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ABSTRACT

Does Training Generally Work? The Returns to In-Company Training*

This paper applies the familiar theoretical distinction between general and specific training to the empirical task of estimating the returns to in-company training. Given the theoretical prediction that employees who receive general training are more likely to quit, the productivity effects of general training should be lower than those of specific training. Using a firm-level dataset which distinguishes between general and specific training, we test for the relative effects of the two types of training on productivity growth. We find, contrary to expectations, that although general training has a statistically positive effect on productivity growth, no such effect is observable for specific training. This positive effect of general training remains when we control for changes in work organization and corporate restructuring. Moreover, the impact of general training varies positively with the level of capital investment.

JEL Classification: J24
Keywords: in-company training, general training, specific training

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NON-TECHNICAL SUMMARY

In recent years a number of papers have attempted to estimate the effect of employer-provided training on productivity, using firm-level data. Among the findings of these papers have been that the volume of training provided may be less important than the type of training for generating productivity growth. In this paper we add to this literature using a unique firm-level dataset which contains information on 215 firms. The dataset has three particularly attractive features. First, the data used was specifically designed to collect detailed information on firms' training practices during 1993, including a measure of days spent on specific and general training, following Becker's familiar distinction. Although this distinction between these types of training has been well developed in the theoretical literature, empirical studies which draw on this distinction are extremely rare. Second, the data include information on output, capital and employment at two points in time, 1993 and 1995. This allows us to estimate the impact of general and specific training provided during 1993 on productivity growth between 1993 and 1995. Third, a range of variables indicating changes in corporate structure, organizational and personnel policies are also included. Hence, we are able to control for the effects such changes might be expected to have on productivity growth. In sum, the data allow the paper to make both a novel contribution to the measurement of the impact of training and an important addition to the limited empirical work on general versus specific training.

One of the core predictions to follow from the distinction between general and specific training is that workers who receive general training will be more likely to quit than those who receive specific training. If this is true, it would be expected that specific training would have a greater impact on productivity growth in the firm than general training. We test this using equations in which the dependent variable is productivity growth between 1993 and 1995.

Initially, the dependent variables used are investment between 1993 and 1995, employment growth over the period, training (including general and specific) provided during 1993 and sectoral controls. No significant effect of training is found. When we break training into its general and specific components, however, we find that general training has a positive and significant effect on productivity growth but specific training does not have a significant effect.

This finding leads us to ask if general training is a proxy for other policies of the firm. Hence, we add three dummy variables to the models. The first one

indicates whether some form of corporate innovation occurred at the firm between 1993 and 1995, such as the introduction of Total Quality Management. The second dummy variable indicates if personnel policies, such as incentive pay, were introduced. The third one indicates if corporate re-structuring occurred, such as a merger or take-over. The coefficients on general training change little in response to the introduction of these dummy variables. In addition, only the corporate restructuring variable had a significant effect on productivity growth and this effect is negative.

In order to explore further this general training effect we introduce an interaction term in the model to take account of a possible interaction between investment in physical and human capital. We find that there is a positive and significant interaction between general training and investment in fixed assets and that this reduces the size of the coefficient on general training. Even when the interaction terms are included, however, the effect of general training remains positive and significant.

Three important implications follow from our findings. First, and consistent with other research in the area, the absolute volume of training undertaken by companies appears to be less important than the *type* of training. Second, our findings underscore the complexity of the relationship between investment in human and physical capital and company performance. Third, this study adds to a growing empirical literature which calls into question the theoretical expectations which follow from the distinction between general and specific training.

Section 1: Introduction

In recent years a number of papers have appeared which seek to measure the effect of employer-provided training on productivity using firm-level data (Holzer et al, 1993, Bartel 1994, Black and Lynch, 1996). Previously, such exercises were constrained by the lack of appropiate data. With the growth in firm-level data and the relaxing of this constraint, we are beginning to develop a deeper knowledge of the link between training provided by the employer and productivity.

