employed 1974	0.019	(0.020)				
Financial difficulties 1974	−0.007	(0.029)				
Lived with both parents 1974	−0.019	(0.024)				
Number of siblings	−0.003	(0.007)				
Number of older siblings	0.011	(0.009)				
1991 region:						
North	−0.153	(0.045)	−0.076	(0.080)	−0.076	(0.080)
North-West	−0.156	(0.037)	−0.147	(0.064)	−0.147	(0.064)
Yorkshire and Humberside	−0.165	(0.038)	−0.076	(0.073)	−0.077	(0.074)
West Midlands	−0.153	(0.038)	−0.177	(0.066)	−0.178	(0.065)
East Midlands	−0.137	(0.041)	−0.120	(0.058)	−0.119	(0.058)
East Anglia	−0.145	(0.042)	−0.065	(0.063)	−0.066	(0.064)
South-West	−0.124	(0.042)	−0.076	(0.073)	−0.078	(0.074)
South-East	0.045	(0.034)	0.105	(0.038)	0.105	(0.038)
Wales	−0.152	(0.044)	−0.162	(0.072)	−0.162	(0.072)
Scotland	−0.141	(0.038)	−0.125	(0.063)	−0.126	(0.063)
1981 region:						
South-East			−0.069	(0.037)	−0.069	(0.036)
South-West			0.041	(0.077)	0.043	(0.077)
Wales			*0.131*	*(0.073)*	*0.131*	*(0.073)*
West Midlands			0.108	(0.066)	0.108	(0.065)
East Midlands			0.029	(0.056)	0.027	(0.056)
East Anglia			0.026	(0.075)	0.025	(0.076)
Yorkshire and Humberside			0.000	(0.075)	0.000	(0.075)
North-West			0.032	(0.064)	0.032	(0.064)
North			−0.020	(0.078)	−0.021	(0.078)
Scotland			0.071	(0.064)	0.072	(0.064)
λ_{EMP}			0.082	(0.089)	0.084	(0.088)
λ_{OCC}			*−0.021*	*(0.033)*	*−0.020*	*(0.033)*
λ_{EPTC}					−0.007	(0.017)
λ_{w1}			−0.559	(0.125)	−0.555	(0.126)
Number of observations	1601		1601		1601	
Log likelihood	−391.51		−331.05		−330.96	
R^2	0.4383		0.4989		0.4989	

TABLE A.5: Detailed female wage equations

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Constant	1.331	(0.108)	0.555	(0.191)	0.524	(0.190)
w_1			−0.410	(0.142)	−0.376	(0.142)
EPTCs since 1981:						
Beginning of new job	0.066	(0.050)	0.051	(0.053)	0.047	(0.053)
Current job:						
On-the-job EPTC(s)	0.055	(0.026)	0.048	(0.025)	0.003	(0.032)
Off-the-job EPTC(s)	0.098	(0.026)	0.096	(0.025)	0.046	(0.032)
Previous jobs:						
On-the-job EPTC(s)	0.035	(0.036)	0.046	(0.036)	0.005	(0.039)
Off-the-job EPTC(s)	0.070	(0.033)	0.062	(0.032)	0.010	(0.041)
Other WRTCs	0.064	(0.028)	0.063	(0.027)	0.066	(0.027)
Only one job since 1981	0.153	(0.023)	0.133	(0.023)	0.128	(0.023)
QTC(s) since 1981:						
Lower vocational	0.003	(0.033)	0.011	(0.033)	0.011	(0.033)
Middle vocational	0.008	(0.050)	0.069	(0.049)	0.064	(0.049)
Higher vocational	0.083	(0.035)	0.104	(0.033)	0.103	(0.033)
Only one job 1981	−0.034	(0.023)	−0.056	(0.023)	−0.058	(0.023)
Highest school qualification:						
CSEs	0.035	(0.039)	−0.026	(0.045)	−0.028	(0.045)
1–4 O levels	0.003	(0.039)	−0.040	(0.045)	−0.045	(0.045)
5+ O levels	0.065	(0.044)	0.012	(0.051)	0.014	(0.051)
A levels	0.117	(0.048)	0.053	(0.058)	0.055	(0.058)
Highest post-school qualification 1981:						
Other	−0.061	(0.048)				
Lower vocational	0.060	(0.029)				
Middle vocational	0.039	(0.048)				
Higher vocational	0.136	(0.040)				
Degree	0.242	(0.045)	0.130	(0.039)	0.126	(0.039)
Occupation 1991 job:						
Professional/Intermediate	0.400	(0.037)	0.398	(0.120)	0.415	(0.121)
Skilled non-manual	0.238	(0.030)	0.213	(0.066)	0.221	(0.066)
Skilled manual	0.084	(0.047)	0.101	(0.056)	0.105	(0.056)
Private sector 1991	−0.019	(0.023)	−0.024	(0.024)	−0.023	(0.024)
Union member 1991	0.108	(0.021)	0.115	(0.022)	0.114	(0.022)
Large employer 1991	0.084	(0.023)	0.063	(0.024)	0.066	(0.024)
Occupation 1981 job:						
Professional/Intermediate			0.054	(0.065)	0.054	(0.065)
Skilled non-manual			0.038	(0.042)	0.042	(0.042)
Skilled manual			−0.012	(0.052)	−0.005	(0.052)
Private sector 1981			0.062	(0.027)	0.059	(0.027)
Union member 1981			−0.053	(0.029)	−0.053	(0.029)
Large employer 1981			−0.004	(0.025)	−0.001	(0.025)
WRTCs by 1981:						
EPTC in 1981 job	−0.006	(0.021)				
EPTC in first job	−0.027	(0.026)				
Maths ability age 7:						
Second quintile	0.000	(0.031)				
Third quintile	−0.013	(0.034)				
Fourth quintile	−0.010	(0.034)				
Top quintile	0.009	(0.035)				
Reading ability age 7:						
Second quintile	0.069	(0.042)				
Third quintile	0.083	(0.043)				
Fourth quintile	0.071	(0.045)				
Top quintile	0.073	(0.048)				

