Training and Establishment Survival

by William Collier*, Francis Green*, John Peirson* and David Wilkinson**

January 2003

JEL Classification: J24, J51, L21

Keywords: Training, survival, economic performance.

* Department of Economics, University of Kent

** Policy Studies Institute.

Address for Correspondence:

Dr. William Collier,
Department of Economics,
Keynes College,
University of Kent at Canterbury,
Canterbury,
KENT CT2 7NP, UK.
Tel: +44 1227 823432
Fax: +44 1227 827850
Email: W.J.Collier@ukc.ac.uk

ABSTRACT

We investigate the relationship between training and the likelihood of commercial survival over a 7-year period, using a survey of British establishments. We find that in establishments of 200 or more employees, increased training of those in Professional, Sales, and Clerical and Secretarial occupations is associated with a greater chance of survival. In smaller establishments of less than 200 employees, increased training for Operatives and Assembly workers, Personal and Protective Service workers, and Craft and Technical workers is associated with better chances of survival. We interpret these findings as suggesting that training for these groups generated above-normal returns and indicates under-investment in training by such firms. There is no evidence to suggest under-investment in management training.

Training and Establishment Survival

1. Introduction

This paper examines the association between training and the commercial survival of establishments, in order to throw light on the relationship between employer training and company performance. In most industrialised countries, very large numbers of workers undertake some type of job-related training each year. For the most part, employers pay substantially for this training (Loewenstein and Spletzer, 1998; Green, 1999). To receive or impart training, employees are disengaged fully or partially from productive activities, normally while still receiving wages. Equipment and courses have to be paid for. The cost of continuing vocational training in EU countries in 1999 ranged from around 1½ to 3 per cent of total labour costs (Nestler and Kailis, 2002) equivalent at the top end of this scale to around 1400 Euro per employee. Another estimate puts the total cost to employers in Britain at around £1,300 per employee in 2000 (Spilsbury, 2001): this adds up to approximately £23 billion, which is more than half the public education budget.[1] We may presume that the general intention of all this training is both to produce those work skills that education could not (or did not) provide and to meet new skill needs arising from changing technology, and hence that there is a financial benefit to the training to be set against the large cost.

Yet, to substantiate this rational view of training, it would be useful to have evidence as to the existence and extent of employer returns to training investments. If the distribution of these returns were known by firms, in a stable market equilibrium the quantity of training would be expected to respond to the expected returns, and so the

[1] The investment is unequally distributed among occupational groups; typically, managers and professionals receive training most frequently, while large numbers of manual workers never receive any continuing training after a period of induction.

returns to training would adjust towards the normal rate of return. However, though many firms evaluate their own training expenditures, the benefits in terms of productivity gains or of profits rises are typically extremely hard or impossible to measure, even *ex post*.[2] Thus the uncertainty surrounding a firm's investment in skills might best be characterised as pure uncertainty (in the sense of Knight) rather than as risk with a known probability distribution.

Given the lack of information facing all parties, there is no reason to expect that the return to training will converge to the normal rate of return. Because it is hard for a firm to assess the impact of its training expenditures on profits, the consequence could be either an over-investment or an under-investment in training. A typical argument is heard that "short-termist" firms will accord disproportionate weight to known current training expenditures, and less weight to unknown future benefits. If that is the case, such firms are likely to under-invest in human capital, that is, to train less than the optimal amount. This would be observed as an above-normal rate of return to training. Yet, it is equally possible that employers could be putting undue faith in the efficacy of training, especially since we do observe ostensibly very large sums being invested in this way. In that case the returns to training would be below normal. This paper seeks to investigate which of these scenarios on average prevails, using an economic model and formal statistical methods with a large, representative establishment-level data set.

Knowledge of the link between training and company performance is a useful input into policy making. If, for example, the returns to training are found to be high for a particular group of workers, this supports policies that make use of this information to

[2] Within a firm, the human resource department would typically carry out such evaluations; there is sometimes an incentive for that department to justify training expenditures as having benefits in bidding for further resources. The decision to spend money on training is sometimes described by employers as an "act of faith".

encourage increased training (though not necessarily for subsidies). If, by contrast, the returns are less than normal, one could infer that firms may be spending too much on training (though, since training has externalities and may be credit-constrained, the training could still be too low from society's point of view (Stevens, 1999)). The dissemination of information about the effectiveness or otherwise of different types of training can thus be a public good.[3]

Although there is evidence that training raises wages and productivity, there is only very limited evidence concerning its impact on company profits. Formal estimates of the rate of return to employer training range from 7 per cent to 50 per cent. These estimates are based, however, on records from a small number and range of US companies. It would thus seem unsafe as yet to draw strong general conclusions about how the returns to training compare with normal rates of return. In this paper we examine the relationship between training and profits indirectly, by exploiting information on plant closure in a panel of British establishments. The presumption is that, if investment in training has an above-normal rate of return for the establishment, the training will enable the establishment to survive longer. The converse also applies: if training expenditures are too high, this could lead to lower profits. The data afford detailed measures of the annual training given to each of the various occupational groups in the organisation. We provide, for the first time, evidence for an association between training and establishment survival, and hence indirectly with profitability. Since the survey data are drawn from all (private) sectors of the British economy

[3] Such has been the implicit rationale of a number of UK government policy initiatives in recent decades, which have sought to foster training through the dissemination of best practice, and the promotion of employer training as good for employers; the advantage from government's point of view is that such policies rarely entail large expenditures.

(subject to a minimum of 25 employees in the establishment), our findings can be regarded as applicable in a wide range of contexts.

The remainder of the paper is organised as follows. Section II presents a brief overview of the small body of evidence on the relationship between training and appropriate measures of economic performance. Section III presents a simple model of the relation between training, profits and establishment survival. Section IV describes the data and methodology. Section V discusses the empirical results. Section VI presents extensions whilst Section VII concludes.

