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Te Pokapū a Mahi me Te Manene Rangahau

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To make or buy (skills): An analysis of training decisions using microdata

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TE TARI MAHI

Labour and Immigration Research Centre
Department of Labour

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Prepared for the Department of Labour by
Geoff Mason[1], Penny Mok[2], Peter Nunns[3], Philip Stevens[4] and Jason Timmins[5]
[1]National Institute of Economic and Social Research (London, UK), [2]New Zealand Treasury, [3]Formerly Ministry of Economic Development, [4]Ministry of Economic Development, [5]Department of Labour

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Department of Labour
PO Box 3705
Wellington
New Zealand
www.dol.govt.nz

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http://dol.govt.nz/research or email research@dol.govt.nz.

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1 INTRODUCTION

The purpose of this paper is to examine the impact of skill shortages on the supply of training within New Zealand firms. The study uses a specially designed survey – the Business Strategy and Skills (BSS) module of the Business Operations Survey (BOS) 2008 (Statistics New Zealand, 2009). The paper evaluates the impact of skills shortages on the incidence and intensity of training across firms.

Information on why New Zealand employers do not train or train very little their existing staff to meet skills shortfalls remains unclear and critical for policy-makers to design appropriate incentives to encourage firms to provide in-house training to their employees. Developing policies to alleviate skill shortages within key sectors of the economy is critically important if New Zealand is to raise productivity levels and improve its international competitiveness.

There is a long literature examining the relationship between human capital and firm performance (Abowd, Kramarz, and Margolis, 1999; Haltiwanger, Lane, and Spletzer, 1999; Haskel, Hawkes, and Periera, 2005). In the short run, shortages of appropriately skilled workers curtails economic activity but may also have longer-term impacts on the way firms do business (Stevens, 2007) in terms of their location, size, structure, production methods, and product strategy (Mason, Forth, Stevens, Wilson, Campbell, Dickerson, and Hogarth, 2003; Durbin, 2004; Mason, 2005).

A crucial element in a firm's business strategy is how it obtains, creates, and develops the skills it needs to perform successfully. As with many investment decisions, firms have a 'make or buy' decision. Firms can increase the skills of their workforce by investing in their existing workers or by purchasing them on the open market through recruitment. Recruitment is particularly attractive when the firm needs to acquire new capabilities (for example, when they acquire or introduce new technology).

Training and recruitment (beyond simply replacing or expanding the workforce) can be seen from two perspectives. First, they can be seen as remedial, in the sense that the current workforce does not have the desired skills to deliver the businesses strategy. This may be due to previous recruitment difficulties causing firms to hire workers with lower than desired skills. Second, the firm may change its strategy – the products or services it provides, its production or organisational process, and so on – and require a different set of skills from its workforce.

As well as benefits to the firm, individuals who participate in employment-related training are likely to benefit from improved occupational status, increased earnings potential, and a lower risk of unemployment (Blundell, Dearden, Meghir, and Sianesi, 1999). These advantages are likely to have been amplified by changes in the New Zealand labour market and industrial relations framework in the last decade, with an increase in skills-based pay (Ryan, 1996).

In this paper, we examine the probability and intensity of training as a function of the external skill gaps, as well as consider other factors, such as firm size, previous performance, its ownership, its competitive environment, and the occupational breakdown of its staff.

Until recently, no New Zealand survey made it possible to use a large number of employer characteristics to investigate why some firms supply training to their staff and others don't. The BSS module was designed to investigate the nature of businesses' current and future strategies, their market focus, skills requirements, internal and external skill gaps, and training responses. Together with the 2008 Survey of Working Life, it is now possible to develop a much better understanding of the factors associated with a New Zealand firm supplying training and the types of staff that receive training (Barnes and Dixon, 2010).

A unique feature of the BSS module is the ability to measure differences in training intensity for three types of staff: new staff, existing staff changing roles, and existing staff for their existing roles. We extend the analysis by including additional explanatory variables by combining the BSS module with data from other sections of the current and previous years' BOS and the prototype Longitudinal Business Database (LBD).

The analysis approach is motivated by an investment model for the supply of training (Stevens, 1994) in which the employer's return is given by reduced recruitment costs for skilled workers. Our main interest is the effect of an increase in hiring costs (related to difficulties in recruiting skilled workers) on the firm's supply of training. We use the ratio of vacancies to staff and whether firms reported vacancies as being hard to fill as a proxy for hiring costs. In addition, we identify a subset of firms with hard-to-fill vacancies that reported this was because 'applicants lack the qualifications or skills the business demands', which we use as a proxy for an increase in hiring costs related to a shortage of skilled labour (skill shortages).