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TABLE A.5 continued

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Teachers' rating at age 7:						
Avid reader	0.011	(0.068)				
Above-average reader	0.049	(0.048)				
Average reader	0.011	(0.039)				
Excellent number skills	0.040	(0.064)				
Good number skills	*0.020*	*(0.039)*				
Average number skills	−0.006	(0.029)				
Outstanding general knowledge	0.055	(0.065)				
Good general knowledge	0.048	(0.039)				
Average general knowledge	0.024	(0.028)				
Father's years of education	−0.006	(0.007)				
Father's education not known	−0.026	(0.102)				
No father 1974	0.018	(0.059)				
Mother's years of education	0.002	(0.009)				
Mother's education not known	−0.092	(0.129)				
No mother 1974	−0.006	(0.070)				
Father's occupation 1974:						
Professional/Intermediate	0.035	(0.036)				
Skilled non-manual	0.043	(0.037)				
Skilled manual	−0.004	(0.028)				
Father unemployed 1958, '65 or '74	0.140	(0.050)				
Mother employed 1974	0.008	(0.024)				
Financial difficulties 1974	−0.037	(0.032)				
Lived with both parents 1974	0.032	(0.028)				
Number of siblings	−0.012	(0.009)				
Number of older siblings	0.030	(0.011)				
1991 region:						
North	−0.272	(0.057)	−0.246	(0.071)	−0.241	(0.071)
North-West	−0.189	(0.051)	−0.127	(0.071)	−0.125	(0.071)
Yorkshire and Humberside	−0.283	(0.049)	−0.310	(0.062)	−0.305	(0.062)
West Midlands	−0.178	(0.050)	−0.085	(0.137)	−0.081	(0.135)
East Midlands	−0.222	(0.053)	0.035	(0.127)	0.038	(0.126)
East Anglia	−0.225	(0.062)	−0.153	(0.108)	−0.150	(0.106)
South-West	−0.266	(0.054)	−0.088	(0.071)	−0.088	(0.071)
South-East	−0.084	(0.049)	0.028	(0.053)	0.028	(0.052)
Wales	−0.301	(0.060)	−0.113	(0.208)	−0.089	(0.209)
Scotland	*−0.204*	*(0.051)*	*0.010*	*(0.087)*	*0.013*	*(0.086)*
1981 region:						
South-East			−0.092	(0.046)	−0.086	(0.045)
South-West			−0.096	(0.071)	−0.095	(0.071)
Wales			−0.054	(0.217)	−0.065	(0.217)
West Midlands			0.000	(0.138)	0.003	(0.137)
East Midlands			−0.140	(0.126)	−0.138	(0.127)
East Anglia			0.029	(0.111)	0.025	(0.109)
Yorkshire and Humberside			0.140	(0.062)	0.139	(0.063)
North-West			*0.038*	*(0.071)*	*0.043*	*(0.071)*
North			0.123	(0.072)	0.128	(0.071)
Scotland			−0.098	(0.088)	−0.098	(0.087)
λ_{EMP}			0.060	(0.063)	0.039	(0.064)
λ_{OCC}			−0.004	(0.040)	−0.010	(0.041)
λ_{EPTC}					0.050	(0.023)
λ_{w1}			−0.397	(0.145)	−0.433	(0.145)
Number of observations	1180		1180		1180	
Log likelihood	−306.76		−284.86		−282.47	
R^2	0.5403		0.5039		0.5059	

