



The Determinants and Effects of Training at Work: Bringing the Workplace Back In

Philip J. O'Connell and Delma Byrne

Abstract. This paper brings together two research fields: on work-related training and high performance work practices (HPWP), respectively. We estimate models of both the determinants and the impact of training using the NCPP/ESRI *Changing Workplace Survey*. Our models of the determinants of training confirm previous research: age, education, contract, tenure, and firm size all influence training. Several components of HPWP are associated with a higher probability of training, specifically, general (non-firm-specific) training. Participation in general training is associated with higher earnings, as is involvement in highly participative and consultative working arrangements, and performance reward systems. These patterns of training, and returns to training, are broadly consistent with HPWP approaches and represent a challenge to human capital theory.

Corresponding Author: philip.oconnell@esri.ie

ESRI working papers represent un-refereed work-in-progress by members who are solely responsible for the content and any views expressed therein. Any comments on these papers will be welcome and should be sent to the author(s) by email. Papers may be downloaded for personal use only.

The Determinants and Effects of Training at Work: Bringing the Workplace Back In

1. Introduction

The resurgence of interest in recent years in the importance of education and training in furthering the goals of economic progress, fuller employment and social integration coincides with a new emphasis on the need for ‘life long learning’, both to respond to current changes in the organisation and technology of production and service delivery and to counter the socially disruptive effects of increased labour market flexibility. Most research on continuing vocational training suggests that participation is highly selective: those with higher educational attainment receive more training than the low-skilled, and the employed receive more training than the unemployed, who in turn receive more training than those not economically active.

This resurgence of interest in learning coincides with renewed interest in the features of organisations that promote organisational performance and enterprise profitability. These organisational factors include high performance work practices (HPWP) such as team-working, employee involvement and innovative incentive systems, as well as new technology and labour force flexibility.

In general research has tended to deal with these two important fields of inquiry in a fragmented manner, despite their obvious inter-connections in the workplace. This paper combines the two perspectives. In examining the determinants of training at work we look not only at the influence of personal and job characteristics, but also at the impact of high performance work practices and other dimension of change in the workplace. In looking at the impact of training on employee wages, we also examine the impact of high performance working arrangements and, examine whether training has a greater impact when it is combined with such innovative working arrangements. In the next section we outline two competing theoretical approaches which have important implications for workplace training: human capital and HPWP approaches. In Section 3 we review the research findings relating to the determinants of training and, in Section 4, its effects on wages. Section 5 presents our data and findings, and finally, Section 6 presents our conclusions.

2. Theoretical Framework

The dominant theoretical framework informing most of the research attempting to understand patterns of participation in training has been the human capital approach. This approach, deriving from Becker (1975), situates the training participation decision in a classical utility maximising framework within competitive labour markets: individual workers undertake training, and employers invest in training, on the basis of their estimates of future returns (including employment prospects and wages for the former, and productivity gains for the latter). With regard to training at work, the human capital approach emphasises the key distinction between “general” versus “specific” training. General training is defined in terms of its transferability: general training may be of use to current and subsequent employers, whereas specific training is of use only to the current employer. In this approach employers will be unlikely to pay for general training. If employers were to pay for general training, they would have to recoup the cost by paying a wage below marginal productivity after training, and in a competitive labour market, the workers would leave to earn their full marginal product with another employer. This gives rise to the poaching problem whereby ‘non-training’ employers can pay higher rates to workers who have received general training from a previous employer. This has obvious implications for who bears the cost of training, and a consequence of this market failure is that there is under-investment in training. Extensions of the theory suggest that employees pay for general training, either directly or in the form of lower wages during the training period.

This hypothesis does not receive much support from the empirical literature, which has found: (1) that the theoretical distinction is difficult to operationalise; and (2) that many employers pay for both general and specific training. Most job-related training appears to be general and at least partially paid for by the employer. This is confirmed by findings from Booth & Bryan (2002) in relation to the United Kingdom, from Pischke (2000) in Germany, Loewenstein & Spletzer (1999) and Bishop (1996) in the US. For example, Booth & Bryan (2002) found that about 85% of respondents to the British Household Panel Survey considered their training to be general in nature and 89% reported that it was employer financed. O’Connell (2004) shows that almost 80% of employees in an Irish survey who received employer-sponsored training considered that the training was general and could be used both in their current job or be of use to

another employer. Evertsson's (2004) analysis of an employee survey in Sweden shows that only about 5% of training is regarded as firm-specific in Sweden, another 38% is industry- but not firm-specific and over half is general and fully portable across sectors and firms.

A key assumption of the human capital approach is that labour markets are perfectly competitive, which is, of course, an idealized notion. This assumption underpins the idea that employees can capture the full return on the investment in (general) training, either by earning their marginal product with their current employer or by moving to a different employer. Much of the recent literature has challenged this assumption. An important paper by Acemoglu & Pischke (1999) argues that compressed wage structures, which may arise due to trade union organisation, or to collective bargaining at sectoral or national levels, alter the incentive structure and give rise to a situation in which wages of trained workers, relative to untrained, are held down, with the result that employers can capture at least some of the returns to training. Other reasons advanced for why employers may pay for general training also emphasise departures from perfect competition in the labour market, including transaction costs (including asymmetrical information) and institutional factors (including trade unions and internal labour markets), and labour market regulation (such as employment protection legislation or minimum wages) (Acemoglu & Pischke 1999). Much of the empirical literature suggests that institutions are important in moderating the influence of competitive labour markets and thus lowering the barriers to employer sponsorship of training in general, and general training in particular. Loewenstein & Spletzer (1998) develop a model in which training is determined within long-term contracts, including minimum wage guarantees. Bassanini & Brunello (2003) in an analysis of ECHP data for 7 countries, find that the incidence of general training (proxied by off site training) is higher in sectors with lower differentials between wage growths of trained versus untrained workers. They find no evidence of a relationship between firm-specific training and the training wage premium. Brunello (2001) finds that countries with higher union density, stronger employment protection, and lower minimum wages, tend to show higher incidence of training.

The development of the human capital approach led to an emphasis on the competitive labour market, arguably, mainly on the supply side, and to the neglect of processes,

institutions and relationships in the workplace. Rapid developments in the organisation and technology of production and service delivery in a context of progressive globalisation have led to increased attention to the way work is organised and the adoption of High Performance Work Practices (HPWP). We use HPWP as a summary term to refer to a collection of arguments suggesting that alternative systems for the organisation of work, including flat hierarchical structures, team-working, greater participation of employees in decision-making, quality programmes, job-rotation and innovative payment or incentive schemes (see Mandel & Levine 2004; Appelbaum & Blatt 1994). The central argument uniting the various strands of the approach is that the adoption of HPWP can benefit employers, through enhanced productivity and performance, and their employees through higher wages and greater job-satisfaction as well as other subjective measures of welfare. Firms adopting HPWP are also likely to implement special training measures in order to enhance employees' capacities to implement innovative work practices. Appelbaum et al., (2000) see training as a core component of HPWP, in addition to opportunities to participate in decision-making and incentive systems that encourage skill acquisition, participation and employee-retention.

Not only are HPWP likely to increase the demand for skills and training, their adoption also has implications for the types of training in which employers will be willing to invest. Successful implementation of HPWP requires enhanced capacity of workers directly involved in production and service delivery to perform more complex tasks, or to conduct statistical analysis of quality issues, or to use soft skills such as problem-solving or interaction skills in order to facilitate effective team working (Osterman 2006). Most of these skill requirements appear general in nature. In this respect HPWP differs sharply from the human capital approach, which expects that employers will not pay for general training. This is not to say that training within a HPWP context is exclusively general. Handel & Levine (2004) argue that new work practices may also require more firm-specific skills.

HPWP represent a context in which innovative work practices are complemented by skill development practices as well as employee retention and security policies (Appelbaum et al., 2000; Godard 2001). To the extent that HPWP entail expectations of enduring employment relationships, employers need to worry less that trained

employees will be poached by other employers – a key barrier to training investment identified by the human capital approach – and thus may be more willing to provide both general and firm specific training.

