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EXECUTIVE SUMMARY

1. While the better educated are more likely to participate in training, overall results on the estimation of the determinants of training outcomes indicate that relatively low paid workers are the ones that benefit most from training. Also, workers who have worked on the job for 1 to 10 years are likely to have the most successful training. Age, education, or gender matters in a few training outcomes including feeling employable, getting a new job and refreshing knowledge and skills.
2. The following are key results derived from our empirical model on the impact of training due to different socio-demographic and employment related characteristics:

Training Participation

- Well educated individuals and those with higher earnings are much more likely to participate in training programs than others.
- Age has a small positive impact on training participation for workers who are under 37 years old. However, the effect becomes negative for older workers. This might be due to employers having less incentive to send their senior workers for training, either due to the higher opportunity cost or the narrower time horizon of reaping the benefits out of the training program. The results are however not statistically significant.
- Occupational affiliations of the workers have a significant impact on their training participation as well. Broadly, production & related workers are most likely to engage in training. Compared to them, “working proprietors” and “managers and administrators” are less likely to participate in any type of training. This is due to the fact that both the direct and opportunity costs of training are very high for these workers.
- Employers (with employees) are less likely to participate than employees and self-employed workers (without any employees).
- Females are more likely to participate in training programs, but the difference between males and females is not statistically significant even at the 10% level.
- Married workers seem to be less likely to participate in training programs, but the difference between married and single is only significant at the 10% level.

Training Outcomes

- Broadly, most respondents provided positive responses to training outcomes. The two most common outcomes cited were that training helped them do their jobs better and refreshed their knowledge and skills. Specifically, we find that workers with relatively low earnings and have worked for 5 to 10 years (older workers) are more likely to view that training helps them in doing their current

job better. This set of workers is the best candidates to be sent for training so that they can do their current job better.

- Those with higher education tend to feel more employable in other jobs after training. However, beyond 14 years in education (or roughly upper secondary level), the relationship becomes negative. Similarly, workers with low earnings are more likely to feel that training makes them more employable in other jobs. Workers in occupational groups such as labourers, cleaners, and other manual workers are most likely to feel employable in other jobs after training. Temporary and part-time workers also think likewise. However, findings for this outcome must be approached with caution as much will depend on the objectives of training.
- Lower paid workers are more likely to experience a pay rise or promotion after training, similar to workers who have worked on the job for 1 to 10 years. By occupation, workers who are engaged as managers & administrators, professionals, or associate professionals and technicians are least likely experience a pay rise or promotion after undergoing training. This could be due to the fact that they are already earning a relatively high income.
- Men are more likely to get a new job after going for training than women. This is similarly the case for temporary and part-time workers compared to full-time permanent workers. But workers with higher income are less likely to get a new job after training. Again, results for this outcome have to be approached with caution as the outcome may reflect their job search activity and the prevailing labour market conditions.
- Younger (below mid-30s) and higher educated workers are more likely to feel that training helps them refresh knowledge and skills. Workers in public administration and defence, health and social works and other community, social and personal service sectors are most likely to feel that training helps them refresh their knowledge and skills as these industries are the ones that require frequent updating of knowledge and retraining.
- Age has negative effects on a trainee's decision to participate in further training. That is, older trainees are less encouraged to do further training than younger ones. However, the effect of age and other personal characteristics on this outcome is found to be statistically insignificant.