2 DATA

2.1 Business Operations Survey (BOS)

The BOS is a modular business survey with three modules: Module A collects annual financial and employment data and qualitative information on firm performance, Module B alternates between collecting information on innovation and communication technology use, while Module C is a contracted module. In 2008, Module C was focused on the nature of establishments' current and future strategies, their market focus, skills requirements, internal and external skill gaps, and training strategies. The target population for the BOS 2008 was active enterprise on Statistics New Zealand's (SNZ) Business Frame that, at the population selection date, have an annual GST turnover figure of greater than $30,000, had at least six employees, and had been operating for at least a year. It is a nationally representative survey of 36,075 New Zealand establishments for all sectors except for government and private non-profit organisations. BOS 2008 has two levels of stratification according to ANZSIC industry and employment size groups. The survey's response rate is 81.1 percent, which represented 5,543 establishments in 2008.

2.2 Study population

Our data is drawn from the merging of three distinct sources. The main source of data is a specially designed survey – the Business Strategy and Skills (BSS) module of the Business Operations Survey (BOS) 2008. By combining the BSS module with data from other sections of the current and previous years' BOS and the prototype Longitudinal Business Database (LBD), we expand the analysis in two ways. First, we draw on additional explanatory variables from a wide range of sources (other surveys and administrative data). Second, we can exploit the panel nature of the dataset to consider issues of endogeneity in a more sophisticated manner.

The BOS 2008 dataset was merged with the Linked Employer-Employee Database (LEED) and Business Activity Indicator (BAI) data to obtain measures of the number of employees, labour productivity and relative wages for each firm. LEED contains the primary source of employment and is constructed by Statistics NZ from Inland Revenue Department (IRD) tax data, notably pay-as-you-earn (PAYE) returns for employees. The BAI dataset consists of GST, sales, and purchases and is collected on a monthly, bi-monthly or 6-monthly basis by IRD, depending on firm size.

The 2008 BOS contains 5,543 establishments of which 5,472 establishments can be matched to the LEED and BAI datasets.

3 DETERMINANTS OF PARTICIPATION OF FIRMS IN TRAINING

3.1 Econometric model

Incidence of training

The main objective of this paper is to analyse the circumstances under which the training within firms takes place and whether firms are encouraged to train existing staff in response to rising recruitment costs (skills shortages). We use a probit regression model to estimate the probability of the incidence of training (at least one employee received a planned period of training during the last financial year) while controlling for other factors that may explain differences in the incidence of training across firms. The advantage of the model is that the independent effects of a set of variables can be analysed holding the effects of other hypothesised correlates constant (Tan, Savchenko, Gimpelson, Kapelyushnikov, and Lukyanova, 2007). The model is estimated using the establishment-based weights to provide results that are representative of all New Zealand businesses.

Consider the following model:

$T_{si}^{*} = \beta_{si} X_i + \mu_{si}$ (1)

$T_{si} = 1$ if $T_{si}^{*} > 0$; $T_{si} = 0$ otherwise (2)

T_{si}^{*} is the unobserved net benefit (latent variable) to the employer providing training *s*. The establishment offers training ($T_{si}^{*} = 1$) if the benefit of training is positive. If the benefit of training is not positive, the establishments will not support training. A set of *X* variables represent the independent variables and both dichotomous and continuous variables. As independent variables, we identify two sets of regressors: controls and explanatory variables of organisational change that underlie the training decision of firms, as suggested by the economic literature. We include industry dummies to control for differences in the incidence in training across industries (for example, some industries may have a history of training through the use of apprenticeship schemes). Firms are grouped into 16 industry categories using the ANZSIC96 classification system at the one-digit level.

Intensity of training

After focusing on the probability of an establishment providing training, we next analyse training intensity (percentage of staff trained). BOS 2008 has provided unique information on the proportion of training for three types of employees: new staff, existing staff changing roles, and existing staff for their existing roles. Questions were asked whether the establishments provide training 'less than half', 'half or more', 'all', or 'no staff of this type' for all three types of employees. Training intensity is a latent variable that is not directly observable. We only observe the responses to the questions above on training intensity. We utilised the information to classify the training intensity into two categories: none or less than half (assigning a value of 0) and half or more trained (assigning a value of 1). A separate probit regression model was used for each employee type.

3.2 Training

The BOS 2008 collected information on whether a firm had done any training of staff (training incidence) and the proportion of staff changed for three different types of employees (training intensity).

The 2008 BOS Business Strategy and Skills module (C) defines training as 'any *planned* periods of training, instruction or practical experience, whether on site or off site, for which the primary purpose is improving the skills or knowledge of staff' and asks respondents to include all employees, managers, and working proprietors, but to exclude contractors. There are three questions related to training within the firm included in 2008 BOS Module C. The first question (24) asks: 'During the last financial year, have the staff of this business received training of any type?' The respondent can select 'yes' or 'no'. If a respondent selects 'yes', they are asked two further training questions. Question 25 asks respondents to select the proportion of staff (less than half, half or more, all, no staff of this type) that participated in training across three types of staff: new staff, existing staff changing roles, and existing staff for their existing roles.[1] Firms that selected 'less than half' in question 25 will contain firms that trained no staff of that type as well as firms that trained between 1 percent and 50 percent of staff.

