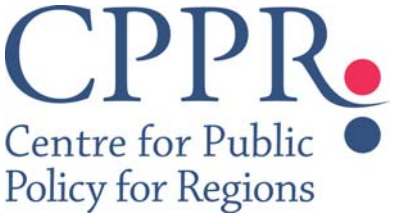

Working Paper 24

Products, Processes and Policies, the Drivers of Training? : Training in Private Sector Workplaces in Scotland

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ABSTRACT

This paper investigates the incidence of training and the intensity of off-the-job training provided in private sector establishments in Scotland. Two measures of training incidence are produced and examined. One is a dichotomous dummy variable and seeks to differentiate between whether or not training is undertaken at the establishment. The other is the multinomial outcomes to a question about training, and seeks to contrast the nature of training undertaken at the establishment, relative to no training taking place. One measure of training intensity is produced and examined for those establishments which undertook off-the-job training. This is based upon the percentage of workers at the establishment who received off-the-job training.

The investigation makes use of the 2008 Scottish Employers' Skills Survey. A special feature of this date set is the potential to incorporate into the analysis of the training decision variables associated with the 'drivers of training' literature i.e. variables which reflect the nature of the product/service provided, work organisation at the establishment and the human resource management policies and practices in operation there. For purposes of this paper, these variables are collected into categories, denoting product, process, management, change, human resource management strategy and human resource management policy and practice, all pertaining to the workplace.

In the two estimations of training incidence, the joint significance of the variables associated with management, change and human resource management strategy is established. In the regression of training intensity, the joint significance of the variables associated with management and human resource management strategy is established. In the latter result, additionally three individual variables associated with human resource management policy and practice are statistically significant viz. the employment at the workplace of highly skilled labour; workplaces which consider policies towards workforce involvement to be important; and workplaces which consider profit sharing to be important.

In all three estimations, the results of the Wald tests also establish the joint significance of the variables denoting key sector, size and establishment characteristics. From which it is concluded that irrespective of the extent to which training may appear to be part determined by factors such as management, change, strategy and policy, the role of structural factors cannot be dismissed.

Products, Processes and Policies, the Drivers of Training? : Training in Private Sector Workplaces in Scotland [1]

1. INTRODUCTION

This paper investigates the incidence of training and the intensity of off-the-job training provided in private sector establishments in Scotland. Two measures of training incidence are produced and examined. One is a dichotomous dummy variable and seeks to differentiate between whether or not training is undertaken at the establishment. The other is the multinomial outcomes to a question about training, and seeks to contrast the nature of training undertaken at the establishment, relative to no training taking place. One measure of training intensity is produced and examined for those establishments which undertook off-the-job training. This is based upon the percentage of workers at the establishment who received off-the-job training. The investigation makes use of the 2008 Scottish Employers' Skills Survey.

Studies of training at the establishment/firm tend to focus upon their structural characteristics, such as their size and sector. One feature of the data set used in this study is the potential to incorporate into the analysis variables commonly associated with the 'drivers of training' literature, variables which reflect the nature of the product/service provided, work organisation at the establishment and the human resource management policies and practices in operation there. According to this resource based theory of the firm, establishment/firm skill requirements and training needs, effectively the establishment's/firm's demand for training, have their origin in the business strategy of the organisation.

[1] This work contains statistical data from ONS which is Crown copyright and reproduced with the permission of the controller of HMSO and Queen's Printer for Scotland. The use of ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets which may not exactly reproduce National Statistics aggregates. Both for this paper and my other research which makes use of the 2008 Scottish Employers' Skills Survey data set, I am indebted to the following: Ben Davies of IFF for providing me with the codebook associated with the questionnaire, which facilitated my initial examination of the original data set: members of the MAUS team, for their co-operation throughout the process of statistical analysis: Andy Dickerson and John Forth for their advice and assistance with respect to the ramifications and implications of 'stratification' when applying Stata's 'survey design' routines: and Patrick Watt, of Skills Development Scotland, for his encouragement, interest and support. The usual disclaimer applies.

The structure of the paper is as follows. Section 2 reviews some literature of relevance, to provide both policy and academic context. Section 3 describes the data set used in the analysis, emphasising the potential of responses to the questionnaire which have particular relevance to the central issue of the role of product, process and policy in influencing the training decision. Section 4 defines the three dependent variables used to estimate training incidence and training intensity and outlines the models used in the estimations. Sections 5 and 6, respectively, report the results of the estimations of training incidence (two) and training intensity (one). A final section concludes, making some observations about the implications the results reported in this paper have for future research on the determinants of training.

2. SOME LITERATURE OF RELEVANCE

A vision of a "globally competitive economy based on high value jobs with progressive and innovative business leadership" (Scottish Government, 2007, p. 4) is not necessarily unique to Scotland. Nonetheless, there is a purported distinctiveness about the principles underlying the skills strategy in Scotland designed to bring this vision to fruition, where this distinctiveness is attributable to a recognition of the importance of 'economic pull' factors, such as "stimulating increased demand for skills from employers, both public and private" (Scottish Government, 2007, p. 5: Payne, 2009).[2]

Despite the purported 'economic pull' distinctiveness, however, training and skills remain central to strategy, as the following quotation illustrates:

> "A skilled and educated workforce is essential to productivity and sustainable economic growth. Not only are more skilled workers potentially more productive in their own right, but the skill level of the workforce is likely to impact significantly on the effectiveness of capital investment and the ability

[2] There is some justification for this emphasis on 'pull' factors, given emerging evidence of both over qualification and under utilisation of knowledge and skills on the part of the employed workforce in Scotland (Felstead, 2007: Felstead and Green, 2008: Sutherland, 2010), something which may be partially attributable to the skills content of jobs in Scotland (Dickerson, 2010). However, the role envisioned for demand in the skills strategy is less to address this existing inadequacy and more to integrate skills strategy into a comprehensive strategy for economic development.

of employers to adopt innovative work practices." (Scottish Government, 2007, p. 6)

In this conventional strategy – and, as before, with the Leitch Review of Skills (Leitch, 2006) - an implicit, supply-side oriented input-output model is assumed, whereby increases in inputs – increases in the relevant factors of production and/or enhancements in their qualities, via for example 'training' in the context of labour – increase outputs. Given this production function type construct, firms are viewed from a technological perspective as production units that transform inputs into outputs. One consequence is that training is always and everywhere beneficial: to the economy, the organisation and the worker. One policy implication is that the determinants of training must be identified, thereby providing the necessary information to facilitate the design of policy aimed at identifying and/or improving incentives to train to those firms which do not train, firms which may consider training as unnecessary costs rather than as enlightened investment expenditures (Keep and Mayhew, 2004: Ashton, 2007).