1. INTRODUCTION

- 1.1 Accumulation of human capital is very crucial for sustaining long-term growth of the economy. Human capital, generally defined as formal schooling and job training, contributes to economic growth through its impact on productivity of workers and firms, and also in complementing the implementation of new technologies (Bartel and Lichtenberg, 1987). There are numerous empirical studies that highlight the positive impacts of education and training on innovation and productivity growth in an economy with rapidly changing industrial structure. The ability to absorb and disseminate new knowledge is most important, as this enables workers to increase their human capital and earn higher incomes (Welch, 1970; Mincer, 1989, Lillard and Tan, 1992; Foster and Rosenzweig, 1996).
- 1.2 As opposed to general education, training has an added advantage to firms and workers. The firms have the autonomy to decide on the type of skills needed to upgrade their workers. However, in some OECD countries such as Portugal, participation in training is very low as there is little incentive for employers and employees to participate in training. In addition, the current evidence suggests that participation in training is mostly concentrated on more educated and well informed workers, as opposed to more disadvantaged low skilled and older workers (OECD, 2000). There are several important economic implications from the above such as the widening of wage inequality between the skilled and unskilled and the ability of low skilled workers to sustain their employment in a rapidly changing economic structure. There could also be other impacts such as falling firm-level productivity, labour mobility and the lack of incentive to implement new technologies in the economy.
- 1.3 The confluence of an ageing workforce, declining job stability and continuing industry demands for a more flexible workforce has resulted in considerable emphasis on the importance of training workers already in the workforce. The growth of knowledge and technology has meant that much of what adults learnt in the last 5 years is now obsolete or at least modified¹. These workers require training and education to achieve and maintain success in their career fields.
- 1.4 A natural question that arises is whether training benefits the workers, both for the employed and unemployed. For the employed, the benefits are manifested as pay rises and greater chances for promotions; while for the unemployed, the most obvious benefit is the ability to be re-employed.

¹ MacDonald (C) (2001) – A review of Continuing Professional Education. *The Journal of Continuing Higher Education* 49: 29-40

- 1.5 The study, which examines the impact of training on the Singapore labour market, focuses on two main hypotheses. First, does structured training actually benefit those who have undergone training? Second, what factors affect workers' participation in structured training programs? The paper also provides policy discussions on the government policies that actively encourage workers to go for training.
- 1.6 The paper examines the factors affecting participation of workers in structured training programmes in the Singapore labour market. Further, the paper studies the impact of structured training on workers in the labour market. The paper uses micro level data from the 2004 Labour Force Survey² to examine the participation and the impact of training on workers. Finally, the paper discusses some policy implications for the Singapore economy.

2. Training and the Singapore Economy: Key Trends

- 2.1 As the Singapore transits to a knowledge-based economy, the role of the human capital will become crucial for the creation and diffusion of knowledge in the economy. Currently, the economic structure of the Singapore economy is moving towards higher value-added activities, where the demand for skilled workers to drive production is constantly rising. This constant increase in demand for skilled workers will create a “skills gap” in the economy, where the demand for skilled workers outstrips the supply of skilled workers in the economy.
- 2.2 On the back of improved economic conditions, training participation among the resident workforce rose in the 12-month period ending June 2005, reversing two consecutive years of decline. 27% of residents aged 15 to 64 in the labour force were involved in some form of job-related structured training or education³, which was higher than 25% in 2004. However, this is still lower than the peak of 34% recorded in 2002 since the series started in 2000.
- 2.3 Age continued to have a negative impact on participation in training, which suggests that older workers are less likely to participate in training. Similarly, the higher the education, the more likely a person is to participate in adult training.

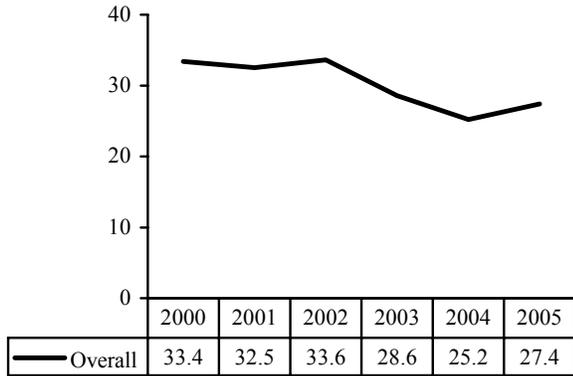
² The micro-level data used for the study were accessed only by Manpower Research & Statistics Department officers who collaborated in the study. While the statistical analysis of key trends pertain to (updated) 2005 data, the estimation results are run using 2004 data (as 2005 data was only available when the model was completed).

³ Job-related structured training or education refers to training that is related to a current or future job. It includes classroom training, private lessons, correspondence courses, workshops, seminars, structured on-the-job and apprenticeship training but excludes informal on-the-job training.