TABLE A.6: Summary statistics – males with O levels

Variable	Whole sample 803 observations		Employed sample 754 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Employed 1991	0.939	(0.240)		
w_2			2.043	(0.378)
w_1	1.613	(0.288)	1.618	(0.289)
Δw_2			0.425	(0.369)
Undertaken WRTC since 1981	0.645	(0.479)	0.658	(0.475)
With qualification	0.237	(0.425)	0.244	(0.430)
WRTCs since 1981:				
Current job:				
On-the-job EPTC(s)			0.259	(0.438)
With qualification			0.031	(0.172)
Off-the-job EPTC(s)			0.325	(0.469)
With qualification			0.072	(0.258)
Previous jobs:				
On-the-job EPTC(s)			0.069	(0.254)
With qualification			0.011	(0.103)
Off-the-job EPTC(s)			0.134	(0.341)
With qualification			0.044	(0.205)
EPTC	0.590	(0.492)	0.605	(0.489)
With qualification	0.137	(0.344)	0.143	(0.351)
Non-employer-provided QTC(s)	0.118	(0.323)	0.121	(0.326)
Beginning of new job	0.021	(0.144)	0.020	(0.140)
Other WRTCs	0.215	(0.411)	0.221	(0.416)
Only one job since 1981	0.421	(0.494)	0.436	(0.496)
QTC(s) since 1981:				
Lower vocational	0.113	(0.317)	0.117	(0.321)
Middle vocational	0.042	(0.201)	0.041	(0.199)
Higher vocational	0.110	(0.313)	0.115	(0.320)
Private sector 1991			0.727	(0.446)
Large employer 1991			0.229	(0.421)
Union member 1991			0.467	(0.499)
Social class 1991 job:				
Professional/Intermediate			0.383	(0.487)
Skilled non-manual			0.168	(0.375)
Skilled manual			0.367	(0.482)
Years in 1991 job			8.329	(5.870)
Promoted in 1991 job			0.561	(0.497)
WRTCs by 1981:				
EPTC in 1981 job	0.619	(0.486)	0.630	(0.483)
EPTC in first job	0.371	(0.483)	0.365	(0.482)
Highest school qualification 1981:				
None				
CSEs				
1–4 O levels	0.486	(0.500)	0.488	(0.500)
5+ O levels	0.514	(0.500)	0.512	(0.500)
A levels				
Highest post-school qualification 1981:				
None	0.329	(0.470)	0.317	(0.466)
Other	0.064	(0.244)	0.065	(0.247)
Lower vocational	0.263	(0.440)	0.257	(0.437)
Middle vocational	0.227	(0.419)	0.236	(0.425)
Higher vocational	0.118	(0.323)	0.125	(0.331)
Degree				

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TABLE A.6 continued

Variable	Whole sample 803 observations		Employed sample 754 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
One job only 1981	0.377	(0.485)	0.387	(0.487)
Private sector 1981	0.679	(0.467)	0.675	(0.469)
Large employer 1981	0.264	(0.441)	0.267	(0.442)
Union member 1981	0.570	(0.495)	0.574	(0.495)
Social class 1981 job:				
Professional/Intermediate	0.188	(0.391)	0.186	(0.389)
Skilled non-manual	0.259	(0.438)	0.260	(0.439)
Skilled manual	0.465	(0.499)	0.467	(0.499)
Years in 1981 job	4.117	(2.515)	4.163	(2.513)
Promoted in 1981 job	0.412	(0.493)	0.419	(0.494)
1991 region:				
North	0.062	(0.242)	0.062	(0.242)
North-West	0.115	(0.319)	0.114	(0.318)
Yorkshire and Humberside	0.103	(0.305)	0.098	(0.298)
West Midlands	0.088	(0.284)	0.088	(0.283)
East Midlands	0.083	(0.277)	0.085	(0.279)
East Anglia	0.041	(0.199)	0.042	(0.202)
South-West	0.077	(0.267)	0.077	(0.267)
South-East	0.220	(0.415)	0.220	(0.415)
London	0.027	(0.163)	0.028	(0.165)
Wales	0.070	(0.255)	0.072	(0.258)
Scotland	0.112	(0.316)	0.114	(0.318)
1981 region:				
London	0.087	(0.282)	0.088	(0.283)
South-East	0.179	(0.384)	0.179	(0.384)
South-West	0.071	(0.257)	0.070	(0.256)
Wales	0.071	(0.257)	0.073	(0.260)
West Midlands	0.077	(0.267)	0.078	(0.269)
East Midlands	0.082	(0.275)	0.085	(0.279)
East Anglia	0.034	(0.180)	0.034	(0.183)
Yorkshire and Humberside	0.092	(0.289)	0.088	(0.283)
North-West	0.115	(0.319)	0.113	(0.316)
North	0.077	(0.267)	0.078	(0.269)
Scotland	0.115	(0.319)	0.114	(0.318)
Maths ability age 7:				
Bottom quintile	0.132	(0.339)	0.130	(0.336)
Second quintile	0.192	(0.394)	0.187	(0.390)
Third quintile	0.224	(0.417)	0.231	(0.422)
Fourth quintile	0.219	(0.414)	0.220	(0.415)
Top quintile	0.233	(0.423)	0.232	(0.422)
Reading ability age 7:				
Bottom quintile	0.133	(0.340)	0.135	(0.342)
Second quintile	0.237	(0.425)	0.239	(0.427)
Third quintile	0.245	(0.431)	0.241	(0.428)
Fourth quintile	0.222	(0.416)	0.221	(0.416)
Top quintile	0.163	(0.370)	0.163	(0.370)