3. Determinants of Training

There is a substantial body of evidence indicating that in-career training is highly stratified, with the result that those with higher skills, or educational attainment are more likely to participate in training, and in training sponsored by their employers (Lynch 1994; OECD 1999; O’Connell 2002b; Schömann 1998; Blundell et al., 1996). The employed receive more training than the unemployed, who in turn receive more training than those not economically active (O’Connell, 1999). Older workers are also less likely to participate in job-related training (Gelderblom & de Koning, 2003). Larger firms and those that pay above average wages are also more likely to train their employees (O’Connell 2002b). Part-time workers and those on temporary contracts are less likely to receive training (Arulampalam & Booth, 1998). These patterns of participation suggest that current allocation principles are in inverse relation to need and training is more likely to exacerbate rather than mitigate existing labour market inequalities. Becker (1999) summarizes the findings of several empirical evaluations of training programs in Germany: access to further professional training is highly selective. The selectivity of further education triggers labour market segmentation and social exclusion of underprivileged workers as well as the general inequality of life chances. This seems to be true for on-the-job training as well as for training outside the workplace. Participation in further education and training depends on participation in prior vocational training. Qualified employees have advantageous access to training compared to skilled workers, whose access is still better than for the low-skilled workers (O’Connell et al., 2002b).

In general, there is little evidence to suggest any marked gender differences in access to training. For example, O’Connell (1999) shows that the incidence of training is similar for men and women across a range of OECD member countries. However, Evertsson (2004) shows that in Sweden women are less likely than men to participate in formal on-the-job training. Participation in training has also been found to decline over the life course. This may be due to the difficulty in recouping the costs of training in either

wages or productivity among older workers, given that the time-span for cost recovery is shorter among older workers (see Gelderblom & de Koning 2002 for Dutch data). In the UK a great deal of training has been found to be induction training of new recruits (Booth & Bryan 2002), although this age-related pattern in training participation may differ between occupational groups.

Most information on continuing education and training derives from individual level survey data. However, research on enterprises confirms the stratified nature of training participation. Hughes et al., (2004) show that firms engage in more training of their employees when they experience labour and skill shortages. However, while the vacancy rate among professional and technical workers is associated with an increase in training, vacancies among low skilled workers have no impact on enterprises' training activities. In general, research on firms suggests that both the incidence and intensity of training is higher in firms characterized by relatively advantaged workforces – in organisations where average wages are higher, and where greater proportions of the workforce are in higher level occupations or possess higher skills (Booth & Zoega 2000; O'Connell 2002b; Lynch 1994). The nature of the firm plays an important role.

Trade unions represent an important labour market institution that may affect training either directly, through training agreements, or indirectly, through wage bargaining. The empirical results on the impact of unions on training are mixed. A number of studies have found a positive impact of union membership or presence on training: for example, in the US (Lynch 1992), the UK (Booth et al., 2003), and in Germany (Dustman & Schönberg 2004). On the other hand, however, Mincer (1983) and Barron et al., (1987) find negative effects for the US, and Bassanini et al., (2005) find no significant effect of unions across the 13 countries covered by the European Community Household Panel Survey.

There are a limited number of studies examining the impact of HPWP on training. Osterman (1995) in an analysis of firm-level data in the US shows that new forms of work organisation are associated with higher rates of training. He finds that the main influential factors are related to quality practices: Quality Circles, Total Quality Management and Statistical Process Control each led to increased training. Other more

direct work practices, such as team working and job rotation did not. His findings also suggest that the adoption of these work practices are short-term, but do not endure over time. Osterman (1995) also found that enterprises that responded positively to a question about their commitment to increasing “the well-being of employees with respect to their personal or family situation” showed higher rates of training. This may be a proxy for progressive employment policies.

O’Connell (2007) shows that the presence of participation arrangements for deciding how work is actually carried out is associated with a higher probability of training. Similarly, employees reporting extensive consultation relating to their jobs are also more likely to have participated in training. These work practices are also associated with an increased likelihood of participation in general rather than firm-specific training. Similarly, Lynch & Black (1998) find that new workplace practices such as Total Quality Management and benchmarking are linked with more general types of training programmes.

4. Wage Effects of Training and High Performance Work Practices

The wealth of empirical research on the labour market effects of initial education (see for example De la Fuente & Ciccone 2002) stands in stark contrast to the paucity of research on the effects of continuing vocational training, which can still be characterised as a developing field of inquiry. Most empirical work suggests that there are positive wage returns to training. Blundell et al., (1996) find positive wage returns to training in the UK. Schömann & Becker (2002) find similar effects in Germany. However, wage returns to training appear to be low in France, at least in the short-term perspective (Goux & Maurin 1998). However, it should be acknowledged that when selection effects are controlled for, the returns are frequently found to be small or even non-significant.

Brunello (2001) in an analysis of European Community Household Panel data for 13 European countries finds that training, both on- and off-the-job, increases current earnings growth although this earnings growth is likely to be temporary. Earnings growth is somewhat higher for those with upper secondary education than those with tertiary education, and that among the latter the returns to training decline with labour

market experience, perhaps because educational qualifications become outdated over an extensive period of time.

One of the interesting findings from the literature on the impact of training is that the wage returns may be higher among those with low propensity to participate in training (e.g. Bartel 1995 in the U.S.; Blundell et al., 1996; and Booth 1991 in the U.K.; Pischke 1996 in Germany). Higher returns to training among groups with low rates of training participation (such as those with low educational attainment) could be due to selection effects, but could also be due to higher returns to training among those with poor qualifications who nevertheless work in the primary segment of the labour market, or, in the formulation of Booth & Zoega (2002), in ‘good’ firms, where the average stock of human capital is high.

With regard to the returns to training, human capital theory anticipates that the returns, in the form of wages, are positive and “smooth”, so that additional periods of continuing vocational training should have, on average, positive and linear effects on wages. Again, however, institutional factors, including wage compression and differential labour mobility may alter the returns to training in differing institutional contexts, for example, across countries. However, recent literature again challenges the human capital approach and the key issue is the departure from a perfectly competitive labour market. While human capital theory assumes a competitive labour market in which trained employees receive their marginal product, and thus the full fruits of their labour enhanced by training, in a non-competitive labour market workers may not receive their full marginal product and the benefits of training may be shared between employer and employee. There is some evidence that the benefits of training are shared between employer and employee. Barron et al., (1989) found that the benefits of training are split more or less equally between productivity gains reaped by employers and wage increases to employees in the US. Dearden et al., (2000) show that the effect of training on productivity was twice as large as that on wages in a panel study of British industries. Other studies that have looked at the impact of training on corporate performance also suggest that employers do appropriate at least some of the returns to training investments. These outcomes are consistent with the contracting model advanced by Loewenstein & Spletzer (1998), in which training is determined within long-term contracts, including minimum wage guarantees. This would also be supported

by the finding that general training increases company turnover or sales (Barrett & O'Connell 2001).

Some of the returns to training are captured by workers either with a time lag or when they change employers. Loewenstein & Spletzer (1999) find that the estimated effect of general training in a previous job is three times higher than in the current job. Booth & Bryan (2002) find that employer provided training increases wages in both current and future firms and that the impact is larger in future firms. These effects suggest that employers have some monopsony power over their own trained workers so that trained workers may not receive their marginal product, and that training, including general training paid for by employers may be transferable across jobs. These effects are not consistent with the implications of the human capital approach and the assumption of a competitive labour market. Of interest here is that the empirical research on the incidence and effects of training may be of interest not only in its own right, but may also have important implications for the dominant theoretical framework informing our understanding of the relationship between human capital formation and labour market behaviour.