II. Previous Evidence on Training and Economic Performance of Firms and Their Employees.

There is now an established body of evidence that employer training benefits employees through increased wages (e.g. Blundell et al, 1996; Bartel, 1995 ; Green et al, 1996)[4]. The magnitude of estimates differ, reflecting differences in the training measures and in training quality across data sets. There is also growing evidence to support the view that training has positive effects on individual or organisational productivity (e.g. Holzer et al, 1993, for the US, Zwick , 2002, for Germany or Alba-Ramirez, 1994, for Spain).[5] An exception, notable because of the high quality of its data base, is the finding reported by Lynch and Black (1995, 2001) that the numbers of employees in training in US manufacturing establishments had no significant impact on contemporaneous productivity.[6] Bishop (1994) and Dearden et al (2000) agree with each other in finding

[4] Overviews are provided by Barrett et al (1998), Bishop (1997) and Green (1997).
[5] Bartel (2000) gives an overview.
[6] Lynch and Black do find that IT use by non-managerial staff raises productivity, and link this to human capital investment by the firm.

that productivity gains are greater than employees' wage gains. We should expect the organisational productivity gains to exceed employees' wage gains, for two reasons. First, if employers are to obtain a positive return to training, unit labour costs need to fall. Second, we expect there to be benefits to training that are external to the individual trainee but internal to the organisation. This expectation is consistent with assumptions sometimes made in endogenous growth models. It also concurs with findings about the function of training within the process of work-based learning (Eraut et al, 1998), where training has been found to be a gateway through which knowledge and expertise enter the organisation. Company training also has some modest effects on other indirect indicators of performance such as labour turnover and mobility (Dearden et al, 1996; Green et al, 2000).

Yet, lacking information on training costs, the above studies do not generate estimates of any impact of training on financial performance. This objective is achieved by two "econometric case studies", where findings are based on individual performance data drawn from a company's internal records, including cost data. Bartel (1995) computes rates of return ranging from 7 to 50 per cent for a large manufacturing company; while estimates from Krueger and Rouse (1998) imply a return of 7 to 9 per cent (Bartel (2000). In both studies, training's effect is derived from the impact on individuals' performance in the first year after training. The range of estimates depends in part on assumptions made about skill depreciation.

Also relevant are studies that find an impact of human resource management policies on performance. Although the evidence is mixed, influential studies by Huselid (1995), Huselid and Becker (1996) and by Ichniowski *et al* (1997) point to the conclusion that introducing modern human resource management systems that include high training levels tend to raise profits. Michie and Sheehan-Quinn (2001) also find a positive

correlation between HRM systems that include training and a subjective measure of financial performance. Ichniowski *et al* find the impact of the choice of HRM systems to be large, and argue that it is only the switching costs of moving to a high performance system that prevents firms exploiting the profit gains. An alternative argument is that firms may be unaware of the potential gains. In these studies, the impact of training is likely to be greater if accompanied by other elements of a human resource policy bundle, such as consultative committees or appraisal schemes. Nevertheless, the precise impact of training within systems of HRM is unclear, since the studies typically do not present estimates of the effects of training both separately and interacted with other policies. We are thus unable to draw from this literature substantial conclusions about employer returns to training.

In short, considering the size of the investment, remarkably little is known about the impact of employer training on the financial performance of companies. Moreover, no existing studies directly examine longer term impacts of training. In this study, by taking as our dependent variable whether or not an establishment has survived for at least seven years, we look indirectly at a possible medium term impact of training on financial performance. In contrast to the indicators used in the previous literature (such as management evaluations of employees), the commercial survival or failure of an establishment is an objective indicator of performance. We have detailed indicators of whether each of nine occupational groups within establishments are given training and, if so, what proportions of employees are trained. We are thus able to derive estimates of training's association with establishment survival, and thereby infer conclusions about its possible medium-term impact on financial performance. We are also able to distinguish between the effects of training different sections of the workforce.

Hitherto, studies of workplace closure have (to our knowledge) not considered any potential role for employer training. The emphasis of some studies has been on whether unionism is detrimental to establishment survival (Machin, 1995; Bryson, 2001), or, relatedly, whether plant closure is linked to conflict in industrial relations (Kirkham et al, 1999). Such studies also focus on the role of greater market power and/or better financial performance in reducing the chances of plant closure. Other researchers have emphasised the importance of entry size and of early entry in the product life cycle (Klepper and Simons, 2000), the stock of professional and technical workers at the establishment together with investments in research and development (Hage et al, 1993), and the role of higher technology and ownership (Colombo and Delmastro, 2001; Agarwal, 1996), in reducing the chances of closure.

III. A Model of the Effects of Training on Economic Performance and Establishment Survival

To examine the relationship between training, profitability and establishment survival, we first develop a simple model of how the training decision depends on beliefs about the efficacy of training. For this purpose we abstract from issues of endogenous recruitment and retention, and treat training as in effect firm-specific; there is thus no difficulty in rationalising why firms have an incentive to invest in training.[7] We consider a simple two period model. In the first period, the plant has a fixed labour force L_1, faces a fixed wage of w and has the decision what proportion of the labour

[7] A number of reasons are afforded in recent literature as to why firms pay for training, the main ones being informational asymmetries and frictions in the labour market, which can render even genuine training effectively specific. See for example Stevens, (1994) or Acemoglu and Pischke (1999).

force, t, to train at a cost c per worker. The profits in the first period, Π_1, are known precisely at

$$\Pi_1 = REV_1(L_1) - w L_1 - t c L_1$$

The revenue function REV_1 depends on the fixed labour force, the production function and implicitly allows for price to fall with increased output.

The profits in the second first period, Π_2, have a probability distribution as the management is unsure about the increased efficiency of labour after training, f(t).

$$\Pi_2 = REV_2(L_1, f(t)) - w L_1$$

The management have a perception about the probability density function for Π_2 - this is given by $\phi(t, \Pi_2)$.[8] For higher t, the density function $\phi(t, \Pi_2)$ first order stochastically dominates density functions for lower t.

It is commonly assumed that the objective of a firm is to maximise profits. In the case of a firm with a number of plants, the central management will wish to expand those parts of the firm that are profitable and close down unprofitable parts – this view of the organisation of multi-divisional firms was first proposed by Williamson (1970). Thus, the manager of a specific plant will wish to be as profitable as possible to avoid closure by the central management or through take-over/merger. Similarly, for the case of a single plant firm, the management will wish to maximise profits so as to avoid closure through bankruptcy or take-over. A proxy for profitability of an establishment is the probability of survival. Consequently, one can consider the effects of training on profitability through the relation of training to the probability of survival.

[8] If labour turnover consequent upon training were also an issue, management's uncertainty about the extent of this could be incorporated in ϕ, without affecting the model's implications.

In this model we consider the motivation of management to be of survival across the two periods. The establishment can be closed at the end of the first or second period. The establishment survives through making profits and greater profits increase the likelihood of survival. We assume that the probability of survival to the end of the second period depends on profits in both periods and is given by $P(\Pi_1(t), \Pi_2)$. This function is assumed to be known exactly by the management.

The decision about training is modelled through maximising the probability of survival with respect to the proportion of the labour force trained. The expected survival probability, S, is given by

$$S = \int_l^u P(\Pi_1(t), \Pi_2) \ \phi(t, \Pi_2)\, d\Pi_2$$

where l and u are the lowest and highest possible bounds for Π_2 whatever t .