In this paper we add to this area of research by drawing on a new data set with three particularly attractive characteristics. First, the data used was specifically designed to collect detailed information on firms' training practices, including a measure of days spent on specific and general training, following Becker's (1975) familiar distinction. Although this distinction between these types of training has been well developed in the theoretical literature, empirical studies which draw on this distinction are extremely rare[2]. Second, the data include information on output, capital and employment at two points in time. This allows us to estimate the impact of general and specific training on productivity growth. Third, a range of variables indicating changes in corporate structure, organisational and personnel policies are also included. Hence, we are able to control for the effects such changes might be expected to have on productivity growth. In sum, the data allow the paper to make both a novel contribution to the measurement of the impact of training and an important addition to the limited empirical work on general versus specific training.

The paper is structured as follows. In Section 2, we briefly review the work which has been done in this area. In Section 3, we describe the research design and the data set. Section 4 contains an outline of the theoretical model on which our empirical work is based. Our results are presented in Section 5. Some conclusions follow in Section 6.

Section 2: Literature Review

[2] One recent exception is Loewenstein and Spletzer (1997).

A number of studies have looked at the effect of employer-provided training on wages (e.g. Booth, 1991; Lynch, 1992). However, our focus here is on the effect of such training on productivity, measured using firm-level data. As such, we will restrict this brief review of the literature to studies of this type.

One of the earliest such studies is Holzer et al (1993). The study arose out of a grant programme run by the State of Michigan, through which grants were made available to manufacturing companies for the financing of training. By surveying companies which had applied for grants, a data set was generated with information on training inputs and companies' outputs. In addition, as they had information on the companies over a number of years it was possible to look at how productivity *changes* across firms are related to *changes* in training, thereby overcoming the familiar problem of time-invariant unobserved heterogeneity. Working with samples of between 171 and 250 firms, they find evidence of a direct link between training and productivity. Bartel (1994) again looked at the link between training and productivity using around 150 firms from another survey of employers, the Columbia Business School survey. Like Holzer et al, she also finds a positive effect of training on productivity.

This employer-based approach to estimating the training/productivity relationship has recently been advanced in a series of papers by Lisa Lynch and Sandra Black (Lynch and Black 1995, Black and Lynch, 1996 and Black and Lynch, 1997). Their advances have been facilitated by a new data set which, as the authors put it, "was designed to overcome some of the limitations of previous studies and collect more precise data on human-capital inputs and establishment inputs" (Black and Lynch, 1996, p263).

The authors use the data for a number of purposes. For current purposes, the first results of interest are found in the 1995 paper[3]. Production functions are estimated for the manufacturing and non-manufacturing sectors in which dimensions of training are included along with the more usual arguments in production functions such as capital and labour. The results on training are interesting; the number of workers trained is not

[3] The same results are found in the 1996 paper which is a published version of a section of the 1995 working paper.

found to have a significant effect on productivity but this masks the effects of different dimensions of training, which do matter. In manufacturing, the higher the proportion of training that is off-the-job, the higher is productivity. Similarly, in non-manufacturing the type of training matters for productivity; in particular, training in computer skills increase productivity.

As the results presented in the 1995 and 1996 papers of Black and Lynch are based on data from a single year, they suffer from the problem of unobserved heterogeneity, mentioned above[4]. In the 1997 paper, they attempt to overcome this by supplementing the original data with data from the Longitudinal Research Database (LRD) of the United States Bureau of the Census. The authors were able to match the companies with records in the LRD and thereby create a dataset with information over time. In re-estimating their earlier work, they now find no effect of training on productivity; however, they maintain that this was probably because the information on training was too weak for its effect to be captured in the extended estimation framework. What does emerge from this study is the interesting effects of workplace practices on productivity. In particular, greater involvement of workers in decision making and the use of performance related pay are seen to generate higher productivity relative to the more traditional labour/management relations.

The importance of workplace practices arises again in the paper by Ichniowski et al (1995). The theory underlying their study is that human resource policies will have complementary effects, whereby the use of certain policies in isolation will have a weaker effect than when such policies are combined with other human resource measures. They found that the hypothesis of complementarity among human resource measures, including training, was supported by their data. Similar to Black and Lynch (1997), they find that the effect of a human resource policy depends not so much on its introduction but on the manner of that introduction, i.e. whether other polices are introduced along with it.

[4] This is acknowledged by the authors; see p266 of the 1996 paper.

Broad conclusions from the above are that training provided by the employer does appear to have a generally positive effect on productivity, although different types of training have different effects. In addition, the effects of other human resource policies on productivity may dominate the training effects but may also be complementary.