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TABLE A.6 continued

Variable	Whole sample 803 observations		Employed sample 754 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Teachers' rating at age 7:				
Avid reader	0.046	(0.210)	0.044	(0.205)
Above-average reader	0.240	(0.428)	0.243	(0.429)
Average reader	0.521	(0.500)	0.521	(0.500)
Excellent number skills	0.040	(0.196)	0.040	(0.196)
Good number skills	0.215	(0.411)	0.219	(0.414)
Average number skills	0.504	(0.500)	0.508	(0.500)
Outstanding general knowledge	0.034	(0.180)	0.031	(0.172)
Good general knowledge	0.262	(0.440)	0.268	(0.443)
Average general knowledge	0.523	(0.500)	0.521	(0.500)
Father's years of education	8.110	(3.840)	8.077	(3.874)
Father's education not known	0.166	(0.372)	0.170	(0.376)
No father 1974	0.054	(0.225)	0.056	(0.229)
Mother's years of education	8.334	(3.647)	8.324	(3.661)
Mother's education not known	0.148	(0.356)	0.150	(0.357)
No mother 1974	0.148	(0.356)	0.150	(0.357)
Father's occupation 1974:				
Professional/Intermediate	0.198	(0.399)	0.198	(0.398)
Skilled non-manual	0.101	(0.301)	0.101	(0.301)
Skilled manual	0.366	(0.482)	0.362	(0.481)
Father unemployed 1958, '65 or '74	0.171	(0.376)	0.172	(0.378)
Mother employed 1974	0.611	(0.488)	0.619	(0.486)
Financial difficulties 1974	0.086	(0.280)	0.082	(0.275)
Lived with both parents 1974	0.660	(0.474)	0.671	(0.470)
Number of siblings	1.736	(1.616)	1.736	(1.604)
Number of older siblings	0.826	(1.208)	0.816	(1.215)

TABLE A.7: Summary statistics – females with O levels

Variable	Whole sample 825 observations		Employed sample 596 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Employed 1991	0.722	(0.448)		
w_2			1.714	(0.433)
w_1	1.415	(0.294)	1.425	(0.285)
Δw_2			0.288	(0.422)
Undertaken WRTC since 1981	0.438	(0.496)	0.508	(0.500)
With qualification	0.182	(0.386)	0.215	(0.411)
WRTCs since 1981:				
Current job:				
On-the-job EPTC(s)			0.198	(0.399)
With qualification			0.022	(0.146)
Off-the-job EPTC(s)			0.168	(0.374)
With qualification			0.039	(0.193)
Previous jobs:				
On-the-job EPTC(s)			0.094	(0.292)
With qualification			0.030	(0.171)
Off-the-job EPTC(s)			0.091	(0.287)
With qualification			0.037	(0.189)
EPTC	0.370	(0.483)	0.440	(0.497)
With qualification	0.095	(0.293)	0.117	(0.322)
Non-employer-provided QTC(s)	0.103	(0.304)	0.117	(0.322)
Beginning of new job	0.018	(0.134)	0.020	(0.141)
Other WRTCs	0.087	(0.282)	0.111	(0.314)
Only one job since 1981	0.345	(0.476)	0.290	(0.454)
QTC(s) since 1981:				
Lower vocational	0.088	(0.284)	0.102	(0.303)
Middle vocational	0.023	(0.150)	0.030	(0.171)
Higher vocational	0.086	(0.281)	0.101	(0.301)
Private sector 1991			0.557	(0.497)
Large employer 1991			0.191	(0.394)
Union member 1991			0.386	(0.487)
Social class 1991 job:				
Professional/Intermediate			0.351	(0.478)
Skilled non-manual			0.463	(0.499)
Skilled manual			0.064	(0.245)
Years in 1991 job			6.122	(5.776)
Promoted in 1991 job			0.423	(0.494)
WRTCs by 1981:				
EPTC in 1981 job	0.411	(0.492)	0.448	(0.498)
EPTC in first job	0.216	(0.412)	0.211	(0.409)
Highest school qualification 1981:				
None				
CSEs				
1–4 O levels	0.582	(0.494)	0.601	(0.490)
5+ O levels	0.418	(0.494)	0.399	(0.490)
A levels				
Highest post-school qualification 1981:				
None	0.516	(0.500)	0.532	(0.499)
Other	0.073	(0.260)	0.060	(0.238)
Lower vocational	0.224	(0.417)	0.198	(0.399)
Middle vocational	0.065	(0.247)	0.076	(0.264)
Higher vocational	0.121	(0.327)	0.134	(0.341)
Degree				