Maximisation of the expected survival probability is given by differentiation with respect to t of the above expression (a superscript on a variable represents differentiation with respect to the corresponding argument), and setting the derivative equal to zero.[9]

$$\int_l^u - c \ L_1 \ P^1(\Pi_1(t), \Pi_2) \ \phi(t, \Pi_2)\, d\Pi_2 + \int_l^u P(\Pi_1(t), \Pi_2) \ \phi^t(t, \Pi_2)\, d\Pi_2 = 0 \qquad (1)$$

9

It is assumed that $P^1 > 0, P^{11} < 0, P^2 > 0, P^{22} < 0, P^{12} < 0, \int_l^u P(\Pi_1(t), \Pi_2) \ \phi^t(t, \Pi_2)\, d\Pi_2 > 0,$ and $\int_l^u c^2 \ L_1^2 \ P^{11}(\Pi_1(t), \Pi_2) \ \phi(t, \Pi_2)\, d\Pi_2 + \int_l^u - 2\, c \ L_1 \ P^1(\Pi_1(t), \Pi_2) \ \phi^t(t, \Pi_2)\, d\Pi_2 + \int_l^u P(\Pi_1(t), \Pi_2) \ \phi^{tt}(t, \Pi_2)\, d\Pi_2 < 0$. With the assumptions of an interior solution, and the differentiability of the functions P and ϕ, and their derivatives, the above are sufficient conditions to ensure a unique maximum.

The first term in (1) represents the marginal reduction in survival probability arising from the reduced first period profits; the second term is the marginal increase in survival probability arising from increased second period profits.

The solution of this condition, t*, depends on the perception of the probability density function $\phi(t, \Pi_2)$. It is instructive to consider two establishments, A and B, with probability density functions, $\phi_A(t, \Pi_2)$ and $\phi_B(t, \Pi_2)$, which differ in how "optimistic" they are about the effects of training labour. Optimism is defined in terms of first order stochastic domination with respect to the functions $\phi(t, \Pi_2)$ and $\phi^t(t, \Pi_2)$. We say that A is more optimistic than B if:

$$\int_x^u \phi_A(t, \Pi_2)\, d\Pi_2 \geq \int_x^u \phi_B(t, \Pi_2)\, d\Pi_2 \qquad \forall\, x \tag{2a}$$

$$\int_x^u \phi_A^t(t, \Pi_2)\, d\Pi_2 \geq \int_x^u \phi_B^t(t, \Pi_2)\, d\Pi_2 \qquad \forall\, x \tag{2b}$$

Condition 2a is that the more optimistic view of the probability density function gives higher probability mass to higher second period profits. Condition 2b characterises the more optimistic view about the effect of a marginal increase in training investment. Compared to the relatively pessimistic view (ϕ_B), the optimistic view (ϕ_A) is that additional training generates a greater upward shift in the probability distribution of second period profits.

We now investigate the relation between the optimistic and pessimistic beliefs and the training decisions of establishments. Using (1), we compute the difference between optimistic and pessimistic establishments of the marginal effect of training on survival probability, evaluated at B's optimal training decision, t_B* :

$$\partial(S|t_B^*,\phi_A)/\partial t - \partial(S|t_B^*,\phi_B)/\partial t = \int_l^u - c\, L_1\, P^1(\Pi_1(t_B^*), \Pi_2)\, \left[\phi_A(t_B^*, \Pi_2) - \phi_B(t_B^*, \Pi_2)\right]\, d\Pi_2$$

$$+ \int_l^u P(\Pi_1(t_B^*), \Pi_2)\, \left[\phi_A^t(t_B^*, \Pi_2) - \phi_B^t(t_B^*, \Pi_2)\right] d\Pi_2$$

Using 2a and 2b, both terms in the above expression are positive. Hence, relative to establishments with beliefs ϕ_B, establishments with more optimistic beliefs ϕ_A will choose a training level t_A^* such that $t_A^* > t_B^*$. Thus, in this model, differences in the amount of training are generated by differences in beliefs about the effectiveness of training.

The relation between the objective expected survival probability and training is given by using the objective probability density function, $\phi_o(t, \Pi_2)$, in the survival probability equation. By the previous assumption that any probability density function generates a single maximum survival probability (see footnote 9), the relation between expected survival probability and training will trace out an inverted U shape. Where beliefs about the effectiveness of training are pessimistic (optimistic) relative to the objective survival probability function, there will be under-investment in training and training will have a positive (negative) association with survival probability. If all views were pessimistic relative to the objective density function, it would only be possible to observe empirically a positive relation between training and survival probability. The aim in the remainder of the paper is to investigate empirically the sign and magnitude of the relation between the probability of survival and training.

IV. Data

The data used are from three surveys of the same workplaces at three different points in time. The first survey, the 1990 Workplace Industrial Relations Survey (WIRS3), was a nationally representative survey of 2061 British establishments with 25 or more employees in all sectors except agriculture, forestry and fishing and coal mining. All WIRS3 main management respondents who said they did not mind being re-contacted were asked to participate in a follow up survey, the Employers' Manpower and Skills Practices Survey (EMSPS) conducted between November 1990 and October 1991. Once unproductive and out of scope responses were taken into account the EMSPS sample was left at 1693 establishments.

Much of the data we utilise comes from EMSPS which was set up to examine aspects of employers' skill formation, including their skill needs, recruitment practices and training.[10] In a few cases it was possible to update relevant variables with information from EMSPS (the ownership variable is one example). However, we also include some information available only from WIRS3. The two surveys were conducted only a year apart, and we used only those variables (such as union recognition and number of product market competitors) for which it was reasonable to assume that conditions present at the time of WIRS3 also prevailed at the time of EMSPS.

EMSPS has information on a variety of measures of training that has taken place in the twelve months prior to the survey. Our focus is on "continuing" training, that is, training that is not part of an induction process. The survey provides data for each of up to nine major occupational groups in the establishment. We consider two distinct types of

[10] For a descriptive analysis of the EMSPS dataset, see Dench (1993). Subsequent analyses to have used data from EMSPS include studies of the influence of unions (Green et al, 1999) and of high-performance workplaces (Whitfield, 2000) on training.

training measure. Our first measure is whether or not the establishment is a training provider for either non-manual workers or manual workers or both. The second measure is the proportion of employees receiving training, which we take to be an indicator of the establishment's investment in the skills of its workforce. To generate the latter, we first compute the establishment's share of investment in each of nine occupational groups, by multiplying the proportion receiving training in each group by the share of that group in employment. We then sum the investments for each group to give three indicators of training investment: one for all manual occupational groups, one for all non-manual groups and one for the whole workforce.[11] Summary statistics of all variables used are given in Table A1 of the Appendix.