Table 1: Training patterns within firms

	All firms	Training firms
Training incidence	81.7%	100%
Training intensity		
• Tr. 50% or more of new staff	51.4%	62.8%
• Tr. 50% or more of existing staff changing roles	29.7%	36.3%
• Tr. 50% or more of existing staff in existing roles	40.4%	49.4%
Firms	35,298	28,848

Table 1 displays the proportion of firms that did any training (incidence of training) and training intensity patterns for the study population. Training incidence measures the proportion of firms that did any training (responded 'yes' to question 25). Training intensity measures the proportion of firms that trained half or more of new staff, staff changing roles, and existing staff. The statistics by staff type are only available for firms that responded that they did any training. The first column percentages represent all firms, and the second column just includes firms that did any training.

The majority (81.7 percent) of firms responded that they did some training during the last financial year, with just under a fifth of firms reporting that they did not train any staff. Of the firms that did any training, 62.8 percent trained half or more of new staff, compared with 36.3 percent of staff changing roles and 49.4 percent of existing staff.

[1] The third question (26) asked respondents to identify the skills being acquired as part of the training provided or funded by the business.

3.3 Independent variables

Training is seen as an investment decision in the human capital theory (Becker, 1964). This theory provides guidance in our selection of the independent variables. We grouped the variables into four major categories: skills shortages (recruitment costs), business strategies, structural, and employee characteristics.

Recruitment costs (skills shortages)

The analysis approach is motivated by an investment model for the supply of training (Stevens, 1994) in which the employer's return is given by reduced recruitment costs for skilled workers. The main interest of the study is the effect of an increase in hiring costs that are related to difficulties in recruiting workers with the right skills on the firm's supply of training.

Turcotte, Leonard, and Montmarquette (2002) highlighted that vacant positions could have resulted from frictional or organisational factors. Vacant positions could be the result of the skills of existing employees not matching those required by employers, which may mean establishments are more likely to invest in their existing employees. Alternatively, vacant positions could be as a result of the problems in retaining or recruiting employees. Hence, establishments may support training to attract potential employees and to improve retention of their existing employees.

The proportion of vacancies (vacancy rate) is calculated by dividing the number of vacancies (reported by the firms in the 2008 BOS) over the last financial year by the firm's mean monthly employment (calculated from LEED) over the same period. A firm with a high proportion of vacancies may find it too difficult to train workers, the costs in terms of lost production and the problems in replacing workers being trained being too high. Therefore, the proportion of vacant positions and the square of this proportion is used to capture these effects.

Reporting a vacancy may be a poor proxy for measuring an increase in recruitment costs. For example, firms that regularly recruit new staff (for example, because of seasonal demand) may provide basic training (for example, food hygiene) to all new recruits. Alternatively, if a firm is finding it difficult to recruit the skills it needs, faced with increasing recruitment costs, they may hire a lower-skilled worker and then provide them with training.

The 2008 BOS includes two questions related to difficulties in hiring workers and the reasons why the firm found vacancies hard to fill (HTF), including 'a lack of qualifications and skills the business demands'. Question 16 (Section C: Business Strategy and Skills) asks: 'During the last financial year, was this business easily able to fill all vacancies with suitable applicants?' If the response to question 16 is 'yes', the respondent is asked a follow-up question (question 17): 'Mark all that apply. For which of the following reasons did this business find it hard to fill vacancies?' The respondent is provided with a list of possible reasons that are broadly divided into those associated with the applicant (for example, lack of desired attitude, work experience, or qualifications and skills), the vacancy (for

example, job entails shift work or seasonal work or offers a lack of opportunities to progress a career), insufficient advertising, or a lack of applicants.[2] The empirical analysis includes indicator variables for whether a vacancy was HTF and whether the firm gave 'applicants lack the qualifications or skills the business demands' as a response.

Business strategies

The business strategies included are research and development (R&D) activity, changing the technology a firm uses and introducing new goods, services, process or ways of marketing (innovation), and the nature of the establishments' competition and market.

When a firm decides to innovate and/or use the new technology in their production, the firm is faced with two options: to train their existing employees or hire new employees with the necessary skills. However, if the necessary knowledge is very specific or change is occurring frequently and quickly, it would be more efficient to train existing employees (Turcotte et al., 2002). Recruitment is particularly attractive when an establishment needs to acquire new capabilities. Similarly, establishments that engage in R&D are more likely to train their employees. Thus, we would expect a positive relationship between training and R&D, technological change, and innovation.