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TABLE A.7 continued

Variable	Whole sample 825 observations		Employed sample 596 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
One job only 1981	0.288	(0.453)	0.295	(0.457)
Private sector 1981	0.590	(0.492)	0.557	(0.497)
Large employer 1981	0.235	(0.424)	0.240	(0.427)
Union member 1981	0.470	(0.499)	0.507	(0.500)
Social class 1981 job:				
Professional/Intermediate	0.193	(0.395)	0.216	(0.412)
Skilled non-manual	0.653	(0.476)	0.633	(0.483)
Skilled manual	0.065	(0.247)	0.060	(0.238)
Years in 1981 job	3.591	(2.483)	3.663	(2.459)
Promoted in 1981 job	0.445	(0.497)	0.463	(0.499)
1991 region:				
North	0.051	(0.220)	0.052	(0.222)
North-West	0.125	(0.331)	0.134	(0.341)
Yorkshire and Humberside	0.108	(0.310)	0.099	(0.299)
West Midlands	0.081	(0.273)	0.087	(0.282)
East Midlands	0.067	(0.250)	0.060	(0.238)
East Anglia	0.038	(0.190)	0.044	(0.204)
South-West	0.085	(0.279)	0.084	(0.277)
South-East	0.263	(0.441)	0.247	(0.431)
London	0.042	(0.202)	0.045	(0.208)
Wales	0.055	(0.227)	0.055	(0.229)
Scotland	0.086	(0.281)	0.092	(0.290)
1981 region:				
London	0.124	(0.329)	0.121	(0.326)
South-East	0.184	(0.388)	0.163	(0.369)
South-West	0.065	(0.247)	0.065	(0.248)
Wales	0.053	(0.225)	0.055	(0.229)
West Midlands	0.092	(0.289)	0.094	(0.292)
East Midlands	0.068	(0.252)	0.069	(0.253)
East Anglia	0.039	(0.193)	0.044	(0.204)
Yorkshire and Humberside	0.090	(0.286)	0.086	(0.280)
North-West	0.137	(0.344)	0.149	(0.357)
North	0.063	(0.243)	0.059	(0.235)
Scotland	0.085	(0.279)	0.096	(0.294)
Maths ability age 7:				
Bottom quintile	0.136	(0.343)	0.138	(0.345)
Second quintile	0.250	(0.433)	0.243	(0.429)
Third quintile	0.202	(0.402)	0.185	(0.388)
Fourth quintile	0.218	(0.413)	0.230	(0.421)
Top quintile	0.194	(0.396)	0.205	(0.404)
Reading ability age 7:				
Bottom quintile	0.068	(0.252)	0.070	(0.256)
Second quintile	0.173	(0.379)	0.159	(0.366)
Third quintile	0.242	(0.429)	0.245	(0.430)
Fourth quintile	0.265	(0.442)	0.257	(0.437)
Top quintile	0.251	(0.434)	0.268	(0.444)

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TABLE A.7 continued

Variable	Whole sample 825 observations		Employed sample 596 observations	
	Mean	(St. dev.)	Mean	(St. dev.)
Teachers' rating at age 7:				
Avid reader	0.074	(0.262)	0.072	(0.259)
Above-average reader	0.348	(0.477)	0.352	(0.478)
Average reader	0.503	(0.500)	0.507	(0.500)
Excellent number skills	0.021	(0.142)	0.023	(0.152)
Good number skills	0.201	(0.401)	0.206	(0.405)
Average number skills	0.526	(0.500)	0.535	(0.499)
Outstanding general knowledge	0.010	(0.098)	0.013	(0.115)
Good general knowledge	0.178	(0.383)	0.198	(0.399)
Average general knowledge	0.655	(0.476)	0.634	(0.482)
Father's years of education	8.155	(3.810)	8.203	(3.744)
Father's education not known	0.162	(0.369)	0.156	(0.363)
No father 1974	0.048	(0.215)	0.054	(0.226)
Mother's years of education	8.333	(3.628)	8.398	(3.548)
Mother's education not known	0.148	(0.355)	0.139	(0.347)
No mother 1974	0.152	(0.359)	0.138	(0.345)
Father's occupation 1974:				
Professional/Intermediate	0.199	(0.399)	0.183	(0.387)
Skilled non-manual	0.093	(0.291)	0.104	(0.306)
Skilled manual	0.384	(0.487)	0.394	(0.489)
Father unemployed 1958, '65 or '74	0.172	(0.378)	0.164	(0.371)
Mother employed 1974	0.606	(0.489)	0.621	(0.486)
Financial difficulties 1974	0.074	(0.262)	0.079	(0.270)
Lived with both parents 1974	0.679	(0.467)	0.680	(0.467)
Number of siblings	1.749	(1.565)	1.785	(1.602)
Number of older siblings	0.884	(1.180)	0.878	(1.183)