The final part of the data comes from the longitudinal element of the WIRS series. As part of the 1998 Workplace Employee Relations Survey, a randomly selected sub-sample of WIRS3 workplaces were followed up and re-surveyed.[12] This consisted of 1301 workplaces where detailed information on workplace industrial relations at this time was collected to compare with information from 1990. In addition to these interviews, attempts were made to trace all 2061 WIRS3 workplaces to establish whether or not they were still in operation. It is this latter information that we use to measure workplace survival.

Table 1 reveals that of the 1693 establishments in EMSPS, 181 were found to have closed down by 1998. Apart from 45 establishments, where we could not be sure

---

[11] The proportion of the total workforce trained is given by: $T=\sum_{1}^{9} \tau_i s_i$ where τ_i is the training proportion and s_i the share of occupation group i. Investment in training for manual (non-manual) workers is the sum over just the manual (non-manual) occupations.

[12] Full details of the WIRS series of surveys are available at: www.niesr.ac.uk/niesr/wers98.

whether the establishment was still in operation, all others in the sample were in existence. Some of these establishments gave productive interviews, while others had either refused an interview or become ineligible for re-interview in some way, or were not part of the chosen sub-sample for re-interview. This left a closure rate within the sample of 11 per cent over approximately seven years.[13] For the purposes of the rest of this paper we focus on closure as a presumed outcome of poor commercial performance, and hence restrict our analyses to establishments in the private sector.

Table 1

Establishment Outcome of EMSPS Respondents at WERS 1998

Establishment Outcome At WERS 1998	No. of Establishments
Unsampled, Not Closed Down	544
Missing	45
In Sample, Ineligible or Refused yet Continued	171
In Sample, Productive	752
In & Out of Sample Closed Down	181
Total	**1693**

V. Findings

Table 2 reports the results of a bivariate comparison of closure rates according to whether privately owned establishments provide any continuing training. Nearly 19 per cent of the sample establishments which did no training closed down, compared with 13 per cent of establishments which did train. The difference in the proportions is statistically significant at the 5% level (p=0.039).

[13] Larger establishments and certain industries were deliberately over-sampled in WIRS3. The best estimate of the closure rate for the population of British establishments with at least 25 workers in 1992, obtained by applying the sampling weight, is 12.7 per cent.

Of course, it is possible that the returns to training could vary according to where the investment is placed. The returns could differ because the deviation of training from its optimal level, in the face of poor information, need not be the same for each occupational type. A further reason why the returns may differ is that the function of training is likely to vary substantially between groups (Felstead et al, 1997). To verify this possibility, we considered responses to a direct question asked of management respondents to EMSPS. In establishments where the aim "to meet health and safety or other legislative requirements" was considered to be "very important", one half of the workforce were manual staff. By contrast, where this aim was "not important" only 17 per cent were manual workers. Although training in response to legislation or regulation is necessary, this function might be less related to the commercial performance of the company than are other reported functions of training, which amount to increasing skills through which value is added to the product or service. For example, in sample establishments where the training aim "to implement new technology" was very important, an average of 55 per cent of employees were classed as non-manual, but where this function was not important, only 39 per cent were non-manual. For these reasons, we distinguish in much of the subsequent analysis between the effects of training investments in the manual and non-manual workforce.

Table 2 shows that sample establishments which trained at least some of their non-manual workforce had a closure rate of 12 per cent, compared with 19 per cent for establishments which did not train them. This difference is statistically significant at the 1% level ($p=0.006$). For manual worker training, the same comparison gives a 16 per cent closure rate for non-training establishments as against 13 per cent for training establishments, but the difference in these proportions is not statistically significant at conventional levels ($p=0.21$).

Table 2 Training and Establishment Closure

		Training Establishment		Training Non-manuals		Training Manuals	
		No	*Yes*	*No*	*Yes*	*No*	*Yes*
Establishment Closure	*No*	144 (81.4)	771 (87.2)	189 (80.8)	700 (87.8)	335 (84.4)	563 (87.2)
	Yes	33 (18.6)	113 (12.8)	45 (19.2)	97 (12.2)	62 (15.6)	83 (12.9)
	Total	**177**	**884**	**234**	**797**	**397**	**646**

Note: Private sector establishments only.

Whilst these observed differences in closure rates are substantial, one should not read too much into bivariate comparisons. One reason for caution is that training is more prevalent in larger establishments, which are for other reasons (and according to previous studies) less likely to close down. Other factors such as unionism or establishment age are also likely to be linked to both establishment survival and to training. Moreover, the simple comparison in Table 2 does not distinguish between establishments that train only a few of their employees and those that train many. Accordingly, we present multi-variate probit estimates of the determinants of plant closure in Table 3. Apart from training investments, we include controls used in previous studies, and report further on the sensitivity of our findings to variations in model specification. The table reports the marginal effects on the predicted probability of closure, evaluated at the sample means.[14]

Columns 1 to 3 of Table 3 report the 'raw' association of training with establishment closure for an array of alternative training measures. Column (1) utilises two binary variables that capture whether there is any training of non-manual or manual employees. Consistent with the conclusion from Table 2, those establishments which train at least some of their non-manual workers are about 7 percentage points less likely

[14] For binary independent variables, the marginal effect reports the predicted probability of closure for a discrete change of the independent variable from 0 to 1.