Given these conclusions, a natural and important extension of the work in this area is an empirical investigation into one of the most important theoretical distinctions between training types, that is Becker's (1975) distinction between general and specific training. Most of the work on these two types of training has focused on the issue of who pays for general and specific training. Becker's original argument was that general training would be paid for by the employee, due to the transferability of the skills and thus the possibility of an employer being unable to recoup spending on general training. As the skills generated by specific training were not transferable, the employer was more likely to be in a position to recoup the training investment and so would be prepared to share the cost of training.[5] While the work has focused on the sharing of training costs, an implication of the Becker distinction for training effectiveness seems clear. If general training is more likely to lead to more quits, the effectiveness of general training in raising productivity should be lower than that of specific training. Even if general training has a strong "gross productivity" effect, its "net productivity" effect may be reduced through quits.

Section 3: Research Design and the Data Set

The starting point for this research is a survey undertaken in 1993 and reported in Fox (1995). The survey was designed to collect detailed information on the training practices of a nationally representative sample of 1,000 enterprises operating in Ireland[6]. The survey covered companies employing more than 10 people in manufacturing industry, construction and private services. Its focus was on continuing

[5] Bishop and Kang (1996) and Lowenstein and Spletzer (1998) provide theoretical reasons to doubt that employees pay the full cost of general training.

[6] During the period covered in this paper Ireland experienced annual growth rates in GNP of around 7 percent. Such a dynamic economy would appear to provide an ideal setting for the study of productivity effects.

vocational training, rather than initial training, and so apprentices and trainees are excluded.

A total of 654 useable returns were obtained from this survey. The information obtained includes the following: the activity of each company; whether or not different types of training were undertaken; how many days employees spent in training; how much the company spent on training courses, including the labour costs of employees while participating in courses. Our measure of general and specific training is derived from a series of questions which ask respondents (senior managers and chief executive officers) to provide a break-down of the total number of days of training into: (a) seven categories of "general training"; (b) four categories of training "specific to company's activity"; and (c) a residual class of "other training"[7]. We would argue that relying on senior managers to apply the general/specific distinction to their own training activities represents a more satisfactory way of capturing this theoretically important distinction than reliance on an ex-post coding of data, based, for example, on information about the content or location of training.

In order to measure the effects of training on changes in productivity, we conducted a follow-up survey of the 654 companies in April and May of 1997. Given that the sample which we were re-surveying was quite small, we sought to maximise the response rate by minimising the amount of information sought. The main pieces of information sought were as follows: output in 1993 and 1995; the value of fixed assets at the same two points in time; the size of the workforce, again in 1993 and 1995, and changes in personnel policy, and corporate organisation and structure between 1993 and 1995.

Excluding 12 public authorities, the original survey consisted of 642 firms. Eliminating responses with incomplete or poor quality data reduced the number of useful cases from the follow-up survey to 215. In order to check for bias in the response we compared the second-wave cases with the first-wave and found that the distribution of

[7] In the instructions which accompanied the questionnaire respondents were asked to classify as 'general' training which provided "broad skills and knowledge"; training which was "directly related to the operation of the company" was to be classified as 'specific'.

companies by sector and size category was very similar in both surveys. We also found that the mean values of training measures were very similar in the two surveys, and not statistically different. Some descriptive statistics on the firms who responded to the second survey can be found in Table 1 in Section 5 below.

Section 4: The Model

The model on which our estimation is based follows Bartel (1994) which assumes that the relationship between output and inputs at the company level has a standard Cobb-Douglas structure.[8] The production function is shown in Eq. 1 below. Output is a function of two inputs, capital (K) and 'effective labour' (EL), the latter consisting of the amount of labour services employed by the company.

$$Q = AK^{\beta}EL^{\gamma} \qquad (1)$$

where β and γ are numbers greater than zero, as is A.

Effective labour consists of the amount of labour employed (RL, or reported labour) and the stock of training that the workforce have received, its human capital (H). Human capital thus refers to the accumulated stock of skills and competencies of the workforce (OECD, 1998); the training provided to employees in any year can thus be thought of as a "flow" variable, that is the amount that is added to the stock over a period of time. The relationship between effective labour (EL), reported labour (RL) and human capital (H) is as follows:

$$EL = RL(1 + \lambda H) \qquad (2)$$

According to Eq. 2, if human capital stock (H) was equal to zero, effective labour (EL) and reported labour (RL) would be the same. However, as λ is a number greater than zero, if the stock of human capital is greater than zero, then effective labour is greater than reported labour.