We included several dichotomous variables to capture the source of competition (local, national and international) to measure the impact of competition on whether an establishment provides training. The nature of competition on the establishment does not provide unambiguous a priori expectations because establishments that are engaged in highly competitive markets are more likely to train their employees to increase their productivity. In other words, a local market can still be as competitive as a national or international market.

Structural

The structural variables include the size, industry, sales, and unionisation of the workplace.

One would expect that larger firms are more likely to train due to economies of scale (Barron, Black, and Loewenstein, 1989), better access to capital at beneficial rates (Hashimoto, 1979), and a greater capacity to absorb the costs associated with the turnover of trained workers (Holtmann and Idson, 1991). Hence, we adopted the logarithm of the number of employees to capture this effect.

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[2] Question 17 included 12 possible responses (in the order they appear in the 2008 BOS questionnaire): lack of applicants with the desired attitude, motivation or personality; applicants lack the work experience the business demands; applicants lack the qualifications or skills the business demands; low wages compared to other employers within New Zealand; unavailability of non-wage benefits; lack of opportunities for career progression; job entails shift work/unsociable hours; seasonal work; remote location/poor public transport; insufficient advertising of vacancy; not enough applicants; other reasons.

Establishments that have high sales growth have a higher propensity to train their employees due to the greater capacity to absorb the costs of training and to increase the labour productivity in order to retain the market share. Some literature suggests that trade union membership increases the likelihood of receiving training, since trade unions provide a collective voice in demanding training for the workers (Booth, 1991; Green, 1995). Acemoglu and Pischke (1999) found that unionisation reduced the distribution of wages, which might encourage establishments to fund general training due to the increased cost for employees to move to other firms. However, it is also possible that unions are able to negotiate higher wages that may discourage firms from offering further training.

Employee characteristics

We used a number of variables to capture differences between employees across establishments. These include the percentage of employees in high-skilled professions (managers, professionals, and technicians), the proportion of part-time workers, and worker turnover. Even though we are able to control for some worker characteristics within firms, it is still possible that the results could be biased by the omission of other characteristics, which Barnes and Dixon (2010) found was related to the probability of a worker receiving training. While this concern cannot be discounted, a study by Frazis, Gittleman and Joyce (2000) using matched employer-employee data found that the relationship between establishment characteristics and training were not significantly altered by the inclusion of worker characteristics.

A firm's turnover of staff can be linked to training as it may encourage firms to support training in order to increase worker retention and will lead to new employees being hired who may, for a period of time, have higher training needs. However, when turnover reaches a certain level, it may become too expensive for firms to train their employees because they may not get a return on their investment. Turnover is calculated from LEED and divided by total (gross) number of workers who join and leave a firm, over the last financial year, by the mean monthly number of employees over the same period. In order to take into account these effects, we use the turnover rate and the turnover rate squared.

4 RESULTS

4.1 Training incidence

Descriptive statistics

Table 2 provides selected firm and employee characteristics of firms that did (column 2) and did not (column 1) train any staff during the last financial year.

Table 2: Selected firm and employee characteristics of firms that did and did not train any staff over the last financial year

	No training	Training
Vacancy rate	50.4%	82.3%
HTF vacancies	22.2%	52.8%
HTF vacancies (skills related)	12.8%	31.4%
Firm size	13.1	32.7
<20 staff	89.5%	72.9%
20–49 staff	10.8%	19.7%
50–99 staff	1.0%	5.1%
100+ staff	0.6%	4.1%
Research and development	2.9%	7.4%
Firm changed technology	20.3%	37.9%
Firm has introduced new goods/services, process or marketing	38.1%	60.4%
More than 90% employees covered by a union	25.9%	23.0%
Competes locally	6.5%	4.2%
Competes nationally	15.2%	17.6%
Competes internationally	47.7%	51.4%
Agriculture/Forestry/Fishing	14.4%	7.3%
Mining	0.2%	0.3%
Manufacturing	19.4%	14.2%
Utilities (Electricity, Gas, and Water)	0.0%	0.0%
Constructions	7.4%	11.2%
Wholesale trade	10.5%	8.7%
Retail trade	12.7%	15.7%
Hospitality	12.8%	10.6%
Transport/Storage	4.3%	4.3%
Communications	0.4%	0.3%
Business services	0.7%	1.5%
Government services	10.7%	14.8%
Education	0.7%	1.8%
Health	1.8%	6.7%
Recreational services	2.6%	1.7%
Personal services and not further defined	1.3%	0.9%
Firms	6,447	28,848
	(18.3%)	(81.7%)

Firms that did some staff training were more likely to report vacancies, with four out of five firms (82.3 percent) reporting vacancies, compared with around a half (50.4 percent) of firms that did no staff training. A similar finding is found for firms that reported that vacancies were hard to fill (HTF). Conditional on reporting a vacancy, 64.2 percent of training firms report a vacancy being HTF, compared with 44.0 percent of non-training firms.