Empirical evidence of the impact of training at the level of the enterprise is less developed than the evidence relating to individuals, although there is a growing literature which suggests that training increases the productivity of firms and leads to higher earnings for trained personnel. Quantitative analysis of enterprise-level data has tended to focus more on the effects of training on company performance (e.g. Barrett & O'Connell 2001; Bartel 1989; Holzer et al., 1993); although several studies have found evidence of positive effects of training on wages (Bartel 1995; Booth 1991; Loewenstein & Spletzer 1997; Goux & Maurin 1997). Moreover, a number of studies have found that training enhances both company performance and workers' wages (Bishop 1994; Groot & Osterbeek 1995).

Research on the impact of HPWP is growing, and covers the effects on both employers and employees. However, research on the impact of such practices on wages remains somewhat sparse (see Handel & Levine 2004 for a review). Apelbaum et al., (2000) in their study of the steel, apparel and medical instruments industries in the US, show that

teamwork and an index of HPWP were associated with higher earnings in steel and apparel, but not in medical instruments. Batt (2001) found that work discretion was positively associated with earnings, but that team and quality circles were not when appropriate controls were included in her model. Cappelli & Neumark (2001) find higher earnings associated with HPWP in a national survey of US manufacturing establishments, but Black et al., (2004) working with the same data, find positive effects of HPWP are confined to unionized workplaces. Osterman (2000) found no effect of HPWP in his study of a survey of establishments. However, Osterman (2006) found increased wages among blue collar workers, attributable to increased productivity, as well as increased earnings among managers, achieved through different channels.

5. Data and Findings

The paper draws on the NCPP/ESRI *Changing Workplace Survey* conducted by the Economic and Social Research Institute and commissioned by the Irish National Centre for Partnership and Performance (O'Connell et al., 2004). This is a sample survey of 5,200 employees, conducted in mid 2003, designed to collect information relating to characteristics of jobs and workplaces, workplace practices, participation and involvement, experience of and attitudes to change, as well as a series of conventional socio-demographic indicators (age, gender, education, occupation etc.). The survey also collects a small but useful set of indicators of employer-sponsored training, including duration and whether the training is general or specific in nature. Binary and multinomial probit models are used to assess the determinants of training. With respect to the methodology used to model the impact of training on earnings, we begin with a standard Mincer type wage model and then include relevant variables. Sample means and training rates are shown in Table 1.

[Insert Table 1 here]

Training Patterns

Table 1 also presents descriptive training patterns according to personal characteristics, job characteristics and organisational characteristics. Overall 48% of employees report that they participated in training provided by their present employer over the last two

years. We now see that the variation in employer-sponsored training incidence according to these characteristics reveals a familiar pattern. Of particular interest is that males are slightly more likely than females to participate in training. Workers aged 25-39 are most likely to receive training, and training incidence declines substantially among those aged 55 years and over. Training participation is closely linked to educational attainment: only 34% of those with no qualifications received training, compared to almost 60% of those with third level qualifications.

There is also variation in training according to job characteristics. We see that the terms of employment of the position are important: full-time workers are more likely to receive training than part-time workers; permanent workers receive more training than those on temporary contracts. Tenure is also important, with all those who have been in a job for more than a year more likely to receive training than those who have less than a year of job tenure. Those with five or more years with their current employer show a slightly lower training incidence than those with 1-5 years tenure, but this difference is not statistically significant. Union members are substantially more likely to have participated in training than non-members.

In relation to organisational characteristics, training is much more common in the public sector: 60% of workers in the public sector, compared with 45% of those in the private sector participated in employer sponsored training in the previous 2 years. There is some variation according to sector of employment: training incidence is highest in Public Administration and Defense (65%), followed by Transport and Communications (56%) while training incidence is lowest in Other Services (38%) (Results not tabulated here). Training is also strongly influenced by establishment size: those working in establishments with 100 or more employees are twice as likely to participate in training as those in establishments with 1-4 employees (61% versus 24%, respectively). While all of these bivariate associations may provide useful insights, they are likely to suffer from omitted variables bias which may suggest misleading conclusions; hence in the following section we apply multiple regression analysis.

Modelling the Determinants of Training

We now look at some estimation results from the probit models of the determinants of receiving any type of employer sponsored training and consider personal characteristics, job characteristics, organisational characteristics and high performance work practices. Table 2 presents a series of probit regression models of training incidence, measured as a binary variable, and coded 1 if any employer-sponsored training was undertaken over the previous two years. Equation 1 includes only personal characteristics. The results show that females are less likely than males to have participated in training. Age is also influential, with those aged 25-39 more likely to receive training than the reference category, those aged less than 25. As expected, educational attainment is important: those who have attained upper secondary or university education are more likely to have participated in training than those with lower levels of educational attainment. Employees who are married or living with a partner are also more likely to receive training.

[Insert Table 2 here]

Equation 2 adds job characteristics. We now find that older workers are generally less likely to get trained than younger workers. The size of the coefficients for education levels have diminished but remain significant. In line with our expectations, temporary workers are less likely to have received training than permanent employees, as are part time workers relative to full time workers. Also as expected, those with shorter tenure in their present position are less likely to train than those with longer tenure. Union members/members of staff associations are also more likely to have trained. Inclusion of job characteristics eliminates the observed gender differences in training participation.

Equation 3 then considers organisational characteristics and change.¹ Size is important: the larger the organisation, the greater the likelihood than an employee has

¹ In this and all subsequent analyses, models that include Organisational characteristics also include sectoral dummy variables but are not shown in the tables because of space considerations. In the present analysis we found that construction workers were more likely to have trained than those in manufacturing, but that no other sector showed any significant differences.

participated in training. Furthermore, employees working for companies that are part of a larger organisation are also more likely to receive training than those who are not. In addition, organisational changes in the past two years such as the introduction of substantial new technology, the appointment of a new chief executive or equivalent, or the introduction of family friendly policies are all associated with an increase in the likelihood of training. When these organisational characteristics are added to the model, we now see that the size of the coefficients for employee education levels have diminished but remain significant. Being married is no longer a significant determinant of receiving training, nor is working hours.

Equation 4 then adds a series of high performance work practices, relating to the implementation of specific policies and employee involvement and the workplace ethos. *Participation* is a dichotomous variable scored 1 if employees report that their employer provides them with a direct say in the way in which work is actually carried out (including working in teams, problem solving groups, quality circles, continuous programmes or groups). *Consultation* is a scale variable indicating the frequency with which employees are consulted about decisions affecting their work, as well as whether any attention is paid to their views. We also constructed three scales to capture various aspects of working practices. *Performance Reward Systems* is composed of 3 items: performance related pay, performance review system and profit share policy (Cronbach's Alpha=.56). *Progressive Employment Policies* is composed of 2 items: employer policies on equal opportunities and on respect and dignity at work (anti-bullying) (Cronbach's Alpha=.72). *Flexible Work Practices* includes opportunities to work part-time hours, job-sharing and flexi-time policies (Cronbach's Alpha=.54). Employees who report that their organisation provides opportunities to participate directly in how work is carried out are more likely to have received training. Similarly, those who report greater levels of consultation are more likely to have received training than those who do not. Employees working in organisations that have performance reward systems or progressive employment policies are more likely to have received training, but those with flexible working arrangements do not.

Distinguishing between General and Specific Training

One of the key distinctions in the economics of training is that between “general” versus “specific” training. General training is defined in terms of its transferability: general training may be of use to both current and subsequent employers, whereas specific training is of use only to the current employer. In the *Survey of Employees Attitudes and Experiences of the Workplace* respondents who indicated that they had participated in employer education or training provided by their employer over the past 2 years were asked:

Do you feel that the skills or knowledge which you have acquired in this education or training would be of any use to you in getting a job with another employer or was the education or training specific to your current job only?

Of use in getting job with another employer ₁

Of use only in current job ₂

80% of all education and training undertaken by employees with employer sponsorship was general in nature, considered by respondents to be “Of use in getting a job with another employer”. Only about 20% of training was considered to be specific, “of use only in current job.” This pattern, whereby most training is general in nature is similar to that found in other countries (see, for example, Booth & Bryan 2002 in the United Kingdom; Pischke 2000 in Germany; and Loewenstein & Spletzer 1999 in the US). Women are somewhat more likely than men to report that their training was general in nature.