[8] Black and Lynch (1996, 1997) also use a Cobb-Douglas production function in their estimation.

Substituting Eq. 2 into Eq.1 , dividing through by reported labour (RL) and taking the logarithm of both sides we arrive at Eq. (3) which is a model of productivity, estimable using linear techniques:

$$\ln(Q/RL) = \ln A + \beta \ln K + (\gamma-1)\ln RL + \gamma\lambda H + \alpha X + \varepsilon \qquad (3)$$

As the estimation of Eq. 3 could produce a biased estimate of the effect of training on productivity due to unobserved heterogeneity, we difference Eq. 3 producing the following which is the equation we estimate:

$$\ln(Q_t/RL_t) - \ln(Q_{t-1}/RL_{t-1}) = \beta(\ln K_t - \ln K_{t-1}) + (\gamma-1)(\ln RL_t - \ln RL_{t-1}) + \gamma\lambda(H_t - H_{t-1}) + \varepsilon_t - \varepsilon_{t-1} \qquad (4)$$

This equation relates changes in productivity to a range of variables, including the change in human capital stock; $(H_t - H_{t-1})$ is represented in the estimations reported below by training provided by the companies in 1993. Equation (4) encapsulates the core concern in this study which, in essence, investigates whether training provided during 1993 brought about productivity growth between 1993 and 1995.

Section 5: Results

Descriptive statistics

Before presenting the results of our estimation of Eq. 4, we will present some descriptive statistics on our sample of firms. These are contained in Table 1. It should be noted that our sample included some firms who had not undertaken any training.

Productivity at each point in time is measured as output divided by total employment; on average between 1993 and 1995, the sample reported productivity growth of 3.4 percent[9]. The training variables require some explanation so we will provide this here.

[9] Output is measured as sales in the accounting years 1993 and 1995; again, this is similar to the measure used by Black and Lynch (1996, 1997). An effort was made in the follow-up survey to

The first training variable, trainees/employees, is simply the proportion of employees who received some amount of training in 1993. The fourth training variable is the number of days of training per employee. The seventh training variable is training expenditure as a proportion of expenditure on pay.

Table 1

Summary Statistics of Principal Variables (N=215)

	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable:				
Proportionate Change in Productivity	0.034	0.321	-0.75	1.36
Training Variables:				
Trainees/Employees	0.394	0.349	0.00	1.00
General Trainees	0.194	0.239	0.00	1.00
Specific Trainees	0.168	0.200	0.00	0.83
Training Days/Employees	1.917	3.081	0.00	30.87
General Training Days	0.832	2.123	0.00	27.33
Specific Training Days	0.948	1.854	0.00	13.56
Training Expend./Payroll	1.844	2.967	0.00	22.51
Expend. on General Train.	0.835	1.614	0.00	11.29
Expend. on Specific Train.	0.906	2.052	0.00	17.74
Corporate Variables:				
Investment	0.148	0.377	-0.79	2.49
Change in Employment	0.142	0.291	-1.20	1.19
Corporate Innovation	0.363	0.482	0.00	1.00
Personnel Policy	0.270	0.445	0.00	1.00
Corporate Restructuring	0.228	0.420	0.00	1.00
Economic Sectors:				
Catering	0.074	0.263	0.00	1.00
Construction	0.051	0.221	0.00	1.00
Distribution	0.186	0.390	0.00	1.00
Finance	0.033	0.178	0.00	1.00
Manufacturing	0.581	0.494	0.00	1.00
Transport	0.019	0.135	0.00	1.00
Other Sector	0.056	0.230	0.00	1.00

In order to produce variables that reflect the relative amounts of training that is general or specific in nature, we draw on the survey questions regarding the amount of days spent on general and specific training discussed on page 6. Hence, for each company

collect information on value added across firms but the information turned out to be too weak to be used in the estimations.