TABLE A.8: Detailed wage equations – males with O levels

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Constant	1.660	(0.173)	0.306	(0.287)	0.316	(0.287)
w_1			−0.003	(0.184)	−0.012	(0.184)
EPTCs since 1981:						
Beginning of new job	0.049	(0.098)	0.066	(0.107)	0.069	(0.108)
Current job:						
On-the-job EPTC(s)	0.063	(0.032)	0.067	(0.028)	0.084	(0.037)
Off-the-job EPTC(s)	0.077	(0.028)	0.055	(0.025)	0.075	(0.037)
Previous jobs:						
On-the-job EPTC(s)	−0.017	(0.059)	−0.035	(0.060)	−0.021	(0.061)
Off-the-job EPTC(s)	0.054	(0.042)	0.016	(0.040)	0.032	(0.046)
Other WRTCs	0.089	(0.036)	0.058	(0.033)	0.057	(0.033)
Only one job since 1981	0.011	(0.028)	−0.031	(0.026)	−0.030	(0.026)
QTC(s) since 1981:						
Lower vocational	−0.059	(0.038)	−0.020	(0.035)	−0.020	(0.035)
Middle vocational	0.032	(0.060)	0.039	(0.058)	0.041	(0.059)
Higher vocational	0.112	(0.038)	0.133	(0.038)	0.133	(0.039)
Only one job 1981	0.011	(0.034)	−0.015	(0.024)	−0.016	(0.024)
Highest school qualification:						
CSEs						
1–4 O levels	0.032	(0.030)				
5+ O levels			0.004	(0.021)	0.003	(0.021)
A levels						
Highest post-school qualification 1981:						
Other	0.165	(0.057)				
Lower vocational	0.107	(0.040)				
Middle vocational	0.062	(0.035)				
Higher vocational	0.055	(0.045)				
Degree						
Occupation 1991 job:						
Professional/Intermediate	0.207	(0.043)	0.296	(0.156)	0.280	(0.158)
Skilled non-manual	0.094	(0.046)	0.151	(0.110)	0.142	(0.110)
Skilled manual	0.001	(0.039)	0.039	(0.080)	0.033	(0.081)
Private sector 1991	0.037	(0.027)	0.007	(0.029)	0.005	(0.029)
Union member 1991	0.028	(0.027)	0.018	(0.027)	0.018	(0.027)
Large employer 1991	0.057	(0.031)	0.030	(0.030)	0.031	(0.030)
Occupation 1981 job:						
Professional/Intermediate			−0.056	(0.089)	−0.053	(0.089)
Skilled non-manual			−0.011	(0.078)	−0.009	(0.078)
Skilled manual			−0.060	(0.054)	−0.059	(0.054)
Private sector 1981			0.031	(0.030)	0.034	(0.031)
Union member 1981			−0.089	(0.035)	−0.089	(0.035)
Large employer 1981			−0.006	(0.035)	−0.007	(0.035)
WRTCs by 1981:						
EPTC in 1981 job	0.053	(0.030)				
EPTC in first job	0.032	(0.034)				
Maths ability age 7:						
Second quintile	0.035	(0.045)				
Third quintile	−0.006	(0.043)				
Fourth quintile	0.017	(0.045)				
Top quintile	0.028	(0.045)				
Reading ability age 7:						
Second quintile	0.038	(0.042)				
Third quintile	−0.001	(0.047)				
Fourth quintile	0.026	(0.049)				
Top quintile	−0.021	(0.057)				