Previous analysis of this dataset (O’Connell, 2007) shows that older workers are less likely than their younger colleagues to participate in general training, and that a somewhat greater proportion of those without any qualifications who received training reported that it was general in nature, compared to those with higher levels of educational attainment. There were no significant differences in the nature of training between full- and part-time workers, or between employees on temporary versus permanent contracts, although as we have seen, permanent workers are much more

likely to receive training than temporary workers. Public sector workers are more likely than those in the private sector to have participated in training in the past two years and a substantially greater proportion of training in the public sector is specific to the current employer (30%) than is the case in the private sector (18%). The balance between general versus specific training does not vary much by size of organisation.

In order to model the determinants of different types of training, Table 3 reports the results of a multinomial probit estimation, showing participation in either general or specific training contrasted with no training. As expected, overall the patterns differ markedly between the two types of training.

[Insert Table 3 here]

In most respects, the factors that influence participation in any kind of training also influence general training. This is perhaps not surprising given that about 80% of all training is regarded as general in nature. There are no gender differences, but older employees are less likely to receive general training than no training relative to their younger counterparts. Those in shorter tenure are less likely to get trained than those with more than 5 years of tenure with the current employer while those with medium term tenure are more likely to get trained than the former reference group. Union members/members of staff association are more likely than non members to get general training than no training. Size is also positively associated with general training. In relation to organisational change, the appointment of a new chief executive or equivalent and the introduction of new technology are associated with an increase in the likelihood of general training.

Employees who report that their organisation encourages direct participation in workplace decisions, or greater levels of consultation about their work are more likely to have received general training than those who do not. Furthermore, employees who report that their workplace implements performance reward systems or progressive employment policies are more likely to receive training. These outcomes are entirely

consistent with the expectations and findings of previous HPWP research. The presence of flexible working arrangements had no significant effect on general training.

The determinants of specific training are quite different. Gender is significant indicating that women are less likely to receive specific training than men. Education is a significant determinant of receiving specific training but only those with an upper secondary education are more likely to receive training than those with lower levels of educational attainment. Being a trade union member also increases the likelihood of receiving specific training. Workers who work in companies that are part of a larger organisation also have an increased likelihood of specific training. Those who have seen the introduction of new technology are more likely to have received specific training. Two work practices are associated with increased firm-specific training: direct participation and progressive employment policies.

Wage Effects of Training and HPWP

We now turn to the results from the analyses of earnings. Our measure for earnings is the log of hourly net rate of pay for each individual employee. Because net earnings are used, it is important to include marital status in the wage equation because of Irish tax law, which despite elements of individualisation of the tax code, nevertheless provides substantial tax breaks for married couples. The mean hourly earnings for our sample as a whole is €13.27. For those who received training in the past two years, hourly earnings are €14.23, compared to €12.30 for those who did not receive training. This simple mean based comparison strongly suggests lower earnings for those who have received training relative to those who have not. We conduct regression analysis to see if the pay difference remains when we control for the variety of factors that influence earnings other than participation in training. We estimate standard OLS Mincer type wage equations in which the standard controls are included in Table 4 and Table 5 which present the results. In Table 4 we include a dummy variable indicating if an employee has received training in the past two years; and in Table 5 we include two dummy variables indicating if an employee has received general training or specific training in the past two years. At this point we are taking a simple approach and delaying a discussion of selection effects until later in the text.

[Insert Table 4 here]

Equation 1 in Table 4 includes only personal characteristics. We find that those who have received training in the past two years receive on average 10% higher wages than those who have not. Females earn 15% less than males, older workers earn more than younger workers, and those with higher levels of education earn more than those with lower levels of educational attainment. Those who are married earn more than those who are not married.

Equation 2 then includes job characteristics. We now see that the addition of job characteristics reduces the returns to training: those who have received training in the past two years receive on average 7% higher wages than those who have not. Females now earn 16% less than males. Those with higher levels of education continue to earn more than those with lower levels of educational attainment as do those who are married. As expected, workers on temporary contracts earn less than those on permanent contracts and those with lower tenure earn less than those with longer tenure. Part-time workers earn higher hourly wages than full-time employees; trade union/staff association members earn higher wages than non members.

Equation 3 adds variables pertaining to organisation characteristics and change. We now see that the return to training has reduced substantially to less than 4%. The patterns outlined above in relation to personal and job characteristics remain largely stable. In relation to the new variables added to the model, we now see that those working in the public sector earn about 7% more than those working in the private sector. Size also matters for wages, with those working in larger organisations earning more than those working in smaller organisations. Furthermore, employees working in companies that are part of a larger organisation earn higher wages. Work organisation changes are not significantly related to wages, but the introduction of new technology does increase wages.

Equation 4 then includes high performance work practice variables. The presence of arrangements for participation, the strength of consultation and the importance of

performance reward systems, key components identified by the HPWP literature, are each associated with higher wages. Neither progressive employment policies nor flexible working arrangements have any significant impact. The addition of these HPWP variables now reduces the return to training to just less than 3%.

Finally, equation 5 examines whether training has a greater impact when combined with HPWP by specifying interaction terms between training and each of participation, consultation and performance reward systems. None of the interaction terms reach significance suggesting that the effect of training on wages does not differ significantly across work practices.

Returns to General/Specific Training

Table 5 considers the returns to general and specific training. Equation 1 presents the results in relation to personal characteristics. Here the return to general training is higher than the return to specific training; 10% compared to 8% respectively. Equation 2 then adds job characteristics and we now see that the return to specific training is eliminated. However, those who have received general training in the past two years earn 8% more than those who did not receive any training. Equation 3 then adds organisational characteristics and while we see the persistence of a return to general training relative to having not received any training, the return has reduced by 2% when characteristics of organisation structure and change are taken into account. The inclusion of work practices in Equation 4 reduces the return to general training to less than 4%. As in Table 4, above, before, none of the interactions between general training and HPWP - participation, consultation or performance reward systems - achieved statistical significance suggesting that the effect of general training on wages does not vary across work practices.

[Insert Table 5 here]

The OLS estimates from Table 4 (and Table 5) do not account for the endogenous decision to participate in training. Individuals who receive training may be substantially different to those not receiving training either in terms of individual or workplace characteristics (including HPWP) and thus standard regression estimation methods may

produce biased estimates of the effect of training on wages. This potential difficulty can be rectified by using propensity score matching estimators instead of the usual OLS method. By matching treatment (those who received training) and control (those who did not receive training) groups that are similar in terms of observed individual, job and work practice characteristics, the propensity score matching procedure produces unbiased estimates of the effect of training on wages. We thus compare the wages of individuals who participate in training to a group of workers who do not participate in training. To establish an adequate control group, we have to match individuals by employing the predicted values from the full participation model reported as Equation 4 in Table 4. We apply four matching procedures, nearest neighbour, kernel matching, stratification and local linear regression and ensure common support. Table 6 displays the estimated returns to training resulting from different propensity matching methods. The propensity score models produce estimates of the returns to training that are consistently close both in terms of value and significance levels, to those of the OLS model reported in Table 4. Therefore, using this approach we can conclude that the estimated returns to training are robust with respect to possible selection bias. Furthermore, by using this approach, it ensures that levels of estimation bias are greatly reduced by comparing the outcomes of individuals in the treatment and control groups who hold very similar characteristics in terms of individual, job and work practice characteristics.

6. Conclusion

This paper started from the premise that the workplace is an important site for the accumulation of human capital. Our approach, therefore, has been to attempt to bring together two research fields: the large and relatively sophisticated training literature with a growing literature on workplace practices. Our findings suggest that workplaces are indeed important.

We estimate models of both the determinants and the impact of training. Our model of training participation confirms much of the existing literature: age, education, type of contract, tenure, and firm size are all determinants of training. However, we also found that several work practices are also influential: involvement in highly participative or consultative working arrangements; as well as the existence of performance reward

systems and progressive employment policies are all associated with a higher probability of training. When we distinguish between general and firm-specific training, we find that several types of HPWP lead to greater levels of general training. This is consistent with the implication of the HPWP literature and represents a challenge to the human capital approach which has difficulty explaining why employers would pay for general training.