The same pattern is not evident when HTF vacancies are skills related (when respondents select 'applicants lack the qualifications or skills the business demands' as a reason why the vacancy was HTF). Among training firms, the proportion of firms with an HTF vacancy that was skills related is 31.4 percent, which is 59.5 percent of all training firms with an HTF vacancy. For non-training firms the proportion of firms with a skills related HTF vacancy is 12.8 percent, which is 57.7 percent of all non-training firms with an HTF vacancy.

When the responses to question 17 are examined, it turns out the most common reason for finding a vacancy HTF is related to the applicant, and in most cases, firms provide a mix of the three reasons related to the applicant (lack of applicants with the desired attitude, motivation or personality; applicants lack the work experience the business demands; applicants lack the qualifications or skills the business demands).

Experimenting with different definitions of HTF vacancies (for example, skills related) finds that, while having an HTF vacancy is strongly related to the firm training its staff, the relationship does not appear to be any stronger for firms with skills-related HTF vacancies.

Table 2 also shows that bigger firms are more likely to train their staff and that business strategies are strongly associated with staff training. Innovative firms, firms with R&D, and firms that introduced new technology are more likely to train their staff. Firms that face local competition are less likely to train, whereas firms competing nationally or internationally are more likely to train their staff. Firms were more likely to train their staff in the business, education, and health services, as well as mining, construction, retail, and government services. Finally, an interesting finding suggests that unionised workplaces are less likely to train their staff.

Regression results

A probit regression model was used to examine the relationship between the probability of a firm training staff. Table 3 presents the results from the regression model.

Column 1 includes whether a firm indicated it had HTF vacancies and the proportion of vacancies as a proxy measure for recruitment costs. The model is then extended to control for other factors that may be associated with a firm offering training. In column 2, the model includes employer characteristics, industry dummies are included in column 3, and employee characteristics are included in column 4.

Table 3: Incidence of training regression results

	1	2	3	4
Hard-to-fill vacancy	0.18353	0.14292	0.13588	0.13376
	(0.00391)**	(0.00407)**	(0.00402)**	(0.00402)**
Vacancy rate	0.00342	(0.00086)	(0.00108)	(0.00139)
	(0.00121)**	(0.0012)	(0.00119)	(0.00118)
Vacancy rate squared	-0.00005	0.00001	-0.00001	-0.00001
	(0.00001)**	(0.00001)	(0.00001)	(0.00001)
(ln) Employment		0.07484	0.07341	0.08161
		(0.00396)**	(0.00406)**	(0.00417)**
(ln) Emp 2008 – (ln) Emp 2007		0.02967	0.024	0.02589
		(0.00769)**	(0.00737)**	(0.00744)**
(ln) Sales		0.00387	0.00853	0.00464
		(0.00213)	(0.00237)**	(0.00250)
(ln) Sales 2008 – (ln) Sales 2007		0.03116	0.02947	0.02725
		(0.00605)**	(0.00593)**	(0.00601)**
Research and development		0.04441	0.05782	0.05371
		(0.00769)**	(0.00657)**	(0.00666)**
Firm changed technology		0.07679	0.06928	0.06218
		(0.00438)**	(0.00433)**	(0.00432)**
Firm has introduced new goods/services, process or marketing		0.04082	0.04248	0.04222
		(0.00439)**	(0.00426)**	(0.00422)**
More than 90% employees covered by a union		-0.04705	-0.04508	-0.0421
		(0.00584)**	(0.00575)**	(0.00568)**
Competes nationally		0.04847	0.03539	0.04006
		(0.00766)**	(0.00801)**	(0.00772)**
Competes internationally		0.04893	0.03838	0.04621
		(0.00869)**	(0.00866)**	(0.00861)**
Turnover				0.00353
				(0.01308)
Turnover squared				-0.00476
				(0.00607)
Skilled workers (%)				0.09354
				(0.00978)**
Part-time workers (%)				0.00628
				(0.0091)
Industry dummies			X	X
Observations	35,508	30,867	30,867	30,735

Note: For dichotomous variables, the marginal effect represents a change in the predicted probability that a firm with HTF vacancies is training its staff or when switching from a base group (for example, locally competing firms) to a particular group (for example, nationally competing firms). For continuous variables, it is the effect of a marginal change in the predicted probability for a unit change in an independent variable.

Standard errors in parentheses: * significant at 5%; ** significant at 1%.

The first column shows that a firm that reports an HTF vacancy is 18 percent more likely to offer staff training. Controlling for other factors reduces the size of the coefficient from 18 to 13 percent, but the effect remains statistically significant at the 1 percent level.