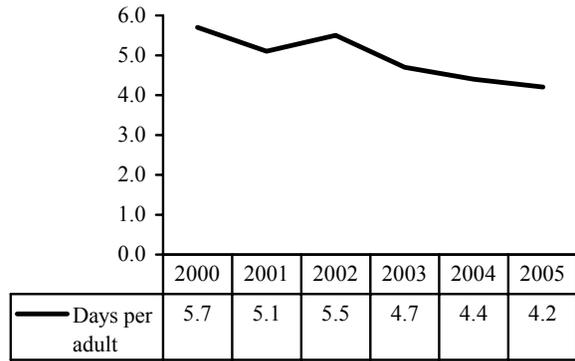
Chart 1: Training Indicators (Participation & Intensity)

Overall

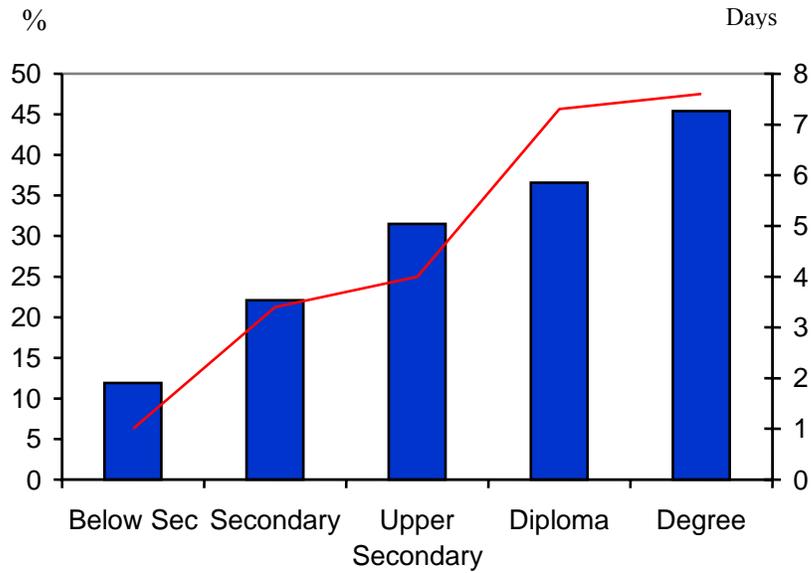
Training Participation (%)



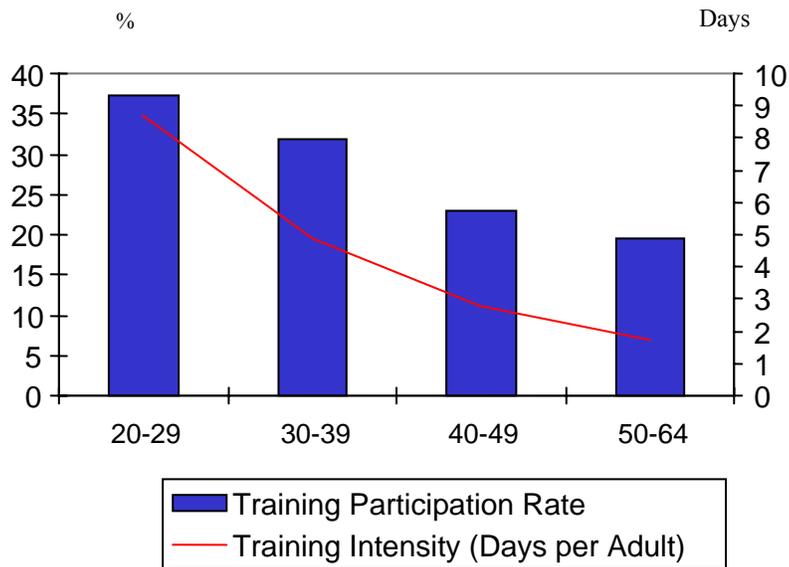
Training Intensity (Mean)



By Education (2005)



By Age (2005)



Source: Ministry of Manpower, Adult Training, 2005

2.4 Determinants of training participation

- 2.4.1 We can classify the determinants of training participants into two main groups – socio-demographic and employment-related.
- 2.4.2 Renaud, Lakhdari and Morin (2004) examine the determinants of using data from a large Canadian service sector and identified seven attributes, namely age, gender, education level, family responsibilities, tenure, hierarchal position and employment status. The first four attributes belong to the socio-demographic group, while the last three are employment related. Of the four socio-demographic attributes, three – age, gender and level of education – are found to be significant determinants and their likelihood of training participation decreases with age. Older workers are less motivated to learn than younger workers. This finding is also found to be stable for mandatory training (e.g. Maurer, Weiss and Barbeite, 2003).
- 2.4.3 Females are more likely to participate in training than males. This is opposite of what have been observed by Green (1993) for participation in mandatory training. One plausible explanation is that the results could be distorted by the fact that the sample is predominantly female.
- 2.4.4 In terms of employment characteristics, occupational position and tenure are the two key variables found to be significant determinants on training participation. Employees holding high positions, and those who have longer tenure are more likely to participate in non-mandatory training. This is in line with Tharenou's

(1997) findings that workers in highly skilled occupations were more likely to participate in training.