To assess the impact of training we estimate a series of wage models. Simple models, controlling for personal and job characteristics show training to have a significant impact on wages. The addition of variables measuring organisational characteristics confirms that organisational factors are important influences on wages, and their inclusion also reduces the estimated returns to training. We also find that several dimensions of HPWP, particularly participation, consultation and performance reward systems, have a significant impact on wages, and when these variables are specified in the model training continues to show a modest return. These returns are confined to general training: we find no significant returns to firm-specific training.

We have shown that individuals who are involved in highly participative and consultative working arrangements, and in organisations that implement performance reward systems, are more likely to train, and to earn more, than those who are not. To assess whether training has a greater impact when combined with these HPWP we specify a series of interaction terms between training and HPWP, but found no evidence of a wage return to such “bundles” of practices.

The literature on the returns to training acknowledges that individuals who receive training may be substantially different to those not receiving training either in terms of individual or workplace characteristics (including HPWP) and thus standard regression estimation methods may produce biased estimates of the effect of training on wages. We apply a propensity score matching technique to ensure that our estimated returns to training are robust with respect to possible selection bias.

We believe that the contribution of this paper is to suggest that future attempts to rigorously estimate the impact of training on wages should take account of the

workplace and the social relations within it. Our findings suggest that observed patterns of training, and of returns to training are broadly consistent with the implications of the HPWP approach and represent a challenge to elements of the human capital approach.

Table 1: Sample means and standard deviations (weighted)

	Variable Mean	Training Rate
Training		
Any training	.50	50.0
Personal Characteristics		
Female	.53	46.2
Age 25-39	.34	49.3
Age 40-54	.38	50.3
Age 55+	.10	46.9
Leaving Certificate	.33	49.2
University	.42	59.4
Married	.55	46.6
Job Characteristics		
Temporary Contract	.16	37.0
29 hours or less	.21	39.6
< 1 year with current	.15	35.8
1-5 years current employer	.32	51.1
Trade Union Member	.42	58.9
Organisation Structure & Change		
Public Sector	.31	60.0
5-19 Employees	.27	33.6
20-99 Employees	.34	45.4
100-500+ Employees	.25	53.4
Part of larger organisation	.57	
Re-organisation of company	.39	57.9
New technology introduced	.51	58.5
New Chief Executive	.27	63.0
Introduction of Family Friendly Policies	.28	60.8

Table 2: Binary Probit Regression Model of Determinants of Participation in Training

	Equation 1		Equation 2		Equation 3		Equation 4	
	Coef.	P>z	Coef.	P>z	Coef.	P>z	Coef.	P>z
Constant	-0.456	0.000	-0.327	0.000	-0.801	0.000	-0.923	0.000
Female	-0.095	0.012	-0.031	0.446	-0.042	0.344	-0.005	0.903
Age 25-39	0.135	0.023	-0.072	0.256	-0.107	0.101	-0.131	0.050
Age 40-54	0.107	0.095	-0.171	0.013	-0.231	0.001	-0.267	0.000
Age 55+	-0.106	0.187	-0.379	0.000	-0.418	0.000	-0.450	0.000
Leaving Certificate	0.312	0.000	0.295	0.000	0.251	0.000	0.187	0.001
University	0.609	0.000	0.574	0.000	0.472	0.000	0.343	0.000
Married	0.139	0.002	0.100	0.027	0.085	0.065	0.055	0.240
Temporary Contract			-0.113	0.050	-0.119	0.043	-0.061	0.309
Part Time Hours			-0.131	0.010	-0.049	0.361	-0.031	0.573
Tenure less than 1 year			-0.335	0.000	-0.298	0.000	-0.287	0.000
Trade Union Member			0.425	0.000	0.209	0.000	0.181	0.000
Public Sector worker					0.116	0.142	0.136	0.091
5-19 Employees					0.233	0.001	0.192	0.005
20-99 Employees					0.234	0.000	0.180	0.008
100+ Employees					0.430	0.000	0.302	0.000
Part of Larger Organisation					0.111	0.008	0.086	0.046
Recent Re-Organisation of company					0.051	0.263	0.027	0.570
New technology introduced					0.195	0.000	0.151	0.000
New Chief Executive/equivalent					0.148	0.003	0.135	0.007
Introduction of Family Friendly policy					0.194	0.000	0.062	0.202
Participation							0.252	0.000
Consultation							0.083	0.000
Performance reward systems							0.145	0.000
Progressive employment policies							0.122	0.000
Flexible working arrangements							0.026	0.249
N	4703		4703		4703		4681	
Chi-Square	203.18		409.22		625.69		795.92	
Pseudo R	0.0312		0.0628		0.096		0.1227	

Table 3: Multinomial Probit Regression of Determinants of General Training v No Training and Specific Training v No Training

	General Training			Specific Training		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
Constant	-1.955	0.211	0.000	-2.776	0.317	0.000
Female	0.087	0.080	0.276	-0.260	0.117	0.027
Age 25-39	-0.190	0.117	0.105	-0.389	0.181	0.032
Age 40-54	-0.407	0.129	0.002	-0.586	0.197	0.003
Age 55+	-0.775	0.161	0.000	-0.737	0.234	0.002
Leaving Certificate	0.268	0.097	0.006	0.503	0.149	0.001
University	0.579	0.101	0.000	0.494	0.155	0.001
Married	0.091	0.083	0.272	0.063	0.122	0.603
Temporary Contract	-0.048	0.108	0.654	-0.269	0.168	0.109
Part Time Hours	-0.124	0.098	0.203	0.123	0.140	0.381
Tenure less than 1 year	-0.510	0.109	0.000	-0.328	0.174	0.059
Trade Union Member	0.238	0.084	0.005	0.567	0.125	0.000
Public Sector worker	0.206	0.143	0.149	0.239	0.199	0.230
5-19 Employees	0.351	0.124	0.005	0.276	0.181	0.127
20-99 Employees	0.378	0.124	0.002	0.001	0.182	0.997
100+ Employees	0.596	0.134	0.000	0.255	0.195	0.192
Part of Larger Organisation	0.089	0.076	0.241	0.398	0.119	0.001
Recent Re-Organisation of company	0.043	0.082	0.603	0.103	0.119	0.387
New technology introduced	0.231	0.075	0.002	0.311	0.112	0.006
New Chief Executive/equivalent	0.217	0.088	0.013	0.167	0.124	0.179
Introduction of Family Friendly policy	0.131	0.084	0.120	-0.043	0.124	0.726
Participation	0.396	0.076	0.000	0.483	0.111	0.000
Consultation	0.184	0.033	0.000	0.037	0.048	0.447
Performance reward systems	0.265	0.040	0.000	0.089	0.062	0.150
Progressive employment policies	0.206	0.040	0.000	0.175	0.063	0.006
Flexible working arrangements	0.052	0.039	0.188	-0.003	0.057	0.961
N=4633						
Chi-Square=930.89						
Pseudo R =.1044						