Table 3 The Effects of Employer Training on Establishment Closure

Dependent Variable: Establishment Closure						
	1	**2**	**3**	**4**	**5**	**6**
Establishment trains its non-manual workers (1/0)	-0.0688 *(2.44)**					
Establishment trains its manual workers (1/0)	-0.0113 *(0.48)*					
Proportion of all employees getting training		-0.1073 *(3.26)*†				
Investment in training of non-manual workers			-0.1460 *(3.36)*†	-0.1492 *(2.41)**	-0.3939 *(3.48)*†	-0.3767 *(2.88)*†
Investment in training of manual workers			-0.0599 *(1.30)*	-0.0488 *(0.93)*	0.0303 *(0.44)*	-0.0516 *(0.79)*
"Small" Establishment (< 200 Employees)				0.0867 *(3.34)*†	0.0483 *(1.29)*	-0.0042 *(0.12)*
Inv. in non-manual training *times* "Small" establishment					0.3090 *(2.68)*†	0.3432 *(2.71)*†
Inv. in manual training *times* "Small" establishment					-0.1165 *(1.37)*	-0.0275 *(0.34)*
Non-manual Union Recognition				-0.0184 *(0.50)*	-0.0326 *(0.97)*	-0.0451 *(1.45)*
Manual Union Recognition				0.1092 *(2.92)*†	0.1122 *(3.21)*†	0.1123 *(3.38)*†
Proportion of Manual Workers				-0.0202 *(0.31)*	-0.0320 *(0.53)*	0.0031 *(0.05)*
Proportion of Female Workers				-0.0740 *(1.11)*	-0.0698 *(1.11)*	-0.1105 *(1.82)***
Proportion of Fixed Contracts				0.1609 *(1.18)*	0.1433 *(1.13)*	0.1811 *(1.66)***
UK Owned				0.0272 *(0.89)*	0.0341 *(1.20)*	0.0522 *(2.12)**
Single Establishment				0.0182 *(0.53)*	0.0273 *(0.83)*	0.0130 *(0.43)*
No Competitors				-0.0668 *(2.64)*†	-0.0636 *(2.69)*†	-0.0416 *(1.96)**
Predominantly Exporter				0.0431 *(1.21)*	0.0499 *(1.46)*	0.0702 *(1.99)**
Contracting Product Market or Activities				0.0285 *(1.04)*	0.0213 *(0.83)*	0.0351 *(1.42)*
< 1 Year Age				0.1361 *(1.40)*	0.1458 *(1.55)*	0.1547 *(1.84)***
1 < Age <10				0.0183 *(0.53)*	0.0186 *(0.56)*	0.0381 *(1.10)*
11 < Age <20				0.0134 *(0.42)*	0.0171 *(0.56)*	0.0105 *(0.38)*
Good Financial Performance	No	No	No	No	No	-0.0455 *(1.88)***
Unemp't at 1992	No	No	No	Yes	Yes	Yes
Regional Dummies (11)	No	No	No	Yes	Yes	Yes
Industry Controls (9)	No	No	No	Yes	Yes	Yes
Pseudo R^2	0.0093	0.0185	0.0220	0.1050	0.1193	0.1799
Sample Size	1013	774	774	680	680	537

Notes

1. For definition of investment in training indicators, see footnote 11.
2. Parameter t-values in parentheses. † denotes significance at 1%; * at 5%; and ** at 10%.

to close down (more likely to survive commercially) after seven years than those that do not train non-manual workers. In contrast, training manual workers appears to have no significant association with establishment survival.

Column (2) investigates the association with establishment closure of the preferred measure of training investment, namely the proportion of all workers receiving training. The marginal effect is negative and statistically significant at the 1% level. Furthermore, its magnitude indicates that raising the proportion of employees in receipt of training by 10 percentage points would lower the chances of closing down by 1.1 percentage points.. Column (3) provides a breakdown of this investment in training into training for non-manual and training for manual employees. The estimates reveal that investment in training of non-manual employees has a significant negative association with closure. However, no such association is observed for manual staff.

Column (4) extends the analysis of Column (3) and reports results when an array of control variables is also included, as suggested by theory and the existing empirical studies of plant closure (noted above). The results reveal that the estimated closure equation is meaningful and broadly consistent with this previous literature. Manual union recognition, for example, appears to raise the chances of plant closure. This suggests that the voice effects of manual unions on raising productivity are insufficient to compensate employers for the higher wages they pay (thus leading to lower profits and a greater risk of plant closure).[15] Non-manual union recognition, by contrast, has no significant association with closure. The size and age of an establishment has a

[15] The impact, according to Bryson (2001), is only significant for establishments that only recognise manual unions, and is somewhat smaller (at 8 per cent) than reported here. The difference emerges because here the period covered is different (1991 to 1998), and because in Bryson's model part of the union effect goes through the industry-level union density variable.

significant impact on the probability of establishment closure. Small establishments (<200 employees) are less likely to survive commercially then larger ones. Likewise, establishments of less than a year's vintage are much less likely to survive than older establishments: the age of the establishment in 1990 is positively related to survival. This association could reflect a causal impact of tenure on establishment profits, perhaps through a process of organisational learning. Alternatively, the association may reflect adverse selection whereby inefficient firms are weeded out over time.

Evidence concerning the nature and state of an establishment's product market is mixed. Managers of trading establishments were asked if their product market was expanding or contracting. Whilst a binary variable for declining product market has a positive marginal effect, the estimate is not significantly different from zero. Yet, as expected, the degree of market power exerted by the establishment in the product market is significant. Those establishments operating in markets where the manager perceives there are no competitors have significantly better chances of survival. This is in accord with microeconomic theory: more competitive markets are expected to yield lower rents, and hence a lower probability of survival for individual establishments.

The net effect of including these other determinants of plant closure is to leave almost unchanged the coefficient on the proportion of non-manual workers trained. Conditional on these other determinants, in the average establishment, raising the proportion of non-manual workers receiving training by 10 percentage points is associated with a rise in the chances of establishment survival by 0.7 percentage points.[16]

[16] Calculated, using Table 3 column (4), as 1.49 x 0.50, where 0.50 is the share of non-manual workers in the average establishment.

It is well-known that training is more widespread in larger firms and establishments. A typical rationale for having less training in smaller establishments is that the costs are disproportionately high, at least for formal training. In particular, it is often stated that it is difficult to spare workers from direct production activities. The implication is that the optimal level of training is greater in large than in small establishments. It is also possible that the impact of training on company performance may differ according to the size of establishment. In Column (5) we investigate this issue and interact the two training investment variables with the binary variable that identifies whether the establishment is "small" (less than 200 workers)[17]. The estimates show that the association between investment in training non-manual workers and plant survival is both positive and statistically significant in large establishments of 200 or more workers. However, the association in small establishments is insignificantly different from zero.[18]

Although our interpretation of these findings has been that investment in training, particularly for non-manual employees, does generate above-normal returns and hence lower closure rates, it is possible that the conditional correlation being captured in these estimates derives from omitted factors that are associated both with training and with long-term survival. One such factor might be the financial health of the company. If the

[17] It should be remembered that establishments with less than 25 workers were excluded from the WIRS sample.