The resource based model of the firm provides an alternative perspective of the role of training and skills formation within firms. The resource-based model assumes that resources are the ultimate source of a firm's sustained competitive advantage and, hence, the means by which its efficiency and effectiveness are enhanced and whereby super normal profits are generated through time, although not necessarily in perpetuity. Its intellectual origin is Penrose (1959) who conceived the firm to be a collection of productive, inherently dynamic, potentially malleable, resources and the services – or, alternatively competences or capabilities - which these resources may provide. Penrose related these resources to the economist's traditional three factors of production – land, labour and capital. Subsequently, other authors have forwarded more developed classifications. Barney (1991), for example, suggests the following:

- Physical capital resources, such as the geographical location of the firm and the access to resources and external economies of scale with which this is associated; its plant and equipment, and the technology reflected in the same:

- Human capital resources, including "the training, experience, judgement, intelligence, relationships, and insight of *individual* managers and workers in the firm" (p. 101, italics in the original): and
- Organisational capital resources, such as the firm's formal and informal information processing, planning, controlling, coordinating and monitoring systems; the nature of the relationships which exist between stakeholders within the firm and these stakeholders' interactions with relevant others in the environment external to the firm e.g. their social networks.

These resources, however defined and classified, are assumed to be distributed heterogeneously across firms, even within the same industry.

Not all resources constitute distinctive capabilities, with the potential to generate a sustained competitive advantage. Some resources may even be detrimental to the attainment of such a goal. Strategically, the task is to identify inputs which have distinctive capabilities with the capacity to generate a sustained competitive advantage, ultimately a matter of managerial or entrepreneurial insight and imagination (Kay, 1993). However, unanticipated changes in the structure of a market – for example 'Schumpeterian Shocks' – may make what was once a source of sustained competitive advantage no longer valuable to the firm.

Human resource management policies and practices are central in helping to create a sustained competitive advantage. Consequently, much within the relevant human resource management literature is about seeking to understand the conditions under which human resources may become strategic assets capable of generating distinctive capabilities – or complementing other factors, notably technology, to produce this outcome – and then devising and implementing the appropriate strategies (cf. Hamel and Prahalad, 1993). The exercise, therefore, is one of building and developing a unique bundle of human and related technical resources which will enhance organisational performance (Boxall and Purcell, 2003: Wright et al, 1994). As the related high performance/high commitment/high involvement management literature illustrates, however, there is no unambiguously unique bundle or a definitive list of

policies and practices which may go towards helping to produce one (Becker and Gerhard, 1996: Ichniowski et al, 1996: Pfeffer, 2008: Procter, 2008: Wood, 1999).

Usually, there are two inter-related elements to the high performance/high commitment/high involvement models forwarded to explain why policy generates improved outcomes, although the specific nature of the inter-relationship between the two elements is somewhat imprecise. The first element is associated with the organisation of work, where the assumption is that the adoption of particular innovative practices improves efficiency. In this context, some researching within the manufacturing sector seek to differentiate between lean and team production systems, with the former being associated also with inventory management systems, such as just-in-time, and the latter being associated mostly with particular types of job re-design to establish semi-autonomous group working (Godard, 2004).

The second element is associated with management policies towards human resources, notably the manner in which management seeks to resolve the not necessarily novel problem of extracting effort from labour to generate high performance (Legge, 2005). However, there are two contrasting perspectives of how this is best achieved, one associated with high commitment and the other with high involvement, both in themselves very complex constructs. The former requires a policy framework designed to engage (or re-engage) the worker with the cultural norms and expectations of the organisation, and would include policies which relate to recruitment and selection, training, communication and reward. Effectively, given the appropriate calibre of labour input, policies designed to motivate workers. By contrast, the latter emphasises the salience of participation, variously if somewhat nebulously defined (Lansbury and Wailes, 2008). According to this perspective, the essential assumption is that the implementation of policies and practices such as the establishment of quality circles, the creation of semi autonomous work teams, the adoption of employee profit sharing schemes etc., all designed to create involvement, improves worker effort. Effectively, again given the appropriate calibre of labour input, requisite employee behaviour becomes self-regulated (Levine, 1995).

In the context of skills strategy, Sung et al (2009) encapsulate this resource based view of the firm into what they identify as a “business strategy and skills utilisation

model" (p 9). According to this model, given its distinctive capabilities the firm constructs a comprehensive business strategy. Although the elements within this model are inextricably interlinked, the starting point is the firm's product market strategy, its choice with respect to the nature of its product and how it chooses to place this product on the market. Next, the firm chooses its production process, principally the nature of capital and labour to be utilised, stereotypically choosing between utilising high or low technology and employing high or low skilled labour, and how work is to be organised combining labour with capital. Finally, it chooses how to manage its human resources, its human resource management (HRM) strategy.

There is no deterministic relationship between product, process and HRM strategy, as Sung et al (2009) emphasise. Nonetheless, product, process and HRM strategy both determine the nature of labour to be recruited, in terms of the existing skills profiles of individuals in the external labour market (or entering into the labour market) seeking employment with the firm and the relative costs with which these skills profiles may be further developed in the future via appropriate training as circumstances require (Thurow, 1975). Furthermore, given that most of this subsequent training is job specific (Becker, 1964) designed to meet the requirements of the firm's internal labour market (Doeringer and Piore, 1985), the option of acquiring these same skills via the external labour market – as reflected in the make or buy strategic options associated with the transactions view of the firm (Coase, 1937; Lazear and Oyer, 2004) – is rarely a practical alternative.

Skill requirements, therefore, are the consequences of these prior strategic decisions about product, process and policy, and, in turn, product, process and policy – and/or change in one or all of these – determine the firm's training needs, its demand for training. One possible outcome, of course, is that such are the prior choices made with respect to product and process, from the perspective of the firm, skills requirements on the part of the labour input may be negligible and training needs non-existent. The decision not to train can be rational, therefore.

3. THE DATA SET

The data set used in the analysis is the Scottish Employers' Skills Survey of 2008, the fifth in a series of large scale surveys undertaken to obtain employers' perspectives on a diverse range of skills related issues e.g. vacancies, including hard to fill vacancies, skill shortages, skill gaps and training. It is establishment based.

The population from which the sample of establishments is taken is obtained from the ONS' Inter-Departmental Business Register. The population sampled is defined as all establishments in Scotland. Quota sampling methods are used. The survey is multi-stage in its design, with three elements to the sampling frame viz. geography (the 11 Scottish Further Education Funding Council Areas); sector (six Sector Skills Council industry groupings); and size (six employer size categories).[3] 14,052 establishments were contacted and positive responses were obtained from 6,274, a response rate of 45 percent.[4] Where positive responses were obtained, telephone interviews were conducted with the senior person responsible for human resource and personnel matters.