Table 4: Wage Equation

	Equation 1		Equation 2		Equation 3		Equation 4		Equation 5	
	Coef.	P>t								
Constant	1.925	0.000	1.968	0.000	1.836	0.000	1.861	0.000	1.847	0.000
Train	0.104	0.000	0.074	0.000	0.036	0.001	0.028	0.009	0.059	0.020
Female	-0.153	0.000	-0.169	0.000	-0.157	0.000	-0.155	0.000	-0.155	0.000
Age 25-39	0.268	0.000	0.203	0.000	0.175	0.000	0.172	0.000	0.172	0.000
Age 40-54	0.371	0.000	0.282	0.000	0.238	0.000	0.235	0.000	0.235	0.000
Age 55+	0.381	0.000	0.288	0.000	0.242	0.000	0.241	0.000	0.242	0.000
Leaving Certificate	0.158	0.000	0.161	0.000	0.138	0.000	0.134	0.000	0.134	0.000
University	0.403	0.000	0.403	0.000	0.316	0.000	0.310	0.000	0.310	0.000
Married	0.081	0.000	0.058	0.000	0.049	0.000	0.047	0.000	0.048	0.000
Temporary Contract			-0.105	0.000	-0.095	0.000	-0.093	0.000	-0.093	0.000
Part Time Hours			0.107	0.000	0.104	0.000	0.104	0.000	0.104	0.000
Tenure less than 1 year			-0.050	0.002	-0.050	0.001	-0.048	0.002	-0.048	0.002
Trade Union Member			0.141	0.000	0.092	0.000	0.090	0.000	0.090	0.000
Public Sector worker					0.071	0.001	0.085	0.000	0.085	0.000
5-19 Employees					0.051	0.003	0.050	0.004	0.050	0.004
20-99 Employees					0.085	0.000	0.079	0.000	0.079	0.000
100+ Employees					0.092	0.000	0.076	0.000	0.077	0.000
Part of Larger Organisation					0.007	0.530	0.004	0.746	0.004	0.705
Recent Re-Organisation of company					0.004	0.755	-0.003	0.825	-0.003	0.822
New technology introduced					0.021	0.065	0.019	0.084	0.019	0.087
New Chief Executive/equivalent					0.015	0.252	0.010	0.430	0.010	0.425
Introduction of Family Friendly policy					-0.004	0.745	-0.015	0.247	-0.015	0.243
Participation							0.064	0.000	0.058	0.001
Consultation (ordinal)							0.036	0.000	0.042	0.000
Performance reward systems							0.038	0.000	0.040	0.000
Progressive employment policies							0.005	0.411	0.005	0.416
Flexible working arrangements							0.008	0.147	0.008	0.151
Interaction Training*Participation									0.011	0.614
Interaction Training*Consultation									-0.014	0.136
Interaction Training*Perf Rew Sys									-0.002	0.865

Table 5: Wage Equation

	Equation 1		Equation 2		Equation 3		Equation 4		Equation 5	
	Coef.	P>t								
Constant	1.926	0.000	1.967	0.000	1.930	0.000	1.859	0.000	1.857	0.000
G Training	0.108	0.000	0.083	0.000	0.066	0.000	0.036	0.002	0.048	0.084
S Training	0.086	0.000	0.040	0.023	0.016	0.353	0.001	0.968	0.002	0.922
Female	-0.152	0.000	-0.169	0.000	-0.163	0.000	-0.155	0.000	-0.155	0.000
Age 25-39	0.266	0.000	0.203	0.000	0.182	0.000	0.172	0.000	0.171	0.000
Age 40-54	0.369	0.000	0.282	0.000	0.250	0.000	0.235	0.000	0.235	0.000
Age 55+	0.381	0.000	0.290	0.000	0.257	0.000	0.243	0.000	0.243	0.000
Leaving Certificate	0.158	0.000	0.161	0.000	0.150	0.000	0.134	0.000	0.134	0.000
University	0.401	0.000	0.402	0.000	0.342	0.000	0.310	0.000	0.310	0.000
Married	0.082	0.000	0.059	0.000	0.053	0.000	0.047	0.000	0.048	0.000
Temporary Contract			-0.102	0.000	-0.106	0.000	-0.091	0.000	-0.091	0.000
Part Time Hours			0.107	0.000	0.100	0.000	0.104	0.000	0.105	0.000
Tenure less than 1 year			-0.048	0.003	-0.046	0.004	-0.047	0.003	-0.047	0.003
Trade Union Member			0.142	0.000	0.088	0.000	0.091	0.000	0.085	0.000
Public Sector worker					0.069	0.001	0.085	0.000	0.085	0.000
5-19 Employees					0.052	0.003	0.051	0.004	0.052	0.003
20-99 Employees					0.077	0.000	0.078	0.000	0.078	0.000
100+ Employees					0.090	0.000	0.077	0.000	0.075	0.000
Part of Larger Organisation					0.002	0.842	0.005	0.656	0.021	0.132
Recent Re-Organisation of company					0.002	0.850	-0.002	0.844	-0.003	0.826
New technology introduced					0.032	0.005	0.021	0.058	0.020	0.074
New Chief Executive/equivalent					0.010	0.464	0.008	0.553	0.008	0.547
Introduction of Family Friendly policy					0.018	0.138	-0.015	0.246	-0.016	0.221
Participation							0.064	0.000	0.053	0.000
Consultation (ordinal)							0.035	0.000	0.038	0.000
Performance reward systems							0.038	0.000	0.041	0.000
Progressive employment policies							0.004	0.533	0.004	0.545
Flexible working arrangements							0.007	0.200	0.007	0.251
Interaction Training*Participation									0.021	0.361
Interaction Training*Consultation									-0.008	0.430
Interaction Training*Perf Rew Sys									-0.007	0.497

Table 6: Propensity Score Estimate impact of training on wages

<i>Method</i>	<i>ATT</i>	<i>Std. Error</i>	T
Nearest Neighbour	.025	.016	1.548
Radius	.036	.031	1.155
Kernel	.043	.012	3.655
Stratification	.039	.014	2.790
	Coeff	Std. Error	P
OLS	.027	.012	.029

Bibliography

- Acemoglu D. and Pischke, J.S. (1999) Beyond Becker: Training in Imperfect Labour Markets. *The Economic Journal*, 109:F112-142.
- Appelbaum, E. and Bailey, T., Berg, P. and Kalleberg, A. (2000). *Manufacturing Advantage: Why High Performance Work Systems Pay Off*. Ithaca: NY: ILR Press.
- Appelbaum, E. and Blatt, R. (1994). *The New American Workplace*. Ithaca: NY: ILR Press
- Arulampam, W. and Booth, A.L. (1998). Training and Labour Market Flexibility: Is There a Trade-off? *British Journal of Industrial Relations*, 36:521-536.
- Bassanini, A. and G. Brunello (2003). Is Training More Frequent when Wage compression is Higher? Evidence from the European Community Household Panel, *IZA Discussion Paper No. 839, August*.
- Barrett, A. and O'Connell, P.J. (2001). Does Training Generally Work? The Returns to in-Company Training. *Industrial and Labour Relations Review*, 54:647-662.
- Bartell, A. (1995). Training, Wage Growth, and Job Performance: Evidence from a Company Database. *Journal of Labor Economics*, 3:401-425.
- Batt, R. (2001). Explaining Wage Inequality in Telecommunications Services: Customer Segmentation, Human Resource Practices, and Union Decline. *Industrial and Labor Relations Review*, 54:425-49.
- Becker, G. (1975). *Human Capital* 2nd Edition. New York: Columbia University.
- Bishop, J. (1994). The Impact of previous training on productivity and wages, in L. Lynch (ed.), *Training and the Private Sector*. Chicago, Il.: University of Chicago Press.
- Booth, A. (1991). Job-Related Formal Training: Who Receives it and What is it Worth? *Oxford Bulletin of Economics and Statistics*, 53:281-294.
- Booth, A. and Bryan, M. (2002). Who Pays for General Training? New Evidence for British Men and Women" [*IZA Discussion Paper No. 486*](#).
- Booth, A. and Zoega, G. (2000). Why Do Firms Invest in General Training? 'Good' Firms and 'Bad' Firms as a Source of Monopsony Power' *CEPR Discussion Paper No. 2536*.
- Black, S., Lynch, L. and Krivelyova, K. (2004). How Workers Fare When Employers Innovate. *Industrial Relations*. 43: 44-66.