3. METHODOLOGICAL FRAMEWROK

- 3.1 Data used in for the model are extracted from the labour force survey supplement on training for 2004. The survey covered some 2,400 individuals and attained a response rate of 98%. The data contain detailed information on individual specific, job specific and family background characteristics. By analyzing the impacts of these characteristics on training participation, it would be possible to design efficient policies that are aimed to promote the training participation of a particular type of workers. We first analyze individuals' training participation decisions. The probability of participating in training programs is modelled as

$$\Pr(PA_i = 1) = \Phi(\alpha + \beta_1 X_i + \beta_2 Z_i + \beta_3 Q_i)$$

where $PA_i = 1$ if person i participated in a training program and 0 otherwise, X_i is a vector of personal characteristics including years in education and its squared, age and its squared, gender, citizenship, race, marital status, Z_i is a vector of family background, such as the number of children in the household, family income, Q_i is a vector of job related characteristics such as own labour income, industry, and occupation.

- 3.2 The selection of independent variables is based mainly on the presumption that individuals with higher expected benefits or lower expected costs are more likely to participate in training programs than others. Thus the total costs of training can be roughly decomposed into two parts: the direct training costs and the opportunity costs. Because most training programs are subsidized by either government or employers, the direct costs borne by trainees depend largely on government and firms' training policies. Given the Singapore government's policy of promoting knowledge-based economy and upgrading the skills of the existing work force, government subsidies are likely to be linked with age, race, gender, and education level. These variables should be included in the model. For example - if government wants to encourage older workers to participate in training programs, its policies might be in the favour of older workers, and thus we should expect age to have a positive effect on training. To capture the potential nonlinearity of the impact of age and education, we also include their squared terms in the regression. If workers have to share part of the training cost, then their willingness to pay for training programs would also affect their participation.
- 3.3 Family incomes can be considered the key factor that affects individuals' willingness to pay and hence we include the log of family incomes in the model. The reason of using the log rather than the level is to capture the potential

nonlinearity between incomes and training participation. As firms in different industries might value training differently, their attitudes toward training are likely to differ. Consequently, we include industry dummies in the regression to capture industrial variation in the data. The benefit derived from a training program is also likely to depend on the trainee’s job description, which is partially captured by the occupation dummies in the regression.

- 3.4 The opportunity cost of training mainly consists of forgone production to the firm if the training is conducted during working time and reduction in leisure if the training is conducted outside working time. If training is conducted during working time, the opportunity cost will be higher for skilled than for unskilled workers. In this case, firms are only willing to send their skilled workers to training programs if the expected returns to training are also higher for skilled workers. If training is conducted outside working time, trainees either have to reduce their consumption of leisure or reduce the time spend on home production. Because females normally play a more important role at home, the opportunity costs are likely to be higher for married females, particularly for females with young children. Therefore, the study controls for the marital status of the workers in the model.
- 3.5 The impacts of training are measured by the following categories of qualitative variables: you can do your current job better; feel employable in other jobs; get a pay rise/promotion, get a new job, refreshed knowledge and skills, encouraged to do further training; no use/unsatisfied with training. Because our data are extracted from a survey on individuals, we can only examine the qualitative impact of training based on the view points of the trainees. Moreover, as the outcomes information such as promotion or salary increase is only collected for trainees, we will focus our discussions on the impact on those who were trained, which is normally called “the treatment effect on treated” in the training evaluation literature. If the training participation is not randomly selected, then the results cannot be generalized to the entire population. However, it does answer a policy relevant question, whether the current trainees benefited from the existing programs and help us to understand why some people are more willing than others to participate in training programs, Moreover, if we expect the future training to be comparable to the current trainees, then our estimation results will also help us to predict who are more likely to benefit from future trainings.^[1]
- 3.6 As the information on the impact of training is also collected as a category variable – qualitative variable, we also used a probit model to analyze the impact of various factors on training outcome.