The original report focussed upon four issues (FutureSkills Scotland, 2009):

1. The relative importance of skills-related issues, as compared with other challenges facing employers, such as their cash flow problems, the imminent economic downturn etc.:
2. The types of jobs in which skills shortages and skills gaps were most/least prevalent:
3. The causes of skills shortages and skills gaps, their consequences and the nature of employers' responses to both: and

[3] Complex survey data lead to a sample which may be weighted, clustered and stratified. Failure to accommodate all these features results in conservative overestimates of standard errors, although not necessarily different values of the coefficients (Cameron and Trivedi, 2005 and 2009). For the statistical analyses undertaken in this paper, the data set is weighted only. The standard errors reported, therefore, need to be viewed in the context of this comment.

[4] Observations which had incomplete responses to all the questions examined in the statistical analysis were subsequently removed from the data set. This reduced the final number of observations to 4,957.

4. The nature and extent of training paid for by employers, examined in two ways viz. 'training incidence' and 'training intensity'.[5]

In contrast, the single focus of this working paper is training. Further, the definition, interpretation, measurement and mode of estimation of the central concepts of training incidence and training intensity in the paper differ from those in the original report.

A particular feature of the 2008 Scottish Employer's Skills Survey (and ignored in the original report) is the inclusion of sets of questions relating to:

- the nature of the products or services provided by the establishment (e.g. 'one off' or 'high volume'; 'simple' or 'complex'; 'price dependent' or not);
- recent change at the establishment (e.g. whether new products or processes had been introduced; whether working methods or workforce organisation had changed); and
- the human resource management policies and practices in operation at the establishment (e.g. was there a staff training plan; to what extent was the training of staff integrated with business strategy; was use made of part time labour etc.).

The assumption is that these questions facilitate an exploration of the role of product, process and policy, the putative 'drivers of training' (Ashton, 2007: Sung et al, 2009).

The names, descriptors and origins of the variables in question are given in Table 1. The variables are collected into six categories, designed to reflect product, process and policy, if somewhat imprecisely and less than comprehensively.

Column 4 of Table 1 identifies the weighted proportion of the variables in question and, therefore, their incidence across private sector workplaces. For example, almost

[5] 'Training incidence' is seen as an "establishment based measure which permits examination of the circumstances under which training takes place" (FutureSkills Scotland, 2009, p 43). In the original report, training incidence is examined when training of any sort is undertaken, by the type of training provided. In contrast, 'training intensity' is seen as an "employee based measure which can help to answer questions about how much training takes place and who receives it" (FutureSkills Scotland, 2009, p 43). Training intensity, however, refers only to off-the-job training undertaken.

60 percent of workplaces report that their products/services target the premium end of the markets they supply. Almost 70 percent report that they employ highly skilled labour. More than half have a business plan, a staff training plan and make use of formal management accounting processes. However, with the exception of the introduction of new products/services, change is a feature of only a minority of workplaces. Recruitment and retention of staff is integrated with business strategy more frequently than staff training is. Profit sharing etc., policy towards equality/diversity and quality circles are considered to be very important in only 10 percent of workplaces.

Policy bundling is a feature of much of the literature, most especially so in the context of human resource management (Procter, 2008). Tables 2 through to 7 provide a partial perspective of bundling, reporting pairwise correlation coefficients for the variables within the six categories associated with product, process and policy. In principle, bundling would be associated with positively signed, relatively high value correlation coefficients. Given the problematical nature of product and process at the workplace, more probably bundling would be observed for the variables within the four categories which relate to management, change, human resource management strategy and human resource management policy. The correlation coefficients in Tables 4 to 7 are all positive and the values to be found in Tables 4 and 6, with two exceptions, are always greater than 3.00. There is, therefore, some provisional evidence of policy bundling at these workplaces.

4. THE MODELS ESTIMATED

From the initial questions asked about Training and Staff Development it is possible to identify the training status of the establishment i.e. whether or not training had been funded or arranged for employees in the past 12 months, and, if so, the nature of the training undertaken, only on-the-job, only off-the-job, or both.[6] The percentage distribution of these responses is reported in Table 8.

The training status of the establishment makes possible the construction of two different measures of training incidence: one as to whether or not training of any sort

[6] Identified as the variable 'TR_STAT' in the codebook.

was undertaken in the past 12 months; the other denoting the nature of the training undertaken, relative to no training being undertaken. The former produces the dichotomous dummy dependent variable *trainincidence*. The latter produces the multinomial dependent variable *trainstat*, which has four outcomes (cf. Table 8).

The binomial probit model used to identify the determinants of whether training took place at the establishment is of the standard form viz.

$$\mathbf{y^*_i} = \mathbf{X_i}\boldsymbol{\beta} + \boldsymbol{\varepsilon_i}$$

where $\mathbf{y^*_i}$ is a latent variable depicting the training outcome at the establishment; and $\mathbf{X_i}$ $\boldsymbol{\beta}$ and $\boldsymbol{\varepsilon_i}$ are, respectively, a vector of observable independent variables, a set of coefficients to be estimated and an error term (Cameron and Trivedi, 2005 and 2009; Long and Freese, 2006). In the estimation, $\mathbf{y_i} = 1$ if training of any sort is undertaken (and = 0 otherwise)

The multinomial probit model used to identify the determinants of the types of training undertaken at the establishment is also of the standard form viz.:

$$\mathbf{y^*_{ij}} = \mathbf{X_i}\boldsymbol{\beta}_{j|b} + \boldsymbol{\varepsilon_{ij}}$$

where $\mathbf{y^*_i}$ is a latent variable denoting the training outcome at the establishment; $_{\mathbf{j}}$ is the number of possible training outcomes, in this instance 4; $_{\mathbf{b}}$ is the base response category, in this instance those establishments where no training is undertaken (i.e. outcome 4 in Table 8); $\mathbf{X_i}$ is a vector of observable independent variables; $\boldsymbol{\beta}$ a set of coefficients to be estimated; and $\boldsymbol{\varepsilon_{ij}}$ is an error term.

The measurement of training intensity has its origins in Question 67.[7] Respondents who reported that off-the-job training was undertaken at the establishment in the preceding 12 months were asked : '..how many staff in each.. occupational categor(y) have received off-the-job training away from their immediate work station over the last 12 months?'[8] Subsequently, these numbers are added together and a variable denoting the total number at each establishment who received off-the-job training produced.[9] The dependent variable *pcstafftrain* is derived by taking this number as a percentage of the total number employed at the establishment at the time of the interview.

pcstafftrain is estimated conditional on off-the-job training occurring at the establishment, in a Heckman selection model.[10]

The assumption is that there exists an underlying regression relationship as follows:

$$\mathbf{y_i} = \mathbf{X_i}\boldsymbol{\beta} + \boldsymbol{\varepsilon_i}$$

where $\mathbf{y_i}$ is training intensity, as defined and measured above; and $\mathbf{X_i}$, $\boldsymbol{\beta}$ and $\boldsymbol{\varepsilon_i}$ are, respectively, a vector of observable independent variables, a set of coefficients to be estimated and an error term. However, the dependent variable is not always observed because not all establishments provide off-the-job training. Rather the dependent variable is observed only when $\mathbf{z_i = 1}$ in a prior selection equation, which is:

[7] At this juncture, it is important to re-emphasise that the training measured and estimated for the dependent variable *pcstafftrain* refers only to off-the-job training, where this is described as "conducted away from the employee's immediate workstation either on the premises or elsewhere" (FutureSkills Scotland, 2009, p. 43). In the original report, this focus upon off-the-job training is done for reasons of expediency. Off-the-job training is seen as easier to measure within establishments and compare across establishments (p. 46). According to the authors of the original report, the intention is not to depreciate the potential quality, effectiveness and importance of informal on-the-job training frequently undertaken in smaller size establishments.