we can calculate what proportion of total training days were general or specific in nature, i.e. general training day (or specific training days) divided by total training days. We then multiply these two ratios by the first, fourth and seventh training variables in Table 1 thus producing the values of the general and specific training variables shown[10].Investment was calculated by subtracting the value of fixed assets in 1993 from that in 1995. Corporate innovation indicates whether or not any of the following organisational policies were introduced between 1993 and 1995: Total Quality Management; World Class Manufacturing; Continuous Improvement/Kaizan; Business Process Engineering; Change Management; Benchmarking. Personnel policies indicate whether or not any of the following were introduced over the relevant period: Performance Related Pay; Productivity Bonus Scheme; Performance Appraisal; Team Working. Finally corporate restructuring indicates if the company underwent a change of ownership, or merged with or took over another company since 1993.

Results for training, undifferentiated by type

In Table 2, we present the results of estimating Eq. 4 using the three training variables which do not distinguish between general and specific training.

Given our primary interest in the effect of training, the results on this variable are most noteworthy. The estimates reveal that the effect of training on productivity growth, controlling for the effects of capital and labour growth and for possible sectoral effects, is not significantly different from zero. While this is perhaps surprising, it is consistent with Black and Lynch (1996, 1997) who found that the level of training had no impact on productivity, although as discussed below, they did find effects of certain *types* of training . The coefficients of both investment and change in employment are measured with statistical precision, as can be seen from their t-values across all specifications, and have plausible signs. Extra capital should increase labour productivity so the positive investment coefficient is as expected. Employment increases would be expected to reduce productivity through a diminishing returns effect and/or through

[10] It will be seen that the sum of the general and specific training variables is less than the corresponding composite training variables in each case. This is because of the residual training category of training.

lower productivity of new hires, so the negative coefficient on employment change is also as expected.

Table 2

OLS Model of Proportionate Change in Labour Productivity, 1993-1995

Equation:	(1)		(2)		(3)	
	Training Variable:					
	No. of Trainees/ Total Employment		Training Days/ Total Employment		Training Expenditure/ Total Payroll	
	Coefficient.	T-value	Coefficient.	T-value	Coefficient.	T-value
Training	0.059	1.23	0.005	0.92	0.003	0.60
Ch. in Employment	-0.762***	-13.62	-0.758***	-13.48	-0.767***	-13.53
Investment	0.238***	5.42	0.233***	5.24	0.234***	5.22
Catering	0.035	0.39	0.026	0.29	0.030	0.33
Construction	0.084	0.83	0.070	0.71	0.072	0.72
Distribution	0.055	0.71	0.048	0.62	0.050	0.64
Finance	-0.008	-0.07	0.006	0.06	0.005	0.05
Manufacturing	0.057	0.80	0.052	0.73	0.057	0.80
Transport	-0.024	-0.18	-0.029	-0.21	-0.025	-0.19
Intercept	0.035	0.47	0.054	0.76	0.054	0.76
Adjusted R^2	0.477		0.476		0.474	

* $p < .10$, ** $p < .05$, *** $p < .01$

Analysing the effects of different types of training

In Table 3, we present the results of the analysis when the training variables are broken up into the general and specific categories.

Focusing again on the training variables, the interesting finding to emerge is the significance of general training across all three specifications. Contrary to expectations, specific training is not found to have a significant impact on productivity growth. It will be recalled that Black and Lynch (1996) also failed to find a significant effect for some types of training. However, they did find that off-the job training did have a positive and significant effect on productivity in manufacturing. Given that the bulk of

off-the-job training is more likely to be general in nature, the broad thrust of their findings are consistent with ours.

Table 3

OLS Model of Proportionate Change in Labour Productivity, 1993-1995
Differentiating General and Specific Training

Equation:	(4)		(5)		(6)	
	Training Variable:					
	No. of Trainees/ Total Employment		Training Days/ Total Employment		Training Expenditure/ Total Payroll	
	Coefficient.	T-value	Coefficient.	T-value	Coefficient.	T-value
General Training	0.182***	2.66	0.016**	2.10	0.020*	1.86
Specific Training	-0.116	-1.39	-0.011	-1.24	-0.008	-0.97
Ch. in Employment	-0.751***	-13.56	-0.732***	-12.84	-0.761***	-13.49
Investment	0.229***	5.26	0.233***	5.29	0.237***	5.33
Catering	0.054	0.61	0.025	0.28	0.054	0.59
Construction	0.116	1.16	0.079	0.80	0.101	1.00
Distribution	0.078	1.01	0.051	0.67	0.072	0.92
Finance	0.024	0.22	0.016	0.14	0.028	0.25
Manufacturing	0.096	1.33	0.070	0.98	0.087	1.19
Transport	-0.008	-0.06	-0.026	-0.20	-0.003	-0.02
(Constant)	0.010	0.14	0.045	0.65	0.024	0.33
Adjusted R^2	0.491		0.484		0.480	