[18] We additionally estimated our regressions utilising the weights provided with WIRS that correct for the sample design. The findings reported in Table 3 column (5), and subsequent specifications in this paper, are not substantially or significantly affected by the use of these weights. However, the specification shown in column (4) did show some sensitivity to the use of sample weights, indicating potential mis-specification (DuMouchel & Duncan, 1983). Our preferred specification thus includes interaction terms between training investments and establishment size. With these included, we follow the approach of DuMouchel & Duncan and report only those estimates obtained for unweighted regressions.

firm is in an especially profitable business, it has a greater chance of survival and it may also be able to afford to spend more on employee training. In this respect the training might be regarded in part as an employee benefit. Using the WIRS data, it is possible to control in part for this possibility. In the 1990 interview, managers of establishments were asked to rate the financial performance of their establishment compared with others operating in the same industry. It may be hypothesised that above average profits persist, at least for more than a year, and hence we assume that the manager's perception in 1990 is a proxy for the extent to which it is an inherently above-average profitable company. Thus, in column (6) we input a binary variable for establishments which were deemed to be performing higher than average. The result shows that, as expected, a more profitable establishment in 1990 was less likely to close down between 1991 and 1998. However, the inclusion of this variable made no significant alteration to the estimated coefficient on investment in training.[19]

Other omitted factors associated with training and also with survival may be unobserved in the data. A possible candidate could be the extent to which management has a long-termist horizon. A company which looks to the long-term future might have a range of strategies for securing long-term prosperity. As part of this strategy it might decide that the workforce has a high level of training needs. If so, we might be according too much weight to training *per se*. The effect of the training that we measure in 1991 might also be attributable to other training in earlier and subsequent years, since the level of training is likely to persist. Alternatively, as the HRM literature hypothesises, the effect of training on performance may be linked to the usage of "high-performance" practices. Such practices were not well catered for in the design of the questionnaire instrument

[19] Due to missing values on financial performance, the sample size in column (6) is substantially smaller. However, the conclusion that there is no alteration to the training investment effect holds when we restrict the sample size to the 537 non-missing cases.

for WIRS3.[20] Since there is no possibility to remove unobserved fixed effects with this closure analysis, the fact that high-training establishments are associated in some cases with a greater likelihood of survival should only be interpreted as causal if one is prepared to assume that the unobserved fixed effects do not generate substantial biases in the estimates.

V. Extensions.

In this section we consider three extensions to our basic findings.

It is often reported by employers that a reason for not training various groups of workers is the fear that their investment would be lost through natural labour turnover or deliberate poaching of newly-trained workers. While evidence suggests that training does not lead to substantially higher rates of labour mobility (Dearden et al, 1996), it remains plausible that training investments will have a larger impact in establishments with a more stable workforce. With a very high turnover, any continuing training can have only an immediate pay-back.

Unfortunately, the data do not afford measures of turnover within each occupational group, something which would be necessary to test the above idea adequately. However, managers were asked to estimate the rate of annual turnover of all staff. We therefore defined a new variable as the interaction between reported turnover and the

[20] Nevertheless, variables measuring the presence of communication channels, such as consultative committees or suggestion schemes, had no significant association with the probability of closure. Whitfield (2000) explores the relationship between such practices and training. Channels for communication are a necessary ingredient of getting employees involved in the establishment, which is at the core of the high-performance model (Appelbaum et al, 2000).

investment in training (proportion of all staff getting trained). Analysis within a probit estimation (not shown, available on request) revealed this variable to not be statistically significant. Thus, there is no evidence within the context of the data that higher turnover negates training investments to any great extent. Nevertheless, this must only be a tentative conclusion owing to the lack of good turnover data in the years following 1991.

The second extension to our findings is to examine the separate effect on closure of investment in training in each of the nine occupational groups. By disaggregating the investment in workforce training into the nine constituent groups, we can investigate whether training has differential effects across occupational groups, and hence whether the discrepancy between training and its optimal level varies across groups.

The results of including all nine investments separately are shown in Table 4. Additional explanatory variables in this specification are the same as that previously reported for column (5) of Table 3, and includes interaction terms with the binary variable for small establishment size. Column (1) of Table 4 presents the estimated coefficient on training investment in each group for a large establishment, whilst column (2) presents the estimated coefficients in small establishments, obtained by summing the coefficients of the training investment term and the interaction with the "small" establishment dummy.

In large establishments, it can be seen that among non-manual occupations a negative association of training investment with plant closure is significant for Sales, Clerical and Secretarial, and Professional occupations. However, for Managerial and Administrative workers, the coefficient is positive, though insignificant. Thus, there is

no evidence that training for managers is below the optimal level. Among the manual occupations, none of the training investment has a significant association with closure.

In small establishments, just as with the more aggregated analysis of Table 3, the picture is different. Most training in non-manual occupation groups has no significant association with establishment closure, the exception being Professional Associate and Technical workers. The point estimate for the coefficient on training for Management and Administrative workers is, again, positive.[21] By contrast, among manual occupations, three separate types of training investment -- for Operatives and Assembly workers, Personal and Protective Service workers, and for Craft and Technical Workers -- each have negative and significant links with establishment closure. In each of these cases, establishments which trained a greater proportion of their workers in that group appear to have enhanced their chances of commercial survival. This finding contrasts with the finding reported from Table 3, where investment in manual training as a whole was not found to be significant at conventional levels. The contrast is explained by the absence of any impact from training the least skilled occupational group, Routine and Unskilled workers. When this group is separated out, it is found that training for the rest of the manual workforce taken together reduces the probability of closure in small establishments at the 1% level of significance.[22]

[21] In this case the estimated impact was close to being significantly different from zero (p=0.102).
[22] The marginal effect is -0.195 and is significantly different from zero (p=0.0094).

Table 4 Establishment Closure: Training by Occupation

Dependent Variable: Establishment Closure		
	(1)	**(2)**
	"Large" establishments	"Small" establishments
Management & Administrative	0.295	0.222
Professional	-0.369**	0.099
Professional Associate & Technical	-0.168	-0.198*
Clerical & Secretarial	-0.223†	-0.057
Craft & Skilled Service	0.077	-0.117**
Personal & Protective Service	-1.326	-0.235*
Sales	-1.584†	-0.141†
Operatives & Assembly	-0.064	-0.109**
Routine, Unskilled	-0.076	0.062
Pseudo R^2	0.1768	
Sample Size	680	

Notes
1. † denotes significance at 1%; * at 5%; and ** at 10%
2. Full specification equivalent to Column 5 of Table 3.
3. Column 2 is the sum of the term in column (1) and the relevant interaction term.

Finally, as a third extension, we investigated whether estimates of the length of training periods had any significant impact on establishment survival. Respondents were asked to estimate how many days the trainees in each occupational group received on average. Accordingly, we defined a variable from the manager's responses, equal to one if the estimated average training period was no more than five days, zero otherwise, and interacted this variable with the proportion trained in each group. A substantial number of respondents were unable to give any notion as to the length of training period, and hence there are more missing values, and a smaller number of observations available when this information is included for estimation purposes.

The resulting probit estimation (not shown here, available on request) indicates that, for every group, the length of training period had no additional significant effect on the probability of establishment closure, beyond the proportion of workers trained. There are two ways to interpret this finding. On one hand, the reports of average training lengths may be subject to considerable measurement error. Few if any respondents

would have consulted records when answering the question and any substantial measurement error would be sufficient to generate large downward biases in the estimated coefficients. Alternatively, if the measure is considered accurate enough, one can conclude that, even where the proportions being trained are not at their optimal level, there is no evidence that the quantity of training per trainee is less or more than the optimum.