[8] Reported as variables Q67_1 through to Q67_9.

[9] Reported as variable Q67_SUM.

[10] Subsequently, it was estimated directly, unconditional on selection (cf. footnote number 2 to Table 11.)

$$z_i = W_i\beta + u_i$$

where X_i (in the previous equation) is a subset of W_i in that there is/are some variables which are assumed to explain whether or not off-the-job training is provided but not its intensity if it is.[11]

All three models are estimated making use of the same vector of independent variables.[12] The expectation is that each of the coefficients of the variables identified and discussed above with respect to the management, change, human resource management strategy and human resource management policy categories will be positively signed and statistically significant. The signs of the individual coefficients of the product and process sets may be more problematical, but the presumption is that the individual variables *complex*, *premqual*, *itgood* and *hiskill* will be positively signed.

5. THE INCIDENCE OF TRAINING

The results of the binomial probit estimation of *trainincidence* are reported in Table 9. Of the 30 variables identified in the table, and somewhat contrary to expectations 14 are negatively signed. Moreover, two of these negatively signed coefficients (*hivol* and *shareimp*) are statistically significant.[13]

More compatible with the drivers of training thesis, however, are the positively signed and statistically significant coefficients which relate to *busplan*, *trainplan* and *manaccounts* (in the category of variables associated with management at the workplace); *newprod* and *equipment* (in the category of variables associated with change at the workplace); and *traininit* and *motivateint* (in the category of variables associated with human resource management strategy at the workplace). Training is 23 percent more likely to take place at workplaces which have a training plan; and 11

[11] In this instance, there are two selection variables: the presence of skills gaps at the workplace, and the presence of hard to fill vacancies at the workplace.
[12] In practice, the variable *trainlaw* does not appear in either the binomial probit or the multinomial probit. In the former, *trainlaw* = 0 predicts success perfectly. It was decided to drop the variable rather than the observations involved. In the latter, its presence is not compatible comprehensively with the configuration of the three outcomes estimated.
[13] Statistically significant at ($P < 0.1$), the criterion used throughout the paper.

percent more likely to take place at workplaces at which training is integrated with business strategy. It is 5 percent more likely to take place at establishments which have introduced new products; and 7 percent more likely to take place at establishments which have introduced new equipment.

The salience of these three categories of variables is further established in the results of the Wald tests, reported in footnote 2 of Table 9. These results confirm the joint significance of the variables associated with the management, change and human resource management strategy categories of variables (but not the product, process nor human resource management policy categories). Notably, however, the results of the Wald tests also establish the joint significance of the variables denoting key sector, size and establishment characteristics. Irrespective of the extent to which training may appear to be part determined by factors such as process and policy, the role of structural factors cannot be dismissed.[14]

The results of the multinomial probit estimation of *trainstat* are reported in Table 10. In multinomial models it is not possible to identify separate coefficients for each of the possible outcomes. Conventionally, the coefficients for a selected outcome are set at zero, and, following this normalisation process, relative probabilities are produced with respect to this base outcome. In this instance, outcome 4 – that no training is undertaken at the establishment - is selected as the base outcome.

Relative to the base outcome, the determinants of both on- and off-the-job training, on-the-job training only and off-the-job training only are quite different. Across the three outcomes, of the 30 coefficients associated with the drivers of training thesis only 14 never change their signs. Of the 14, three (*hivol* , *salesplan* and *shareimp*) are always negative. Of the 11 which are always positively signed, three (*methods*, *payint* and *reviewint*) are never statistically significant. Only two of the coefficients which

[14] For example, in results not reported in Table 9, variables denoting establishment size are correlated with training incidence very much in accordance with results found in other studies. Relative to the reference category (of employing between 25 and 49), establishments employing between 1 and 4 are 37 percent less likely to train; establishments employing between 5 and 9 are 25 percent less likely to train; and establishment employing between 10 and 14 are 12 percent less likely to train. Conversely, establishments employing over 250 are 28 percent more likely to train. Further, establishments reporting skills gaps are 17 percent more likely to train. Where unions are recognised for bargaining purposes, this is associated with a 6 percent increase in the probability of training taking place.

are always positively signed are always statistically significant (*trainplan* and *manaccounts*). None of the three coefficients which are always negatively signed is always statistically significant.

Of the 11 coefficients which are statistically significant in the context of outcome 1, eight are positively signed. Not unexpectedly, the majority of these are the same as those which are positively signed and statistically significant in the earlier binomial probit estimation, generally reflecting the categories of management, change and human resource management strategy. Of the eight coefficients which are statistically significant in the context of outcome 2, two are negatively signed. Five of the six positively signed coefficients constitute a sub set of those positively signed and statistically significant in the context of outcome 1. Only four coefficients are statistically significant in the context of outcome 3, one of which is negatively signed. Two of the variables which are positively signed and statistically significant in the context of outcome 3 constitute a sub set of those positively signed and statistically significant in the context of outcome 2.

In terms of the results of the Wald tests reported in footnote 3 to Table 10, the joint significance of the variables associated with the categories denoting management, change and human resource management strategy are established once again. However, in this instance the joint significance of the variables associated with the process category is also established. Again as with the binomial probit, the joint significance of the variables associated with key sector, establishment size and the characteristics of the establishment is also established.

6. THE INTENSITY OF (OFF-THE-JOB) TRAINING

The results of the Heckman selection model estimating the determinants of *pcstafftrain* are reported in Table 11. 17 of the coefficients identified and associated with the drivers of training thesis are positively signed. Moreover, eight of these are statistically significant (*hiauto*, *hiskill*, *busplan*, *trainplan*, *traininit*, *motivateint*, *involveint* and *incentint*). Only one coefficient (*disputeint*) which is statistically significant is negatively signed.

In contrast to results previously reported with respect to training incidence, certain individual variables associated with both the process and the human resource management policy categories impact upon the percentage of staff at the workplace who receive off-the-job training. For example, a workplace which uses highly skilled labour increases the percentage of the workforce trained in this way by six percentage points. Workplaces which consider their policies towards workforce involvement and profit sharing to be important increase the percentages of the workforce who receive off-the-job training by four percentage points and five percentage points, respectively.