- Blundell, R., Dearden, L. and Meghir, C. (1996). *The Determinants and Effects of Work-Related in Britain*. London: Institute for Fiscal Studies.
- Brunello, G. (2001). On the Complementarity between Education and Training in Europe”, *IZA Discussion Paper Series*, No. 309, Bonn: Institute for the Study of Labour.
- Capelli D. and Neumark, D. (2001). Do High Performance Work Practices Improve Establishment-level Outcomes? *Industrial and Labor Relations Review*, 54:737-735.
- Doeringer, P. and Piore, M. (1971) *Internal Labour Markets and Manpower Analysis*. Lexington Mass.: Heath Lexington Books.
- Dustmann, C. and Schoenberg, U. (2004). Training and Union Wages. *IZA Discussion paper No. 1435*.
- Evertsson, M. (2004). Formal On-the-Job Training: A Gender-Typed Experience and Wage-Related Advantage? *European Sociological Review* 20:79-94.
- Gelderblom, A. and de Koning, J. (2002). Exclusion of Older Workers, productivity and training. In Schömann, K. and O’Connell, P.J (eds.) (2003) *Education, Training and Employment Dynamics*. Cheltenham: Edward Elgar.
- Goux, D. and E. Maurin (2000). Returns to Firm-Provided Training: Evidence from French Worker-Firm Matched Data. *Labour Economics*, 7:1-19.
- Green, F. (1993). The Determinants of Training of Male and Female Employees in Britain. *Oxford Bulletin of Economics and Statistics*, 55:103-122.
- Groot, W. and Osterbeek, H. (1995). Determinants and wages effects of different components of participation in on- and off-the-job training. Research Memorandum, Tinbergen Institute, Rotterdam.
- Handel, M. and Levine, D. (2004). Editors' Introduction: The Effects of New Work Practices on Workers. *Industrial Relations: A Journal of Economy and Society*, 43:1-43.
- Holzer, H. Block, R., Cheatham, M., and Knott, J. (1993). Are Training Subsidies for Firms Effective? The Michigan Experience. *Industrial and Labor Relations Review*, 46:625-636.
- Hughes, G., O’Connell, P.J. and Williams, J. (2003). Market Forces and Company Training in Ireland. *ESRI Seminar Paper, January 23, 2003*.
- Loewenstein, M. and Spletzer, J. (1999). General and Specific Training: Evidence and Implications. *Journal of Human Resources*, 34:710-33.

- Lynch, L. (ed.) (1994). *Training and the Private Sector: International Comparisons*. Chicago: University of Chicago Press.
- OECD. (1999). Training of Adult Workers in OECD countries: Measurement and Analysis. Chapter 3 (P. 135-175) in *Employment Outlook*. Paris: OECD.
- O’Connell, P. (2007). Who Generally Trains? The Effects of Personal and Workplace Characteristics on Training at Work, in Lassnigg et al., (eds.), *Lifelong Learning: Building Bridges through Transitional Labour Markets*. Apeldoorn, Belgium: Het Spinhuis.
- O’Connell, P.J., Russell, H., Williams, J. and Blackwell, S. (2004). *The Changing Workplace: A Survey of Employees’ Views and Experience*. Dublin: The National Centre for Partnership and Performance and The Economic and Social Research Institute.
- O’Connell, P.J. (2002). Does Enterprise-Sponsored Training Aggravate or Alleviate Existing Inequalities? Evidence from Ireland, in Schömann, K. and O’Connell, P.J., (eds.), *Education, Training and Employment Dynamics*. Cheltenham, UK: Edward Elgar Pp 285-302.
- O’Connell, P.J. (1999). *Adults in Training: An International Comparison of Continuing Education and Training*. OECD Center for Educational Research and Innovation, WD(99)1. Paris: OECD.
- Osterman, P. (1995). Skill, Training, and Work Organization in American Establishments. *Industrial Relations: A Journal of Economy and Society*, 34:125-146.
- Osterman, P. (2006). The Wage Effects of High Performance Organization in Manufacturing. *Industrial and Labour Relations Review*, 59:187-204.
- Pischke, J.S. (1996). Continuous Training in Germany. *National Bureau of Economic Research, Working Paper No. 5829*.
- Schömann, K. and O’Connell, P. (eds.), (2003). *Education, Training and Employment Dynamics*. Cheltenham: Edward Elgar.

Year	Number	Title/Author(s) ESRI Authors/Co-authors <i>Italicised</i>
2009		
	288	Climate Feedbacks on the Terrestrial Biosphere and the Economics of Climate Policy: An Application of <i>FUND</i> <i>Richard S.J. Tol</i>
	287	The Behaviour of the Irish Economy: Insights from the HERMES macro-economic model <i>Adele Bergin, Thomas Conefrey, John FitzGerald and Ide Kearney</i>
	286	Mapping Patterns of Multiple Deprivation Using Self-Organising Maps: An Application to EU-SILC Data for Ireland <i>Maurizio Pisati, Christopher T. Whelan, Mario Lucchini and Bertrand Maitre</i>
	285	The Feasibility of Low Concentration Targets: An Application of <i>FUND</i> <i>Richard S.J. Tol</i>
	284	Policy Options to Reduce Ireland's GHG Emissions Instrument choice: the pros and cons of alternative policy instruments <i>Thomas Legge and Sue Scott</i>
	283	Accounting for Taste: An Examination of Socioeconomic Gradients in Attendance at Arts Events <i>Pete Lunn and Elish Kelly</i>
	282	The Economic Impact of Ocean Acidification on Coral Reefs <i>Luke M. Brander, Katrin Rehdanz, Richard S.J. Tol, and Pieter J.H. van Beukering</i>
	281	Assessing the impact of biodiversity on tourism flows: A model for tourist behaviour and its policy implications <i>Giulia Macagno, Maria Loureiro, Paulo A.L.D. Nunes and Richard S.J. Tol</i>
	280	Advertising to boost energy efficiency: the Power of One campaign and natural gas consumption <i>Seán Diffney, Seán Lyons and Laura Malaguzzi Valeri</i>
	279	International Transmission of Business Cycles Between Ireland and its Trading Partners <i>Jean Goggin and Iulia Siedschlag</i>

- 278 Optimal Global Dynamic Carbon Taxation
David Anthoff
- 277 Energy Use and Appliance Ownership in Ireland
Eimear Leahy and Seán Lyons
- 276 Discounting for Climate Change
David Anthoff, Richard S.J. Tol and Gary W. Yohe
- 275 Projecting the Future Numbers of Migrant Workers in the Health and Social Care Sectors in Ireland
Alan Barrett and Anna Rust
- 274 Economic Costs of Extratropical Storms under Climate Change: An application of FUND
Daiju Narita, Richard S.J. Tol, David Anthoff
- 273 The Macro-Economic Impact of Changing the Rate of Corporation Tax
Thomas Conefrey and John D. Fitz Gerald
- 272 The Games We Used to Play
An Application of Survival Analysis to the Sporting Life-course
Pete Lunn

2008

- 271 Exploring the Economic Geography of Ireland
Edgar Morgenroth
- 270 Benchmarking, Social Partnership and Higher Remuneration: Wage Settling Institutions and the Public-Private Sector Wage Gap in Ireland
Elish Kelly, Seamus McGuinness, Philip O'Connell
- 269 A Dynamic Analysis of Household Car Ownership in Ireland
Anne Nolan
- 268 The Determinants of Mode of Transport to Work in the Greater Dublin Area
Nicola Commins and Anne Nolan
- 267 Resonances from *Economic Development* for Current Economic Policymaking
Frances Ruane
- 266 The Impact of Wage Bargaining Regime on Firm-Level Competitiveness and Wage Inequality: The Case of Ireland
Seamus McGuinness, Elish Kelly and Philip O'Connell