The relationship between training incidence and a firm's vacancy rate is in the expected direction in that an increase in the training rate is associated with a high probability of a firm training their staff. The coefficient on the squared vacancy rate is negative, which means the size of the effect diminishes with very large vacancy rates. The interpretation is that, as the proportion of vacancies relative to the number of staff increases, so does the cost of training. For example, it may be difficult (costly) to remove existing staff from the production process. The vacancy rate coefficients are statistically significant in the first model (column 1) but become insignificant when other factors are controlled for.

Large firms are more likely to offer training. As the number of employees at a firm increases, so does the probability that a firm will train staff. The size of the coefficient remains qualitatively similar, as other factors are controlled for, and is statistically significant at the 1 percent level in each of the model specifications presented in Table 3. There is also a dynamic relationship between employee size and training in that training staff is more likely within firms that are growing in terms of employees.

The same story appears true when firm size is measured using the value of their sales; however, the size and statistical significance of the coefficients change depending on the inclusion of other factors. In other words, in general, it appears that firms with a relatively large value of sales are associated with training staff, but the result depends on what factors are controlled for. There does, however, appear to be a fairly robust and statistically significant relationship between growth in the value of sales and the incidence of training.

A firm's business strategy appears to be strongly related to the probability of staff training. Undertaking research and development, changing the firm's production technology, and introducing new goods, services, process or marketing strategies are all associated with an increased probability of training staff. Using the final specification in column 4, undertaking research and development is associated with a 5.4 percent increase in the probability of training staff, compared with 6.2 percent if a firm changes their production technology and 4.2 percent (column 4) if a firm introduces new goods, services, process or marketing strategies.

Heavily unionised workplaces (where 90 percent of more of the staff are a member of a union) are associated with lower probabilities of offering staff training. A unionised workplace is 4.2 percent (column 4) less likely to train staff.

The type of competition faced by a firm appears to be associated with training. Firms that compete nationally or internationally are more likely to train their staff, compared with firms that only face local competition. Interestingly, there is little difference (it is not statistically different from zero) in the increased probability of a firm training staff for firms that compete nationally and internationally.

Nationally competing firms are 4.0 percent more likely to train their staff, and international competitors are 4.6 percent more likely, compared with firms that compete locally (refer to column 4).

The results of the impact of employee characteristics on the probability of staff training are mixed. Employee turnover is positively associated with training, but the relationship is not statistically significant. The coefficient on the turnover squared variable is negative and also not significant. The relationship between staff turnover and training is similar to the effect of vacancy rates. Increased turnover is associated with a higher probability of training, but the effect diminishes at relatively high levels of turnover. The same conclusions can be drawn in firms with high levels of turnover (which means short tenure of employees) where returns to training fall, discouraging firms from offering training. Having a greater share of skilled workers is associated with a higher probability of training staff, whereas the proportion of part-time staff is positively associated with training, but the finding is not statistically significant.

4.2 Training intensity

Descriptive statistics

The subset of firms (81.7 percent) that did some training has been selected to investigate the types of firms that train most of their staff. For each employee type, firms that reported having no employees of that type have been removed, which results in three different-sized overlapping populations. Statistics for firms with existing staff changing roles has been removed to aid presentation. (As we will discuss below, the results are very similar across the three different employee types.)

In Table 4, for each employee type, firms have been divided into those training less than half of the staff in the last financial year and those training over half.

Table 4: Selected firm and employee characteristics by training intensity and type of employees who receive training

	New staff		Existing staff	
	<50%	>=50%	<50%	>=50%
Vacancy	91.6%	90.6%	85.7%	83.8%
HTF	57.8%	57.5%	52.0%	55.3%
HTF (skills)	34.0%	34.9%	31.4%	34.0%
Firm size	32.6	41.0	45.7	34.7
<20 staff	68.5%	67.0%	63.1%	71.7%
20-49 staff	23.8%	22.7%	24.5%	20.7%
50-99 staff	6.2%	6.7%	8.0%	5.5%
100+ staff	4.2%	5.7%	6.6%	4.4%
Innovate	37.0%	41.6%	37.8%	40.3%
R&D	6.8%	8.2%	9.9%	7.6%
Firm has introduced new goods/services, process or marketing	51.5%	65.4%	58.7%	65.2%
More than 90% employees covered by a union	26.6%	22.9%	23.4%	22.2%
Competes locally	2.4%	4.8%	3.2%	4.7%
Competes nationally	17.9%	17.7%	18.4%	17.2%
Competes internationally	49.6%	52.6%	52.5%	51.0%
Agriculture/Forestry/Fishing	6.0%	7.6%	6.9%	6.8%
Mining	0.2%	0.3%	0.3%	0.3%
Manufacturing	22.6%	13.6%	22.3%	10.7%
Utilities (Electricity, Gas and Water)	0.0%	0.0%	0.1%	0.0%
Constructions	14.0%	10.0%	13.2%	10.2%
Wholesale trade	11.2%	8.2%	11.6%	7.3%
Retail trade	9.1%	16.5%	13.0%	16.6%
Hospitality	15.1%	11.5%	10.0%	10.6%
Transport/Storage	1.2%	4.8%	3.7%	4.6%
Communications	0.1%	0.3%	0.2%	0.2%
Business services	1.2%	1.5%	1.2%	1.9%
Government services	13.4%	13.7%	11.1%	16.0%
Education	2.0%	1.9%	1.2%	2.4%
Health	1.4%	7.1%	2.6%	9.5%
Recreational services	1.6%	1.8%	1.6%	1.8%
Personal services and not further defined	0.7%	0.9%	0.8%	0.9%
Firms	2,418	18,132	7,332	14,265