These individual results, however, are not reflected in the results of the Wald tests, reported in footnote 3 to Table 11. Neither the joint significance of the variables associated with the process category nor the joint significance of the variables associated with human resource management policy category is statistically significant. In terms of the categories of variables proxying the drivers of training thesis, the joint significance of the variables associated only with the management category and the human resource management strategy category is established. The Wald tests also establish the joint significance of the variables associated with key sector, establishment size, characteristics and law, producing evidence of the importance of structural factors, this time in the context of determining training intensity.[15]

7. CONCLUSIONS

This working paper has investigated the incidence of training and the intensity of off-the-job training provided in private sector establishments in Scotland. Two measures of training incidence were produced and examined. One was a dichotomous dummy variable differentiating between whether or not training was undertaken at the establishment. The other was the multinomial outcomes to a question about training,

[15] Two results are especially noteworthy in the context of these structural characteristics. The dummy variables associated with the three smallest sized establishments are both positively signed and statistically significant. For example, relative to the reference category (i.e. establishments employing 24 – 49), establishments employing between 1 – 4, 5 – 9 and 10 – 14 increase the percentage of staff trained off-the-job by 23, 9 and 6 percentage points, respectively. The sign of the dummy variable of the largest size band is negative, although it is not statistically significant. The coefficient *trainlaw* appears in the estimations for the first time. It is positively signed and statistically significant. The percentage of staff trained is 20 percentage points higher at workplaces where an element of the off-the-job training provided is done to comply with statutory requirements.

contrasting the nature of training undertaken at the establishment relative to no training having taken place. One measure of training intensity was produced and examined for those establishments which undertook off-the-job training, based upon the percentage of workers at the establishment who received off-the-job training. The investigation made use of the 2008 Scottish Employers' Skills Survey, the most recent in a series of surveys designed to collect information about skills related issues across workplaces located in Scotland.

The principal aim of the paper was to examine the extent to which the specified dependent variables were correlated with variables associated with the 'drivers of training' literature i.e. variables which reflect the nature of the product/service provided, work organisation at the establishment and the human resource management policies and practices in operation there. In the paper, variables reflecting these inter-related forces were collected into six categories, denoting product, process, management, change, human resource management strategy and human resource management policy and practice.

In the context of the two estimations of training incidence, the joint significance of the variables associated with three categories of variables was established viz. management, change and human resource management strategy. In the context of the regression of training intensity, the joint significance of the variables associated with the management and the human resource management strategy categories was established. In the latter result, additionally three individual variables associated with human resource management policy and practice were statistically significant viz. the employment at the workplace of highly skilled labour; workplaces which consider policies towards workforce involvement to be important; and workplaces which consider profit sharing to be important. In all three estimations however, the results of the Wald tests also established the joint significance of the variables denoting key sector, size and establishment characteristics. Irrespective of the extent to which training may appear to be part determined by factors such as product, process and policy, therefore, the role of structural factors cannot be dismissed.

Consequently, the outcome of this micro-econometric examination of the drivers of training thesis must be considered disappointing.

However, the questionnaire used to collect the data examined was not designed to test the thesis, merely to collect information about skills related issues. Although responses to questions within the survey were allocated to categories compatible with the inter-related components of the thesis, the variables associated with product and process in the estimations were somewhat inadequate for the purpose; there were few variables which addressed the central issue of the organisation of work; and although there was a comprehensive set of variables which took cognisance of human resource management strategy – most especially as they related to workforce involvement – there was a shortfall in the number of variables addressing human resource management policy and practice. Further, the statistical examination proceeded by evaluating the significance of the variables individually or as individual variables collected into categories in tests of their joint significance, whereas the essence of the skills utilisation model is the interaction between bundles of variables.

A micro-econometric test of the thesis, therefore, requires not only the right data but a modelling strategy which encompasses bundles of variables appropriately inter-acted, always assuming, that is, that a micro-econometric strategy is the most appropriate methodology to apply to test the thesis.

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Table 1. The Product, Process and Policy Variables: Names, Descriptors, Origins and (Weighted) Proportions, by category

Name	Descriptor	Origin	(Weighted) Proportion
The Nature of the Product or Service			
Hivol	A high volume producer or service provider (=1)	Question 81A, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.387
Complex	A highly complex product or service is provided (=1)	Question 81B, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.474
Pricedep	Competitive success depends upon price (=1)	Question 81C, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.303
Premqual	Products/services target the premium end of the market (=1)	Question 81F, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.586
The Nature of the Process			
Itgood	IT systems and networks are considered 'state of the art' relative to others in the industry (=1)	Question 81D, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.372
Hiauto	The process used to produce/deliver products/services is highly automated (=1)	Question 81E, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.246
Hiskill	The workforce employed is highly skilled, relative to others in the industry (=1)	Question 81G, where responses 4 and 5 are recoded = 1 (and 0 otherwise)	.678
Management Policy and Practice at the Workplace			
Busplan	There is a workplace business plan (=1)	Question 85A	.588
Trainplan	There is a workplace staff training plan (=1)	Question 85B	.501
Salesplan	There is a workplace sales and marketing plan (=1)	Question 85C	.457
Manaccounts	There is a management accounting system in operation at the workplace (=1)	Question 85D	.677

Table 1. (cont.)

Name	Descriptor	Origin	(Weighted) Proportion
The Nature of Change at the Workplace over the past 12 months			
Newprod	New products/service have been introduced (=1)	Question 83A	.467
Modify	Major modifications have been made to existing products/services (=1)	Question 83B	.289
Equipment	Major equipment has been introduced (=1)	Question 83C	.285
Methods	Major changes to working methods or workforce organisation have been introduced	Question 83D	.243
Senior	There has been a change in senior management (=1)	Question 83E	.148
Human Resource Management Strategy at the Workplace			
Trainint	The training of staff is integrated with business strategy (=1)	Question 86A, where response 1 ('to a great extent) = 1, and other responses recoded = 0	.473
Retentint	The recruitment and retention of employees with the right skills are integrated with business strategy (=1)	Question 86B where response 1 ('to a great extent) = 1, and other responses recoded = 0	.651
Motivateint	Activities to motivate staff and promote business focussed attitudes are integrated with business strategy (=1)	Question 86C where response 1 ('to a great extent) = 1, and other responses recoded = 0	.486
Payint	Pay and benefit levels are integrated with business strategy (=1)	Question 86D where response 1 ('to a great extent) = 1, and other responses recoded = 0	.456

Table 1. (cont.)