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TABLE A.8 continued

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Teachers' rating at age 7:						
Avid reader	0.019	(0.089)				
Above-average reader	0.045	(0.052)				
Average reader	0.016	(0.042)				
Excellent number skills	0.021	(0.074)				
Good number skills	0.053	(0.044)				
Average number skills	0.043	(0.035)				
Outstanding general knowledge	0.214	(0.090)				
Good general knowledge	0.108	(0.046)				
Average general knowledge	0.047	(0.038)				
Father's years of education	0.016	(0.012)				
Father's education not known	0.143	(0.139)				
No father 1974	−0.068	(0.068)				
Mother's years of education	−0.016	(0.014)				
Mother's education not known	−0.165	(0.157)				
No mother 1974	−0.059	(0.091)				
Father's occupation 1974:						
Professional/Intermediate	−0.005	(0.041)				
Skilled non-manual	−0.023	(0.048)				
Skilled manual	−0.004	(0.034)				
Father unemployed 1958, '65 or '74	0.044	(0.069)				
Mother employed 1974	0.036	(0.029)				
Financial difficulties 1974	0.017	(0.043)				
Lived with both parents 1974	−0.010	(0.036)				
Number of siblings	−0.006	(0.011)				
Number of older siblings	0.009	(0.013)				
1991 region:						
North	−0.123	(0.073)	−0.075	(0.163)	−0.078	(0.161)
North-West	−0.198	(0.061)	−0.223	(0.153)	−0.219	(0.153)
Yorkshire and Humberside	−0.197	(0.060)	−0.047	(0.131)	−0.050	(0.131)
West Midlands	−0.195	(0.065)	−0.009	(0.131)	−0.010	(0.129)
East Midlands	−0.165	(0.063)	−0.043	(0.096)	−0.040	(0.096)
East Anglia	−0.177	(0.076)	0.033	(0.100)	0.027	(0.102)
South-West	−0.130	(0.062)	0.087	(0.105)	0.084	(0.104)
South-East	0.049	(0.057)	0.095	(0.057)	0.095	(0.057)
Wales	−0.179	(0.064)	−0.195	(0.093)	−0.196	(0.092)
Scotland	−0.156	(0.061)	−0.103	(0.123)	−0.105	(0.123)
1981 region:						
South-East			−0.060	(0.057)	−0.062	(0.057)
South-West			−0.118	(0.106)	−0.117	(0.105)
Wales			0.165	(0.095)	0.165	(0.095)
West Midlands			−0.090	(0.134)	−0.092	(0.133)
East Midlands			−0.049	(0.090)	−0.055	(0.091)
East Anglia			−0.077	(0.107)	−0.074	(0.108)
Yorkshire and Humberside			−0.021	(0.132)	−0.020	(0.132)
North-West			0.102	(0.153)	0.098	(0.152)
North			−0.003	(0.156)	−0.002	(0.154)
Scotland			0.058	(0.124)	0.059	(0.124)
λ_{EMP}			0.161	(0.139)	0.169	(0.140)
λ_{OCC}			−0.042	(0.049)	−0.020	(0.027)
λ_{EPTC}					−0.037	(0.049)
λ_{wl}			−0.546	(0.185)	−0.536	(0.185)
Number of observations	754		754		754	
Log likelihood	−199.01		−147.98		−147.67	
R^2	0.3046		0.3635		0.3640	

TABLE A.9: Detailed wage equations – females with O levels

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Constant	1.237	(0.199)	0.212	(0.331)	0.172	(0.328)
w_1			−0.277	(0.224)	−0.233	(0.222)
EPTCs since 1981:						
Beginning of new job	0.038	(0.072)	−0.008	(0.088)	−0.008	(0.089)
Current job:						
On-the-job EPTC(s)	0.045	(0.035)	0.043	(0.034)	−0.031	(0.046)
Off-the-job EPTC(s)	0.091	(0.036)	0.098	(0.035)	0.027	(0.040)
Previous jobs:						
On-the-job EPTC(s)	0.037	(0.058)	0.045	(0.053)	−0.020	(0.061)
Off-the-job EPTC(s)	0.136	(0.050)	0.158	(0.050)	0.080	(0.062)
Other WRTCs	0.045	(0.043)	0.080	(0.038)	0.091	(0.038)
Only one job since 1981	0.189	(0.034)	0.159	(0.033)	0.149	(0.033)
QTC(s) since 1981:						
Lower vocational	−0.025	(0.044)	−0.028	(0.042)	−0.030	(0.042)
Middle vocational	0.039	(0.067)	0.129	(0.064)	0.118	(0.062)
Higher vocational	0.126	(0.050)	0.137	(0.048)	0.136	(0.048)
Only one job 1981	−0.044	(0.035)	−0.075	(0.037)	−0.082	(0.037)
Highest school qualification:						
CSEs						
1–4 O levels	−0.057	(0.031)				
5+ O levels			0.039	(0.030)	0.049	(0.030)
A levels						
Highest post-school qualification 1981:						
Other	−0.139	(0.079)				
Lower vocational	0.043	(0.035)				
Middle vocational	−0.013	(0.053)				
Higher vocational	0.129	(0.056)				
Degree						
Occupation 1991 job:						
Professional/Intermediate	0.420	(0.051)	0.442	(0.169)	0.473	(0.169)
Skilled non-manual	0.291	(0.040)	0.263	(0.094)	0.277	(0.094)
Skilled manual	0.099	(0.064)	0.120	(0.080)	0.126	(0.079)
Private sector 1991	−0.007	(0.032)	−0.032	(0.033)	−0.030	(0.032)
Union member 1991	0.105	(0.030)	0.142	(0.030)	0.138	(0.030)
Large employer 1991	0.091	(0.036)	0.069	(0.037)	0.075	(0.037)
Occupation 1981 job:						
Professional/Intermediate			−0.043	(0.099)	−0.043	(0.099)
Skilled non-manual			−0.011	(0.058)	−0.003	(0.058)
Skilled manual			−0.094	(0.069)	−0.080	(0.067)
Private sector 1981			0.092	(0.038)	0.090	(0.038)
Union member 1981			−0.103	(0.038)	−0.103	(0.038)
Large employer 1981			0.000	(0.035)	0.004	(0.035)
WRTCs by 1981:						
EPTC in 1981 job	−0.028	(0.030)				
EPTC in first job	−0.052	(0.035)				
Maths ability age 7:						
Second quintile	−0.022	(0.045)				
Third quintile	−0.064	(0.050)				
Fourth quintile	0.024	(0.046)				
Top quintile	0.043	(0.049)				
Reading ability age 7:						
Second quintile	0.102	(0.071)				
Third quintile	0.094	(0.073)				
Fourth quintile	0.095	(0.074)				
Top quintile	0.089	(0.077)				