- 265 Poverty in Ireland in Comparative European Perspective
Christopher T. Whelan and Bertrand Maitre
- 264 A Hedonic Analysis of the Value of Rail Transport in the Greater Dublin Area
Karen Mayor, Seán Lyons, David Duffy and Richard S.J. Tol
- 263 Comparing Poverty Indicators in an Enlarged EU
Christopher T. Whelan and Bertrand Maitre
- 262 Fuel Poverty in Ireland: Extent, Affected Groups and Policy Issues
Sue Scott, Seán Lyons, Claire Keane, Donal McCarthy and Richard S.J. Tol
- 261 The Misperception of Inflation by Irish Consumers
David Duffy and Pete Lunn
- 260 The Direct Impact of Climate Change on Regional Labour Productivity
Tord Kjellstrom, R Sari Kovats, Simon J. Lloyd, Tom Holt, *Richard S.J. Tol*
- 259 Damage Costs of Climate Change through Intensification of Tropical Cyclone Activities: An Application of FUND
Daiju Narita, *Richard S. J. Tol* and *David Anthoff*
- 258 Are Over-educated People Insiders or Outsiders? A Case of Job Search Methods and Over-education in UK
Aleksander Kucel, *Delma Byrne*
- 257 Metrics for Aggregating the Climate Effect of Different Emissions: A Unifying Framework
Richard S.J. Tol, Terje K. Berntsen, Brian C. O'Neill, Jan S. Fuglestedt, Keith P. Shine, Yves Balkanski and Laszlo Makra
- 256 Intra-Union Flexibility of Non-ETS Emission Reduction Obligations in the European Union
Richard S.J. Tol
- 255 The Economic Impact of Climate Change
Richard S.J. Tol
- 254 Measuring International Inequity Aversion
Richard S.J. Tol
- 253 Using a Census to Assess the Reliability of a National Household Survey for Migration Research: The Case of

- Ireland
Alan Barrett and Elish Kelly
- 252 Risk Aversion, Time Preference, and the Social Cost of Carbon
David Anthoff, Richard S.J. Tol and Gary W. Yohe
- 251 The Impact of a Carbon Tax on Economic Growth and Carbon Dioxide Emissions in Ireland
Thomas Conefrey, John D. Fitz Gerald, Laura Malaguzzi Valeri and Richard S.J. Tol
- 250 The Distributional Implications of a Carbon Tax in Ireland
Tim Callan, Sean Lyons, Susan Scott, Richard S.J. Tol and Stefano Verde
- 249 Measuring Material Deprivation in the Enlarged EU
Christopher T. Whelan, Brian Nolan and Bertrand Maitre
- 248 Marginal Abatement Costs on Carbon-Dioxide Emissions: A Meta-Analysis
Onno Kuik, Luke Brander and *Richard S.J. Tol*
- 247 Incorporating GHG Emission Costs in the Economic Appraisal of Projects Supported by State Development Agencies
Richard S.J. Tol and Seán Lyons
- 246 A Carbon Tax for Ireland
Richard S.J. Tol, Tim Callan, Thomas Conefrey, John D. Fitz Gerald, Seán Lyons, Laura Malaguzzi Valeri and Susan Scott
- 245 Non-cash Benefits and the Distribution of Economic Welfare
Tim Callan and Claire Keane
- 244 Scenarios of Carbon Dioxide Emissions from Aviation
Karen Mayor and Richard S.J. Tol
- 243 The Effect of the Euro on Export Patterns: Empirical Evidence from Industry Data
Gavin Murphy and Iulia Siedschlag
- 242 The Economic Returns to Field of Study and Competencies Among Higher Education Graduates in Ireland
Elish Kelly, Philip O'Connell and Emer Smyth
- 241 European Climate Policy and Aviation Emissions
Karen Mayor and Richard S.J. Tol
- 240 Aviation and the Environment in the Context of the EU-US Open Skies Agreement
Karen Mayor and Richard S.J. Tol

- 239 Yuppie Kvetch? Work-life Conflict and Social Class in Western Europe
Frances McGinnity and Emma Calvert
- 238 Immigrants and Welfare Programmes: Exploring the Interactions between Immigrant Characteristics, Immigrant Welfare Dependence and Welfare Policy
Alan Barrett and Yvonne McCarthy
- 237 How Local is Hospital Treatment? An Exploratory Analysis of Public/Private Variation in Location of Treatment in Irish Acute Public Hospitals
Jacqueline O'Reilly and Miriam M. Wiley
- 236 The Immigrant Earnings Disadvantage Across the Earnings and Skills Distributions: The Case of Immigrants from the EU's New Member States in Ireland
Alan Barrett, Seamus McGuinness and Martin O'Brien
- 235 Europeanisation of Inequality and European Reference Groups
Christopher T. Whelan and Bertrand Maitre
- 234 Managing Capital Flows: Experiences from Central and Eastern Europe
Jürgen von Hagen and Iulia Siedschlag
- 233 ICT Diffusion, Innovation Systems, Globalisation and Regional Economic Dynamics: Theory and Empirical Evidence
Charlie Karlsson, Gunther Maier, Michaela Trippl, *Iulia Siedschlag*, Robert Owen and *Gavin Murphy*
- 232 Welfare and Competition Effects of Electricity Interconnection between Great Britain and Ireland
Laura Malaguzzi Valeri
- 231 Is FDI into China Crowding Out the FDI into the European Union?
Laura Resmini and Iulia Siedschlag
- 230 Estimating the Economic Cost of Disability in Ireland
John Cullinan, Brenda Gannon and *Seán Lyons*
- 229 Controlling the Cost of Controlling the Climate: The Irish Government's Climate Change Strategy
Colm McCarthy, Sue Scott
- 228 The Impact of Climate Change on the Balanced-Growth-Equivalent: An Application of *FUND*
David Anthoff, Richard S.J. Tol

- 227 Changing Returns to Education During a Boom? The Case of Ireland
Seamus McGuinness, Frances McGinnity, Philip O'Connell
- 226 'New' and 'Old' Social Risks: Life Cycle and Social Class Perspectives on Social Exclusion in Ireland
Christopher T. Whelan and Bertrand Maitre
- 225 The Climate Preferences of Irish Tourists by Purpose of Travel
Seán Lyons, Karen Mayor and Richard S.J. Tol
- 224 A Hirsch Measure for the Quality of Research Supervision, and an Illustration with Trade Economists
Frances P. Ruane and Richard S.J. Tol
- 223 Environmental Accounts for the Republic of Ireland: 1990-2005
Seán Lyons, Karen Mayor and Richard S.J. Tol
- 2007** 222 Assessing Vulnerability of Selected Sectors under Environmental Tax Reform: The issue of pricing power
J. Fitz Gerald, M. Keeney and S. Scott
- 221 Climate Policy Versus Development Aid
Richard S.J. Tol
- 220 Exports and Productivity – Comparable Evidence for 14 Countries
The International Study Group on Exports and Productivity
- 219 Energy-Using Appliances and Energy-Saving Features: Determinants of Ownership in Ireland
Joe O'Doherty, Seán Lyons and Richard S.J. Tol
- 218 The Public/Private Mix in Irish Acute Public Hospitals: Trends and Implications
Jacqueline O'Reilly and Miriam M. Wiley
- 217 Regret About the Timing of First Sexual Intercourse: The Role of Age and Context
Richard Layte, Hannah McGee
- 216 Determinants of Water Connection Type and Ownership of Water-Using Appliances in Ireland
Joe O'Doherty, Seán Lyons and Richard S.J. Tol
- 215 Unemployment – Stage or Stigma? Being Unemployed During an Economic Boom
Emer Smyth

- 214 The Value of Lost Load
Richard S.J. Tol
- 213 Adolescents' Educational Attainment and School Experiences
in Contemporary Ireland
Merike Darmody, Selina McCoy, Emer Smyth
- 212 Acting Up or Opting Out? Truancy in Irish Secondary Schools
Merike Darmody, Emer Smyth and Selina McCoy
- 211 Where do MNEs Expand Production: Location Choices of the
Pharmaceutical Industry in Europe after 1992
Frances P. Ruane, Xiaoheng Zhang
- 210 Holiday Destinations: Understanding the Travel Choices of
Irish Tourists
Seán Lyons, Karen Mayor and Richard S.J. Tol
- 209 The Effectiveness of Competition Policy and the Price-Cost
Margin: Evidence from Panel Data
Patrick McCloughan, *Seán Lyons* and William Batt
- 208 Tax Structure and Female Labour Market Participation:
Evidence from Ireland
Tim Callan, A. Van Soest, J.R. Walsh
- 207 Distributional Effects of Public Education Transfers in Seven
European Countries
Tim Callan, Tim Smeeding and Panos Tsakloglou