Table 4 shows that there is little difference in the characteristics of firms that train less than or more than half of their staff. The most distinctive pattern is that firms with fewer employees tend to train a greater proportion of staff compared with larger firms. This finding is consistent with overseas studies (for example, see Turcotte et al., 2002) and probably reflects different training costs faced by small and large firms.

It may be more efficient for a small firm, once a decision to train has been made, to train all staff immediately or within a short period (they may face high costs for removing a member of staff from the production line so may choose to stop

production and to train all staff at once, or roles within small firms maybe similar and a firm can run a single training programme for all staff).

For larger firms there is likely to be more specialisation and the need to roll out a number of different training programmes, which may take more than 12 months to complete and means that, within a single year, a larger firm never trains its entire staff in one go.

Differences across industries may simply reflect differences in firm size distributions. For example, manufacturing firms are under-represented among firms that train more than 50 percent of their staff, whereas retail firms are over-represented. Manufacturing firms tend to be larger than retail firms.

The other interesting finding is that the proportion of firms training more than half of their staff is similar between the different employee groups (including existing staff changing roles that have been excluded from Table 4).

Regression results

The training intensity regression models, presented in Table 5, use the same set of controls as the final specification (column 4) in Table 4, which include employer and employee characteristics and industry dummies.

Table 5 presents the regression results on the estimated probability of a firm training half or more of new staff (column 1), existing staff changing roles (column 2), and existing staff in existing roles (column 3).

Table 5: Intensity of training regression results

	Trained 50% of new staff	Trained 50% of staff changing roles	Trained 50% of existing staff
Hard-to-fill vacancy	0.00798	0.03036	0.08328
	(0.00427	(0.00764)**	(0.00641)**
Vacancy rate	-0.00805	0.0356	-0.01065
	(0.00112)**	(0.00894)**	(0.00443)*
Vacancy rate squared	0.00009	-0.00019	0.00098
	(0.00002)**	(0.00056)	(0.00022)**
(ln) Employment	0.00943	-0.018	-0.0489
	(0.00393)*	(0.00658)**	(0.00570)**
(ln) Emp 2008 – (ln) Emp 2007	0.04219	-0.01459	0.04587
	(0.00865)**	(0.01371)	(0.01273)**
(ln) Sales	-0.0078	0.02315	0.01259
	(0.00281)**	(0.00496)**	(0.00398)**
(ln) Sales 2008 – (ln) Sales 2007	-0.00283	-0.02308	-0.00573
	(0.00622)	(0.01097)*	(0.00879)
Research and development	0.024	-0.03792	-0.07175
	(0.00706)**	(0.01454)**	(0.01250)**
Firm changed technology	0.04615	0.03445	0.01914
	(0.00498)**	(0.00866)**	(0.00694)**
Firm has introduced new goods/services, process or marketing	0.01271	0.02472	0.04581
	(0.00445)**	(0.00792)**	(0.00666)**
>90% employees covered by union	-0.01046	-0.05114	0.00468
	(0.00593)	(0.01039)**	(0.00855)
National competition	-0.12876	-0.14986	-0.04804
	(0.02114)**	(0.02838)**	(0.01792)**
International competition	-0.09032	-0.17836	-0.04788
	(0.01279)**	(0.02459)**	(0.01604)**
Turnover	0.00094	0.23323	-0.03234
	(0.01997)	(0.04202)**	(0.02696)
Turnover squared	0.01412	-0.22415	0.01776
	(0.01389)	(0.03326)**	(0.01693)
Skilled workers (%)	0.04277	0.08082	0.15756
	(0.01076)**	(0.01893)**	(0.01565)**
Part-time workers (%)	0.04884	0.0086	0.02733
	(0.01086)**	(0.01849)	(0.01584)
Industry dummies		X	X
Observations	22,524	15,600	23,853

Note: For dichotomous variables, the marginal effect represents a change in the predicted probability that a firm with HTF vacancies is training its staff or when switching from a base group (for example, locally competing firms) to a particular group (for example, nationally competing firms). For continuous variables, it is the effect of a marginal change in the predicted probability for a unit change in an independent variable.