*p < .10, ** p < .05, *** p < .01

The question arises as to why specific training is found to have no effect, given that firms invest in it. It could be that our data is too noisy to capture a positive effect. However, it can be argued that companies are more likely to understate the amount of specific training undertaken by them if such training is given on a more informal basis than general training. If this is the case then we would expect the coefficient on specific training to suffer from upward bias; hence, this argument actually strengthens the finding of specific training having no effect in increasing productivity. Another possible interpretation of the non-significant effect of specific training is that it represents a part of the normal operational expenses of a company, related perhaps to personnel turnover. Higher spending on specific training may then arise in an effort to maintain productivity levels. In contrast, general training represents an additional investment

above and beyond normal operating requirements and so enhances company performance.

The positive and significant effect of general training would appear to indicate that the increased tendency to quit associated with such training in not sufficient to outweigh the gross productivity effect, at least over the period which we are observing. We cannot say if this is because of the strength of the gross productivity effect or because the quit tendency is smaller than predicted. Whichever it may be, the positive finding is striking.

This finding of a significant effect of general training prompted us to ask the question of whether general training was capturing the effects of other omitted variables which have positive effects on training. In particular, it seemed possible that firms that offer training that is general in nature may also employ a range of personnel policies which increase productivity. In order to test for this we re-estimated the equations of Table 3 and included the dummy variables indicating corporate innovation, introduction of new personnel policies and corporate restructuring (definitions of which are provided above). The results of this re-estimation are presented in Table 4.

Our concern that the general training variables were picking up the effects of other company policies is dismissed by the results in Table 4. The coefficients of the general training variables change little when the corporate policy variables are introduced[11]. Of these variables, only the restructuring variables is consistently significant. Its negative sign would appear to indicate that such restructuring has a disruptive effect on the workplace, at least in the short run. The finding that neither corporate innovation nor the introduction of new personnel policies have any discernible impact on productivity will be cold comfort to management consultants advocating such policies. The lack of significance of these variables may be related to a timing issue, in the sense that the period of observation may be too short for any positive effect of these policies to be

[11] We also estimated a set of equations in which all training variables were omitted but the policy variables were included. This produced a similar pattern of results, in particular the significance of corporate restructuring and the lack of significance of corporate innovation and personnel policies. The intercept remained non-significant.

felt and it is clear that further empirical work is needed to assess the impact of such policies.

Table 4

OLS Model of Proportionate Change in Labour Productivity, 1993-1995
Differentiating General and Specific Training
and Controlling for Changes in Corporate Strategy

Equation:	(7)		(8)		(9)	
			Training Variable:			
	No. of Trainees/ Total Employment		Training Days/ Total Employment		Training Expenditure/ Total Payroll	
	Coefficient.	T-value	Coefficient.	T-value	Coefficient.	T-value
General Training	0.186***	2.75	0.015*	1.91	0.019*	1.84
Specific Training	-0.095	-1.14	-0.011	-1.26	-0.007	-0.82
Ch. in Employment	-0.772***	-13.68	-0.753***	-12.93	-0.782***	-13.61
Investment	0.246***	5.62	0.249***	5.61	0.252***	5.63
Corp Innovation	-0.006	-0.18	-0.002	-0.07	-0.002	-0.06
Personnel Policy	0.002	0.06	-0.003	-0.08	-0.006	-0.15
Corp Restructuring	-0.104***	-2.63	-0.098**	-2.47	-0.101**	-2.54
Catering	0.064	0.73	0.031	0.35	0.062	0.68
Construction	0.126	1.26	0.084	0.85	0.106	1.06
Distribution	0.107	1.37	0.077	0.99	0.099	1.25
Finance	0.089	0.80	0.078	0.69	0.093	0.82
Manufacturing	0.113	1.56	0.086	1.20	0.103	1.40
Transport	0.012	0.09	-0.008	-0.06	0.016	0.12
(Constant)	0.013	0.18	0.054	0.76	0.032	0.44
Adjusted R^2	0.501		0.493		0.490	