Name	Descriptor	Origin	(Weighted) Proportion
Human Resource Policy and Practice at the Workplace			
Involveimp	Arrangement for the direct involvement of employees in decision making and problem solving is very important (=1)	Question 88_1, where response 1 ('very important) = 1, and other responses recoded = 0	.393
Fleximp	Flexibility for employees to decide how their work is organised and carried out is very important (=1)	Question 88_2, where response 1 ('very important) = 1, and other responses recoded = 0	.347
Shareimp	Profit sharing/share options/gain sharing for employees is very important (=1)	Question 88_3, where response 1 ('very important) = 1, and other responses recoded = 0	.075
Ptimp	The use of part time staff is very important (=1)	Question 88_4, where response 1 ('very important) = 1, and other responses recoded = 0	.237
Equalimp	The explicit policy on equality/diversity in the workplace is very important (=1)	Question 88_6, where response 1 ('very important) = 1, and other responses recoded = 0	.113
Disputeimp	The formal dispute resolution procedures are very important (=1)	Question 88_7, where response 1 ('very important) = 1, and other responses recoded = 0	.207
Incentimp	Incentive or performance related pay is very important (=1)	Question 88_8, where response 1 ('very important) = 1, and other responses recoded = 0	.165
Surveyimp	The formal survey of employee views or opinions is very important (=1)	Question 88_9, where response 1 ('very important) = 1, and other responses recoded = 0	.142
Reviewimp	The formal staff performance review is very important (=1)	Question 88_10, where response 1 ('very important) = 1, and other responses recoded = 0	.228
Circlesimp	Quality circles are very important (=1)	Question 88_11, where response 1 ('very important) = 1, and other responses recoded = 0	.100

Footnote to Table 1.

Additionally, the three models estimated contain the following independent variables also collected into categories, because although the results for individual variables are not reported the results of Wald tests for their joint significance are:

- area i.e. 10 dummy variables (with one exclusion) denoting the 11 Scottish Further Education Funding Council areas;
- key sector i.e. 5 dummy variables (with one exclusion) denoting the 6 (relevant) Sector Skills Council key industry groupings;
- size i.e. 5 dummy variables (with one exclusion) denoting the 6 establishment size bands in terms of number of employees employed;
- characteristics i.e. 7 distinct dummy variables denoting the characteristics of the establishment, being: whether or not it was a single plant enterprise; whether or not it had a headquarters function; whether or not it was overseas owned; the vacancy rate (an integer); whether or not it identified the presence of hard-to-fill vacancies; whether or not it identified skills gaps (deficiencies) on the part of its workforce; and whether or not the 'organisation' (sic) recognised trade unions for bargaining purposes.
- law i.e. which contains one variable viz. that some element of the training provided was designed to meet statutory requirement
- market i.e. i.e. 4 dummy variables (with one exclusion) denoting the 5 principal markets for products and services.

Table 2. Pairwise Correlation Coefficients: PRODUCTS

	hivol	complex	pricedep	Premqual
Hivol	1.0000			
Complex	0.1605	1.0000		
Pricedep	0.0801	-0.0460	1.0000	
Premqual	0.1522	0.3548	-0.0134	1.0000

Table 3. Pairwise Correlation Coefficients: PROCESS

	itgood	hiauto	Hiskill
Itgood	1.0000		
Hiauto	0.2916	1.0000	
hiskill	0.1711	0.1574	1.0000

Table 4. Pairwise Correlation Coefficients: MANAGEMENT

	buspplan	Trainplan	salesplan	Manaccounts
Busplan	1.0000			
Trainplan	0.3606	1.0000		
Salesplan	0.4306	0.3534	1.0000	
Manaccounts	0.3253	0.1683	0.3005	1.0000

Table 5. Pairwise Correlation Coefficients: CHANGE

	newprod	modify	equipment	methods	Senior
Newprod	1.0000				
Modify	0.3913	1.0000			
Equipment	0.2410	0.2935	1.0000		
Methods	0.2488	0.3299	0.2860	1.0000	
Senior	0.1746	0.1391	0.0909	0.2350	1.0000

Table 6. Pairwise Correlation Coefficients: HUMAN RESOURCE MANAGEMENT STRATEGY

	trainint	retentint	motivateint	Payint
Traininit	1.0000			
Retentint	0.4311	1.0000		
Motivateint	0.3630	0.3368	1.0000	
Payint	0.2550	0.3170	0.3358	1.0000

Table 7. Pairwise Correlation Coefficients: HUMAN RESOURCE MANAGEMENT POLICY

	involvimp	fleximp	shareimp	ptimp	equalimp	disputeimp	incentimp	surveyimp	reviewimp	Circleimp
Involveimp	1.0000									
Fleximp	0.4358	1.0000								
Shareimp	0.2011	0.1809	1.0000							
Ptimp	0.1451	0.1815	0.1379	1.0000						
Equalimp	0.1194	0.1317	0.0939	0.2937	1.0000					
Disputeimp	0.2359	0.1902	0.1661	0.2240	0.1342	1.0000				
incentimp	0.1901	0.1747	0.3435	0.1535	0.1297	0.2329	1.0000			
Surveyimp	0.2636	0.2092	0.2350	0.2063	0.1020	0.3433	0.2862	1.0000		
Reviewimp	0.2299	0.1770	0.1989	0.1989	0.1079	0.3676	0.3084	0.5347	1.0000	
circlesimp	0.2052	0.1648	0.1682	0.1682	0.0666	0.2365	0.2095	0.3380	0.3653	1.0000

Table 8. The Nature of Training Undertaken (dependent variable *trainstatus*) (Percentage Distribution)

Nature of Training Undertaken	Percent	Outcome in the Multinomial Probit
Training both on-and off-the job	47.59	1
Training on-the-job only	20.06	2
Training off-the-job only	9.31	3
No training undertaken	23.04	4, the base outcome
Number of observations	4,995	

Table 9. Probit Results: Dependent Variable *trainincidence*

Variable	Coefficient	Robust Standard Error	P > |z|	Marginal Effects
Hivol	-.1398	.0779	.073	-.051
Complex	-.0017	.0819	.983	-.000
Pricedep	-.0604	.0773	.435	-.022
Premqual	.1193	.0811	.141	.044
Itgood	.0126	.0901	.888	.004
Hiauto	-.0394	.0999	.693	-.014
Hiskill	-.1289	.0831	.121	-.047
Busplan	.1572	.0840	.061	.058
Trainplan	.6409	.0864	.000	.232
Salesplan	-.1120	.0879	.203	-.041
Manaccounts	.1942	.0805	.016	.072
Newprod	.1527	.0872	.080	.056
Modify	.0766	.0970	.430	.028
Equipment	.2080	.0908	.022	.075
Methods	.0728	.1028	.479	.026
Senior	-.0665	.1052	.527	-.024
Trainint	.3264	.0908	.000	.119
Retentint	-.0319	.0890	.720	-.011
Motivateint	.2061	.0874	.018	.075
Payint	.0914	.0848	.281	.033
Involveimp	.0136	.0890	.878	.005
Fleximp	.0313	.0874	.720	.011
Shareimp	-.2920	.1543	.058	-.111
Ptimp	-.0421	.0871	.629	-.015
Equalimp	-.1369	.1202	.255	-.051
Disputeimp	-.0673	.0980	.492	-.025
Incentiveimp	-.0157	.1295	.903	-.005
Surveyimp	.0250	.1282	.845	.009
Reviewimp	.1462	.1135	.198	.053
Circlesimp	-.0057	.1348	.966	-.002
Constant	.4113	.2182	.059	
Log likelihood :				-.2434.8049
Number of observations:				4,957
Wald chi2 (61):				762.02
Prob > chi2:				0.0000
Pseudo R2				0.2692

Footnotes to Table 9.