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TABLE A.9 continued

Variable	OLS levels		Quasi-difference models			
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Teachers' rating at age 7:						
Avid reader	0.038	(0.121)				
Above-average reader	0.067	(0.076)				
Average reader	0.039	(0.065)				
Excellent number skills	0.135	(0.111)				
Good number skills	0.042	(0.062)				
Average number skills	0.019	(0.044)				
Outstanding general knowledge	−0.013	(0.100)				
Good general knowledge	0.027	(0.057)				
Average general knowledge	−0.004	(0.042)				
Father's years of education	−0.008	(0.013)				
Father's education not known	−0.125	(0.166)				
No father 1974	0.064	(0.096)				
Mother's years of education	0.009	(0.014)				
Mother's education not known	−0.118	(0.210)				
No mother 1974	0.075	(0.119)				
Father's occupation 1974:						
Professional/Intermediate	0.035	(0.050)				
Skilled non-manual	−0.029	(0.047)				
Skilled manual	−0.007	(0.037)				
Father unemployed 1958, '65 or '74	0.213	(0.074)				
Mother employed 1974	−0.002	(0.033)				
Financial difficulties 1974	0.000	(0.052)				
Lived with both parents 1974	0.068	(0.043)				
Number of siblings	−0.024	(0.016)				
Number of older siblings	0.049	(0.018)				
1991 region:						
North	−0.173	(0.086)	−0.119	(0.112)	−0.120	(0.113)
North-West	−0.126	(0.074)	−0.031	(0.102)	−0.035	(0.100)
Yorkshire and Humberside	−0.239	(0.079)	−0.257	(0.085)	−0.247	(0.085)
West Midlands	−0.184	(0.077)	−0.192	(0.186)	−0.200	(0.184)
East Midlands	−0.196	(0.075)	0.154	(0.132)	0.154	(0.136)
East Anglia	−0.203	(0.095)	−0.217	(0.162)	−0.219	(0.155)
South-West	−0.204	(0.083)	0.034	(0.101)	0.023	(0.097)
South-East	−0.026	(0.078)	0.103	(0.078)	0.099	(0.076)
Wales	−0.244	(0.088)	0.125	(0.357)	0.140	(0.358)
Scotland	−0.195	(0.081)	0.097	(0.128)	0.100	(0.122)
1981 region:						
South-East			−0.053	(0.068)	−0.048	(0.067)
South-West			−0.106	(0.104)	−0.097	(0.103)
Wales			−0.120	(0.370)	−0.123	(0.372)
West Midlands			0.171	(0.185)	0.182	(0.183)
East Midlands			−0.192	(0.127)	−0.189	(0.134)
East Anglia			0.191	(0.166)	0.187	(0.159)
Yorkshire and Humberside			0.216	(0.087)	0.207	(0.089)
North-West			0.070	(0.099)	0.081	(0.097)
North			0.169	(0.109)	0.176	(0.111)
Scotland			−0.095	(0.135)	−0.099	(0.129)
λ_{EMP}			0.103	(0.105)	0.068	(0.105)
λ_{OCC}			−0.020	(0.054)	0.075	(0.033)
λ_{EPTC}					−0.032	(0.054)
λ_{w1}			−0.455	(0.226)	−0.503	(0.225)
Number of observations	596		596		596	
Log likelihood	−153.03		−143.95		−141.36	
R^2	0.4764		0.4653		0.4699	

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