*p < .10, ** p < .05, *** p < .01

An additional line of inquiry into this general training effect was motivated in the following manner. We showed in Table 1 that the companies included in our survey increased both employment and capital assets by about 15% over the 1993-1995 period. In each of the estimated models capital investment has a strong positive effect on productivity while the effect of increases in employment is negative. This led us to ask whether our findings of the positive effect of general training were concentrated among firms with an expansion strategy based on increased capital investment rather than employment growth. Thus, for example, if general training mostly took place in

companies with high levels of capital investment, then the existence of a strong interaction might produce a positive effect of general training. To investigate this more formally we specified a series of interaction terms between general or specific training days with both investment and employment. We report the results in Table 5.

Table 5
OLS Model of Proportionate Change in Labour Productivity, 1993-1995
Specifying Interaction Terms Between Training and Factor Inputs

Equation:	(10)		(11)	
	Coefficient	T-value	Coefficient	T-value
General Trainees/ Total Employment	0.123*	1.69	0.117*	1.66
Specific Trainees/ Total Employment	-0.130	-1.51	-0.088	-1.09
Change in Employment	-0.805***	-12.14	-0.780***	-14.35
Investment	0.116**	2.01	0.158***	2.98
Investment*General Training	0.050***	2.95	0.046***	2.76
Ch. in Employment *General Training	0.004	0.51		
Investment*Specific Training	0.009	0.40		
Ch. in Employment *Specific Training	0.016	0.45		
Corporate Restructuring			-0.091**	-2.37
Catering	0.019	0.21	0.024	0.27
Construction	0.074	0.75	0.087	0.89
Distribution	0.060	0.78	0.086	1.12
Finance	0.011	0.10	0.073	0.66
Manufacturing	0.071	1.00	0.090	1.28
Transport	-0.023	-0.18	-0.005	-0.04
(Constant)	0.057	0.79	0.049	0.68
Adjusted R^2	0.508		.522	

*p < .10, ** p < .05, *** p < .01

Note: Only the trainees as a proportion of employees measure of training is included in models 10 and 11.

In both models 10 and 11 the interaction between change in capital and general training is positive and significant, while none of the other interaction terms has any discernible

effect. The coefficient for general training is reduced, as is its significance.[12] The impact of the investment term, however, is much greater, suggesting the importance of general training for investment to be productivity enhancing. The findings suggest that the returns to general training are higher in companies which also have higher capital investment, an effect which goes some way to explain the findings on general training However they also show, this interaction effect notwithstanding, that the returns to general training remain positive across the sample of companies in the study.

Section 6: Conclusion

Our purpose in this paper has been to apply the familiar theoretical distinction between general and specific training to the empirical task of estimating the returns to in-company training. Given the theoretical prediction that employees who receive general training are more likely to quit, it would be expected that the productivity effects of general training would be lower than those of specific training. Using a firm-level dataset which includes information on the split between general and specific training across firms, we have tested for the relative effects on the two types of training on productivity growth. We find, contrary to what was expected, that although general training has a statistically positive effect on productivity growth, no such effect is observable for specific training. What is more, this positive effect of general training remains when we control for other workplace policies and corporate re-structuring. While corporate restructuring is found to have a significant negative effect on productivity, workplace policies are not found to have a significant effect. Finally, the impact of general training varies positively with the level of capital investment.

Three important implications follow from out findings. First, and consistent with other research in the area, the absolute volume of training undertaken by companies appears to be less important than the *type* of training. Second, our findings underscore the complexity of the relationship between investment in human and physical capital and

[12] To further ensure that the effect of general training was not confined to firms characterised by relatively high capital investment and low employment growth, we re-estimated Model 4 from Table 3 above, excluding all cases with investment rates above the median and employment growth rates below the median cases; the general pattern of effects reported in Table 3 was maintained, including, crucially, the positive and significant effect of general training.

company performance. Third, this study adds to a growing empirical literature which calls into question the theoretical expectations which follow from the distinction between general and specific training.

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