1. Marginal effects for all dummy variables are for a discrete change from 0 to 1. Marginal effects are calculated at mean values.

2. Results of the Wald tests for the joint significance of the variables within the categories identified:

area: chi2 (10) = 6.30 : Prob > chi2 = 0.7897
key sector: chi2 (5) = 16.95 : Prob > chi2 = 0.0046
size : chi2 (5) = 130.50 : Prob > chi2 = 0.0000
characteristics : chi2 (7) = 58.24 : Prob > chi2 = 0.0000
market : chi2 (4) = 0.97 : Prob > chi2 = 0.9140
product : chi2 (4) = 5.54 : Prob > chi2 = 0.2359
process : chi2 (3) = 2.71 : Prob > chi2 = 0.4382
management : chi2 (4) = 75.85 : Prob > chi2 = 0.0000
change : chi2 (5) = 16.12 : Prob > chi2 = 0.0065
HR strategy: chi2 (4) = 28.57 : Prob > chi2 = 0.0000
HR policy : chi2 (10) = 8.64 : Prob > chi2 = 0.5669

Table 10. Multinomial Probit Results: Dependent Variable *trainstat*

Variable	Coefficient	Robust Standard Error	P > |z|	Marginal Effects
Outcome 1: train both on- and off-the-job				
Hivol	-1762	.1149	.125	-.022
Complex	.0752	.1169	.520	.024
Pricedep	-1847	.1112	.097	-.046
Premqual	.0721	.1166	.537	-.008
Itgood	.0186	.1242	.881	.001
Hiauto	.0845	.1392	.544	.042
Hiskill	-.0594	.1160	.609	.017
Busplan	.2826	.1167	.015	.055
Trainplan	1.0452	.1263	.000	.184
Salesplan	-.0814	.1233	.509	.004
Manaccounts	.2406	.1149	.036	.031
Newprod	.2207	.1201	.066	.036
Modify	.2494	.1367	.068	.068
Equipment	.3175	.1290	.014	.051
Methods	.1123	.1402	.423	.018
Senior	.0069	.1430	.961	.025
Trainint	.4973	.1320	.000	.083
Retentint	.0525	.1313	.689	.025
Motivateint	.2185	.1245	.079	.018
Payint	.1137	.1174	.333	.016
Involveimp	.0748	.1334	.575	.021
Fleximp	.1153	.1297	.374	.031
Shareimp	-.5231	.2111	.013	-.095
Ptimp	-.1270	.1221	.298	-.031
Equalimp	.0085	.1687	.958	.041
Disputeimp	-.2401	.1299	.065	-.068
Incentiveimp	.0385	.1886	.838	.018
Surveyimp	-.0399	.1805	.825	-.017
Reviewimp	.1365	.1638	.405	.005
Circlesimp	.0445	.1799	.804	.018
Constant	-.2625	.3118	.400	
Log psuedolikelihood:				-.133584.39
Number of Observations:				4,957
Wald chi2 (183):				1355.81
Prob > chi2:				0.0000

Table 10 (cont.)

Variable	Coefficient	Robust Standard Error	P > |z|	Marginal Effects
Outcome 2: train on-the-job only				
Hivol	-.1799	.1132	.112	-.021
Complex	.0169	.1213	.889	.002
Pricedep	-.0369	.1143	.747	.006
Premqual	.2864	.1204	.017	.062
Itgood	.0986	.1342	.463	.028
Hiauto	-.1155	.1466	.431	-.028
Hiskill	-.3742	.1245	.003	-.093
Busplan	.0473	.1324	.721	-.028
Trainplan	.7673	.1277	.000	.073
Salesplan	-.1260	.1296	.331	-.010
Manaccounts	.2034	.1235	.099	.016
Newprod	.1859	.1320	.159	.020
Modify	.0246	.1442	.865	-.015
Equipment	.2614	.1333	.050	.026
Methods	.0226	.1557	.885	-.013
Senior	-.2698	.1424	.058	-.064
Trainint	.4287	.1301	.001	.051
Retentint	-.0743	.1283	.562	-.019
Motivateint	.3563	.1270	.005	.062
Payint	.0677	.1243	.586	0.000
Involveimp	-.0960	.1300	.460	-.037
Fleximp	.0029	.1281	.982	-.009
Shareimp	-.2954	.2260	.191	-.020
Ptimp	.0067	.1247	.957	.016
Equalimp	-.2837	.1736	.102	-.057
Disputeimp	.0673	.1410	.633	.039
Incentiveimp	-.0496	.1806	.783	-.013
Surveyimp	.0163	.1794	.927	.002
Reviewimp	.1850	.1571	.239	.021
Circlesimp	.0117	.2006	.953	.005
Constant	-.3894	.3278	.235	

Table 10 (cont.)

Variable	Coefficient	Robust Standard Error	P > |z|	Marginal Effects
Outcome 3: train off-the-job only				
Hivol	-.1716	.1194	.151	-.009
Complex	-.1199	.1264	.343	-.022
Pricedep	.0281	.1218	.817	.014
Premqual	.0367	.1273	.773	-.010
Itgood	-.1231	.1336	.357	-.022
Hiauto	-.1878	.1544	.224	-.025
Hiskill	.0595	.1321	.652	.027
Busplan	.3377	.1332	.011	.034
Trainplan	.4794	.1332	.000	-.010
Salesplan	-.3096	.1378	.025	-.036
Manaccounts	.3009	.1302	.021	.024
Newprod	.1230	.1360	.366	-.000
Modify	-.0458	.1472	.755	-.019
Equipment	.2135	.1386	.123	.004
Methods	.1890	.1633	.247	.022
Senior	-.0001	.1623	.999	.010
Trainint	.2199	.1342	.101	-.009
Retentint	-.0866	.1521	.569	-.012
Motivateint	.1586	.1343	.238	-.002
Payint	.1678	.1367	.220	.016
Involveimp	.1510	.1322	.253	.023
Fleximp	-.0082	.1307	.950	-.006
Shareimp	-.2401	.2473	.332	-.001
Ptimp	-.0611	.1384	.659	-.003
Equalimp	-.3004	.1952	.124	-.030
Disputeimp	-.0039	.1528	.979	.007
Incentiveimp	-.0660	.1770	.709	-.009
Surveyimp	.1153	.1963	.557	.019
Reviewimp	.2676	.1651	.105	.026
Circlesimp	-.1655	.1987	.405	-.025
Constant	-.7689	.3277	.019	

Footnotes to Table 10.