6. Conclusion.

Why do firms provide continuing training for their employees? If not because of external regulation, the prime general motive is normally assumed to be to invest in future productivity gains. Yet in deciding how much resource to devote to training, and where best to allocate it, firms generally lack any precise metric. How a firm benefits from training its employees can sometimes be captured through measures of improved job performance, but the impact on organisational productivity and *a fortiori* on profits has typically to be a matter of judgement in the face of uncertainty. It is thus quite possible for a firm's marginal returns to training investments to be substantively above or below a normal rate of return without stimulating an adjustment in the size and distribution of its training budget.

This study has provided, for the first time, evidence of a link between training and the commercial survival of establishments. Our best estimate is that, by raising investment in training non-manual workers by 10 percentage points, the average establishment would have lowered the risk of closure between 1991 and 1998 by about 0.7 percentage points. Set against the average closure rate of 13 per cent, such an efficiency gain appears modest but worth having. We interpret the finding as evidence that the training

investment on average provided *ex post* an above normal rate of return, thereby lowering the risk of commercial failure. The finding implies that on average employers in 1991 were unduly pessimistic about the efficacy of training. Moreover, there is no evidence of over-investment in training for manual or non-manual workers. This conclusion is subject to the usual caveats about inferences drawn from a cross-section. Although we have been able to control for the manager's perception of relative financial performance in 1990, as well as other determinants of plant closure as suggested by previous studies, and although the training investment in 1991 is a pre-determined variable in relation to subsequent decisions taken from 1992 to 1998, it remains possible that other factors affect closure and are also correlated with the 1991 training investments.

Further investigation suggested that the gains from training varied substantially according to which groups were being trained and according to the size of establishment. In smaller establishments, our estimates suggest that training for Operatives and Assembly workers, Personal and Protective Service workers, and Craft and Technical workers was sub-optimal in 1992, in the sense that establishments which trained greater proportions of these groups could generate a lower risk of closure. This evidence appears to support the view that policies to encourage smaller establishments to train workers in these lower-ranking occupational groups would be beneficial for employers. However, there is no case found (on grounds of economic performance) for more training to be provided for Routine and Unskilled workers. In larger establishments, training appeared to be sub-optimal particularly for Sales, Clerical and Secretarial, and Professional workers. There was also no evidence of any gains to be had from increasing the proportion of Managerial and Administrative workers who

receive training. Indeed, in our estimate for small establishments, training for this group came close to having a statistically significant negative association with survival.[23]

An implicit assumption underlying a series of government initiatives in Britain has been that firms could do better for themselves by raising their training effort. Yet, such an injunction has typically lacked weight (and arguably been ineffectual) because there was no reason to suppose that government officials had superior information to employers about the private returns to training.[24]

For policy-makers, it is likely that the prime task remains that of addressing externalities, credit restrictions and associated inequality of access in the training market (Policy Innovation Unit, 2001). Nevertheless, the provision of objective information is also a public good; such a rationale underpins public policy in several areas of the education and training market. Statistical studies such as this one of the relationship between training and firm performance cannot help individual employers to determine the returns to their own training budget. However, information about how training is associated with performance, gleaned from a large number of establishments, can contribute to the information set upon which private judgements are made, and assist policy-makers whose aim may be to affect the amount of employer training through the dissemination of information, without the need for costly public subsidies or unpopular levies.

[23] It is notable that, between 1992 and 2000, training participation increased by a few percentage points for most occupational groups, but for Managerial and Administrative workers appeared to remain unchanged.

[24] By encouraging firms to raise training governments may also be aiming to raise training closer to a socially optimal level, which is above the private optimum level owing to externalities and credit constraints (Stevens, 1999).

References

Acemoglu, D. and J.-S. Pischke (1999). "The Structure of Wages and Investment in General Training." *Journal of Political Economy* 107 (3): 539-572.

Agarwal, R. (1996). "Technological Activity and Survival of Firms." *Economics Letters* 52 (1): 101-108.

Alba-Ramirez, A. (1994). "Formal Training, Temporary Contracts, Productivity and Wages in Spain." *Oxford Bulletin of Economics and Statistics*, 56 (2): 151-170.

Appelbaum, E., T. Bailey and A. L. Kalleberg (2000). "*Manufacturing Advantage: Why High-Performance Work Systems Pay Off*." Ithaca and London, Cornell University Press.

Barrett, A., B. Hovels, P. den Boer and G. Kraayvanger (1998). "*Exploring the Returns to Continuing Vocational Training in Enterprises: A Review of Research Within and Outside of the European Union*." Thessaloniki, CEDEFOP.

Bartel, A. P. (1995). "Training, Wage Growth, and Job Performance: Evidence from a Company Database." *Journal of Labor Economics* 13 (3): 401-425.

Bartel, A. P. (2000). "Measuring the Employer's Return on Investments in Training: Evidence from the Literature." *Industrial Relations* 39 (3): 502-524.

Bishop, J. H. (1994). "The Impact of Previous Training on Productivity and Wages." *Training and the Private Sector. International Comparisons*. L. M. Lynch. Chicago, University of Chicago Press.

Bishop, J. (1997). "What Do We Know About Employer Provided Training." *Research in Labor Economics* 16 (1-87).

Black, S. E. and L. M. Lynch (2001). "How to Compete: The Impact of Workplace Practices and Information Technology on Productivity." *Review of Economics and Statistics* 83 (3): 434-445.

Blundell, R., L. Dearden and C. Meghir (1996). "*The Determinants and Effects of Work-Related Training in Britain*." London, Institute For Fiscal Studies.

Bryson, A. (2001). "*Employee Voice, Workplace Closure and Employment Growth*." London, Policy Studies Institute.

Colombo, M. G. and M. Delmastro (2001). "Technology Use and Plant Closure." *Research Policy* 30(1): 21-34.

Dearden, L., S. Machin, H. Reed. and D. Wilkinson (1996) "*Labour Turnover and Work-Related Training*," Report to the Department for Education and Employment.

Dearden, L., H. Reed and J. Van Reenen (2000). *Who Gains When Workers Train?* The Institute for Fiscal Studies, Working Paper 00/04.

Dench, S. (1993) "*What Types of Employer Train?*" Employment Department, Social Science Research Branch Working Paper No. 3.

DuMouchel, W.H. and Duncan, G.J. (1983). "Using Sample Survey Weights in Multiple Regression Analyses of Stratified Samples." *Journal of the American Statistical Association* 78: 535-543.