Standard errors in parentheses: * significant at 5%; ** significant at 1%.

The descriptive statistics presented in Table 4 suggested that, among firms that trained their staff, there is less variation in proportions of staff trained across different firm outcomes. For example, firms that reported having HTF vacancies were 13 percent more likely to train their staff, whereas the predicted probability of training more staff (intensity of training) when reporting HTF vacancies is between 0.8 percent and 8 percent depending on whether they are new staff (0.8 percent), existing staff changing roles (3.0 percent), or existing staff in existing roles (8.3 percent).

You might expect the proportion of new staff that receive training to rise if a firm, when faced with difficulties in recruiting skilled workers, switches to hiring unskilled workers and then training them up to skilled positions (for example, using an apprenticeship scheme). An alternative strategy would be to train existing unskilled staff into skilled workers. The approach taken by firms may depend on the amount of training required and the suitability of the existing staff to be trained.

The results in Table 4 suggest that, when a firm is faced with difficulties in hiring workers, it responds by increasing the proportion of existing workers that receive training. Firms that report HTF vacancies are 3.0 percent more likely to train more than half of their existing staff changing roles and 8.3 percent more likely to train more than half of existing staff in their existing roles. Both these estimates are statistically significant, and the difference between the estimated probabilities is statistically significant from zero. Therefore, this could be interpreted that firms are more likely to adjust the training levels of existing staff in their existing roles than among staff changing roles. The presence of HTF vacancies is associated with an increased probability of training half or more of new staff, but the effect is relatively small (0.8 percent) and statistically insignificant.

The descriptive finding (Table 4) that smaller firms are more likely to train 50 percent or more of existing staff is confirmed in the regression model for staff changing roles and existing staff (-2 percent and -5 percent respectively). Interestingly, firms with more employees are associated with a higher probability of training new staff. The effect is relatively small (1 percent) but could be related to larger firms having more formal induction policies that include training.

Firms that make changes to their production processes (introduce new technologies) and introduce new goods and services have a higher predicted probability of training 50 percent or more across all three groups of staff. Again, the effects are relatively small and vary between 1 and 5 percent. Table 4 suggests that firms that compete nationally and internationally are more likely to train 50 percent or more of their staff. However, once other factors are controlled for in the regression analysis, national and international firms are less likely to train 50 percent of their staff.

There is a consistent and relatively large finding that firms with a relatively high proportion of skilled staff are more likely to train 50 percent or more of staff. The effect ranges from 4 percent for new staff, 8 percent for staff changing roles, and 16 percent for existing staff.

5 DISCUSSION

The findings of this study suggest that firms that experience difficulties in hiring workers are more likely to train their staff and that they respond by increasing the proportion of existing staff being trained, instead of training new recruits into skilled positions. However, the findings cannot help answer whether this relationship reflects a response by firms to make the skills they need (train new or existing workers) when faced with difficulties (increased costs of recruitment) in trying to buy the skills in the labour market or whether HTF vacancies and training are simply associated with a particular business strategy. For example, it could be argued that firms that are continuously developing new products and services and are quick to adopt new technologies will continuously be upgrading the skills of their employees and also face difficulties in finding the right skills in the labour market.

The results from the training intensity regression models show that firms with HTF vacancies are more likely to train half or more of existing staff (either in their existing roles or when they move into new roles) but not for new staff. One possible interpretation is that firms are training staff in order to move them into positions they are finding HTF as opposed to hiring lesser skilled applicants and training them up (for example, apprenticeships).

The other findings suggest that firms with business strategies that involve changing their products and services and introducing new production process are not only more likely to train their staff but to train a relatively large proportion of them. Other results are consistent with findings in other studies. For example, larger firms are more likely to train, but small firms are more likely to train more of their staff.

6 NOTES

The opinions, findings, recommendations. and conclusions expressed in this paper are those of the author(s). Statistics New Zealand, the Ministry of Economic Development, the National Institute of Economic and Social Research, and the Department of Labour take no responsibility for any omissions or errors in the information contained here.

Access to the data used in this study was provided by Statistics New Zealand in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular, business, or organisation. The results in this paper have been confidentialised to protect individual businesses from identification. The results are based in part on tax data supplied by Inland Revenue to Statistics New Zealand under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information is published or disclosed in any other form or provided back to Inland Revenue for administrative or regulatory purposes. Any person who had access to the unit-record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to privacy and confidentiality. Any discussion of data limitations or weaknesses is not related to the data's ability to support Inland Revenue's core operational requirements.

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