1. The base outcome is ‘4’, no training is done at the establishment

2. Marginal effects for all dummy variables are for a discrete change from 0 to 1. Marginal effects are calculated at mean values.

3. Results of the Wald tests for the joint significance of the variables within the categories identified:

area: chi2 (30) = 33.69 : Prob > chi2 = 0.2932
key sector : chi2 (15) = 56.62 : Prob > chi2 = 0.0000
size : chi2 (15) = 233.93 : Prob > chi2 = 0.0000
characteristics: chi2 (21) = 98.30 : Prob > chi2 = 0.0000
market : chi2 (12) = 10.27 : Prob > chi2 = 0.5920
product : chi2 (12) = 17.72 : Prob > chi2 = 0.1245
process : chi2 (9) = 20.67 : Prob > chi2 = 0.0142
management : chi2 (12) = 109.19 : Prob > chi2 = 0.0000
change : chi2 (15) = 39.09 : Prob > chi2 = 0.0006
HR strategy : chi2 (12) = 38.63 : Prob > chi2 = 0.0001
HR policy : chi2 (30) = 37.40 : Prob > chi2 = 0.1656

Table 11. Heckman Selection Model

Variable	Coefficient	Robust Standard Error	P > |z|
pcstafftrain			
Hivol	-3.0972	2.4124	.199
Complex	-1.2259	2.4110	.611
Pricedep	-2.488	2.3317	.286
Premqual	2.025	2.3088	.380
Itgood	-.7555	2.3785	.751
Hiauto	4.6345	2.7666	.094
Hiskill	6.7080	2.5437	.008
Busplan	4.8719	2.5547	.057
Trainplan	8.4806	3.1918	.008
Salesplan	-.4657	2.4386	.849
Manaccounts	.8765	2.3540	.710
Newprod	3.7448	2.5960	.149
Modify	3.1839	2.6168	.224
Equipment	2.4626	2.2034	.264
Methods	-2.5200	2.3566	.285
Senior	1.9539	2.5095	.436
Trainint	6.3287	2.5114	.012
Retentint	-1.0801	2.9210	.712
Motivateint	5.8634	2.4252	.016
Payint	.0971	2.2658	.966
Involveimp	4.7811	2.4866	.055
Fleximp	2.4475	2.5257	.333
Shareimp	-2.4199	3.5093	.490
Ptimp	-2.0279	2.6787	.449
Equalimp	1.1039	2.9083	.704
Disputeimp	-4.7775	2.3453	.042
Incentiveimp	5.4763	2.7331	.045
Surveyimp	-1.5144	3.7014	.682
Reviewimp	-.9036	2.6822	.736
Circlesimp	-2.0057	3.0798	.515
Constant	2.9952	9.0184	.740
Log pseudolikelihood:		-303282.4	
Number of observations:		4,957	
Censored observations:		2,225	
Uncensored observations:		2,732	
Wald chi2(60):		352.50	
Prob > chi2:		0.0000	

Table 11. (cont.)

Variable	Coefficient	Robust Standard Error	P > |z|
Select			
Hivol	-.1012	.0702	.150
Complex	-.0134	.0715	.851
pricedep	-.1264	.0659	.055
Premqual	-.0559	.0696	.422
Itgood	-.0000	.0701	1.000
Hiauto	.0926	.0800	.247
Hiskill	.1374	.0702	.051
Busplan	.1985	.0734	.007
Trainplan	.2985	.0782	.000
Salesplan	-.0335	.0772	.664
Manaccounts	.1258	.0707	.075
Newprod	.0460	.0715	.520
Modify	.1156	.0748	.122
Equipment	.1119	.0722	.121
Methods	-.0157	.0756	.835
Senior	.1620	.0774	.036
Trainint	.0378	.0741	.610
Retentint	.0565	.0787	.473
Motivateint	-.0094	.0717	.896
Payint	.0786	.0699	.261
Involveimp	.1140	.0704	.105
Fleximp	.0394	.0693	.569
Shareimp	-.1651	.1212	.173
Ptimp	-.0416	.0725	.566
Equalimp	.0489	.0913	.592
Disputeimp	-.1295	.0757	.087
Incentiveimp	-.0092	.0904	.918
Surveyimp	-.0579	.1181	.624
Reviewimp	.0638	.0893	.475
Circlesimp	-.0647	.1007	.520
Constant	-.7439	.1855	.000
/athrho	.9141	.2059	.000
/insigma	3.5592	.0768	.000
rho	.7230	.0982	
sigma	35.1376	2.6996	
lambda	25.4079	5.3572	

Wald text of independent equations (rho = 0) : chi2 (1) = 19.70 : Prob > chi2 = 0.0000

Footnotes to Table 11.

1. The two variables omitted after the selection equation are both from the 'characteristics' set viz. that the establishment identifies (separately) the existence of skills gaps and the existence of hard to fill vacancies, variables assumed to determine training incidence but not training intensity

2. Subsequent to the estimation of the Heckman sample selection model, an unconditional OLS regression of the 2732 uncensored observations was undertaken. For the variables under discussion, the values of all coefficients are different in both estimations; the signs of three coefficients change, from being positive in the Heckman model to being negative in the OLS regression (viz. *manaccounts*, *payint* and *equalint*); and only four of the nine coefficients which are statistically significant (again at $P < 0.1$) in the Heckman model are statistically significant in the OLS regression (viz. *hiskill*, *trainint*, *involveimp* and *incentimp*).

3. Results of the Wald tests for the joint significance of the variables within the categories identified:

area: chi2 (20) = 15.81 : Prob > chi2 = 0.7284
key sector : chi2 (10) = 41.81 : Prob > chi2 = 0.0000
size : chi2 (10) = 189.48 : Prob > chi2 = 0.0000
characteristics : chi2 (10) = 30.13 : Prob > chi2 = 0.0008
law : chi 2(2) = 206.49 : Prob > chi2 = 0.0000
market : chi2 (8) = 10.23 : Prob > chi2 = 0.2492
product : chi2 (8) = 9.55 : Prob > chi2 = 0.2983
process : chi2 (6) = 9.81 : Prob > chi2 = 0.1328
management : chi2 (8) = 33.66 : Prob > chi2 = 0.0000
change : chi2 (10) = 15.45 : Prob > chi2 = 0.1164
HR strategy : chi2 (8) = 17.20 : Prob > chi2 = 0.0281
HR policy : chi2 (20) = 23.15 : Prob > chi2 = 0.2815