Eraut, M., J. Alderton, G. Cole and P. Senker (1998). "*Development of Knowledge and Skills in Employment.*" Research Report No. 5, University of Sussex Institute of Education.

Felstead, A., F. Green and K. Mayhew (1997). "*Getting the Measure of Training*." Leeds, Centre for Industrial Policy and Performance, University of Leeds.

Green, F. (1999). "Training The Workers." *The State of Working Britain*. P. Gregg and L. Wadsworth. Manchester, Manchester University Press**:** 127-146.

Green, F., M. Hoskins and S. Montgomery (1996). "The Effects of Training, Further Education and YTS on the Earnings of Young Employees." *Oxford Bulletin of Economics and Statistics* 58: 471-488.

Green, F. (1997). "*Review of Information on the Benefits of Training for Employers.*" Research Report No 7, Department for Education and Employment.

_____ (1999). "Trade Unions and Training Practices in British Workplaces." *Industrial & Labor Relations Review* 52(2): 175-195.

Green, F., A. Felstead, K. Mayhew and A. Pack (2000). "The Impact of Training on Labour Mobility: Individual and Firm Level Evidence from Britain." *British Journal of Industrial Relations* 38(2): 261-275.

Hage, J., P. D. Collins, F. Hull and J. Teachman (1993). "The Impact of Knowledge on the Survival of American Manufacturing Plants." *Social Forces* 72 (1): 223-246.

Holzer, H., R. Block, M. Cheatham and J. Knott (1993). "Are Training Subsidies for Firms Effective? The Michigan Experience." *Industrial and Labor Relatios Review* 46 (July): 625-36.

Huselid, M. (1995). "The Impact of Human Resource Management Practices on Turnover, Productivity and Corporate Financial Performance." *Academy of Management Journal* 38 (5): 635-672.

Huselid, M. and B. Becker (1996). "Methodological Issues in Cross-Sectional and Panel Estimates of the Human Resource-Firm Performance Link." *Industrial Relations* 35 (3): 400-422.

Ichniowski, C., K. Shaw and G. Prennushi (1997). "The Impact of Human Resource Management Practices on Productivity." *American Economic Review* 87 (June): 291-313.

Kirkham, J., S. Richbell and D. Watts (1999). "Manpower Factors and Plant Closures in Multiplant Firms." *International Journal of Manpower* 20(7): 458-468.

Klepper, S. and K. L. Simons (2000). "The Making of an Oligopoly: Firm Survival and Technological Change in the Evolution of the US Tire Industry." *Journal of Political Economy* 108(4): 728-760.

Krueger, A. and C. Rouse (1998). "The Impact of Workplace Education on Earnings, Turnover and Job Performance." *Journal of Labor Economics* 16 (January): 61-94.

Loewenstein, M. A. and J. R. Spletzer (1998). "Dividing the Costs and Returns to General Training." *Journal of Labor Economics* 16 (January): 142-171.

Lynch, L. M. and S. E. Black (1995). "*Beyond the Incidence of Training: Evidence from a National Employers Survey.*" Working Paper No. 5231, National Bureau of Economic Research.

Machin, S. (1995). "Plant Closures and Unionisation in British Establishments." *British Journal of Industrial Relations* 33(1): 55-68.

Michie, J. and M. Sheehan-Quinn (2001). "Labour Market Flexibility, Human Resource Management and Corporate Performance." *British Journal of Management* 12: 287-306.

Nestler, K. and E. Kailis (2002). "*Costs and Funding of Continuing Vocational Training in Enterprises in Europe*," Eurostat.

Policy Innovation Unit (2001). "*In Demand: Adult skills for the 21st Century*." London, Cabinet Office.

Spilsbury, D. (2001). "*Learning and Training at Work 2000.*" DfES Research Brief No. 269.

Stevens, M. (1994). "An Investment Model for the Supply of Training by Employers." *The Economic Journal* **104**(May): 556-570.

Stevens, M. (1999). "Human Capital Theory and UK Vocational Training Policy." *Oxford Review of Economic Policy* 15 (1): 16-32.

Whitfield, K. (2000) "High-performance Workplaces, Training, and the Distribution of Skills." *Industrial Relations* 39 (1): 1-25.

Williamson, O.E. (1970). "*Corporate Control and Business Behaviour.*" Prentice-Hall, Englewood Cliffs, New Jersey.

Zwick, T. (2002). "*Training and Firm Productivity -- Panel Evidence for Germany*," Oxford and Warwick Universities, SKOPE Research Paper No. 23.

Data Appendix

Table A1:
Summary Statistics

Variable	Establishment	
Establishment Characteristics	*Mean*	*SD*
Establishment Closed at 1998	0.137	
Training at Establishment	0.909	
Manual Training at Establishment	0.696	
Non-manual Training at Establishment	0.847	
Investment in Training (proportion of employees getting training)	0.485	0.381
of which:		
Training Non-Manual Workers	0.281	0.313
of which:		
Managerial and Administrative	0.044	0.060
Professional	0.030	0.093
Professional Associate & Technical	0.036	0.097
Sales	0.083	0.199
Clerical & Secretarial	0.089	0.171
Training Manual workers	0.205	0.276
of which:		
Craft & Skilled Service	0.062	0.125
Personal & Protective Service	0.018	0.090
Operatives & Assembly	0.081	0.178
Routine, Unskilled	0.044	0.121
Manual Union Recognition	0.503	
Non-manual Union Recognition	0.441	
Proportion of Manual Workers	0.504	0.331
Proportion of Female Workers	0.273	0.203
Proportion on Fixed Contracts	0.013	0.075
Establishment is UK Owned	0.799	
Single Independent Establishment	0.162	
No Competitors	0.394	
Market for Product Primarily International	0.178	
Declining Product/Service Market or Activities	0.254	
Age <1 year at time of WIRS Original Survey	0.022	
Age 1-10 years	0.222	
Age 11-20 Years	0.196	
Age 20+ years	0.560	
< 200 Employees at Establishment	0.557	
Regional Unemployment (%) at 1992	9.605	1.068
1-Digit Industry Affiliation		
Energy and Water Supplies	0.035	
Minerals, Metal Manufacture and Chemicals	0.068	
Metal Goods, Engineering and Vehicles	0.184	
Other Manufacturing	0.169	
Construction	0.029	
Distribution, Hotels and Catering	0.246	
Transport and Communication	0.047	
Banking, Finance, Insurance & Business Services	0.144	
Other Services	0.078	

Regions		
Greater London	0.163	
Rest of South	0.181	
East Anglia	0.029	
South West	0.062	
West Midlands	0.084	
East Midlands	0.063	
Yorkshire	0.090	
North West	0.124	
North	0.056	
Wales	0.043	
Scotland	0.106	
N		680