$$\Pr(PA_i = 1) = \Phi(\alpha + \beta_1 X_i + \beta_2 Z_i + \beta_3 Q_i)$$

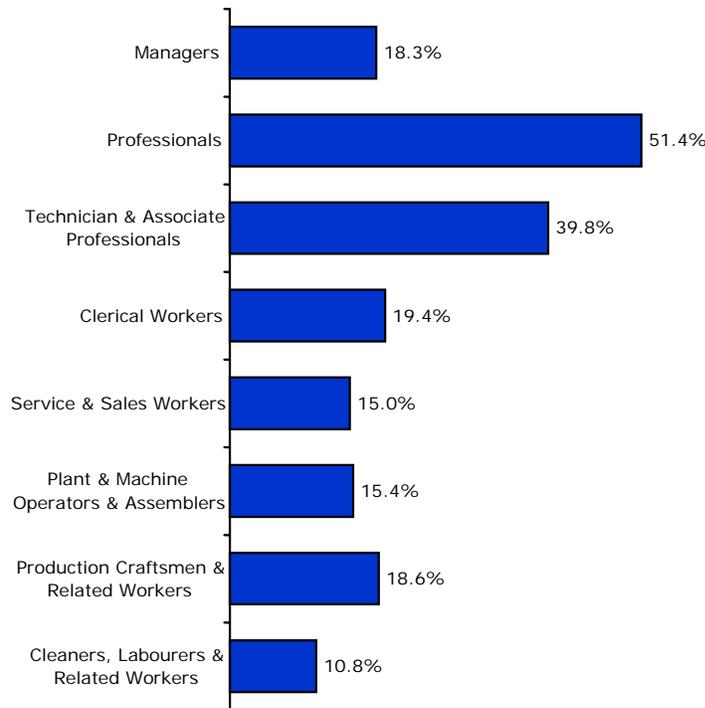
where $PA_i = 1$ if positive response to the question on outcome of training and 0 otherwise, X_i is a vector of personal characteristics including education and its squared, age and its squared, gender, citizenship, race, marital status, Z_i is a vector of family background, such as the number of children in the household, family income, Q_i is a vector of job related characteristics, such as own labour income, industry, and occupation.

4. EMPIRICAL RESULTS: KEY FINDINGS

4.1 Factors that affect a worker's participation of training programs

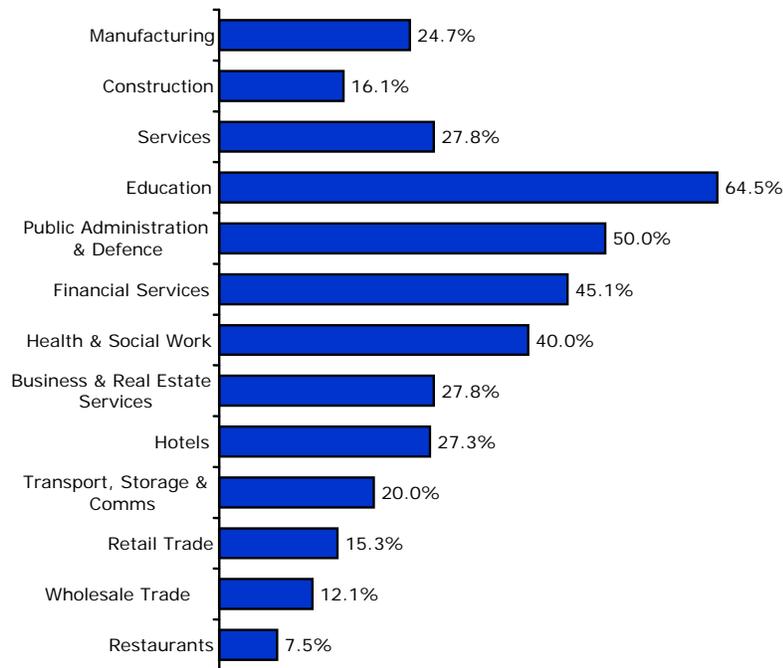
4.1.1 As we discussed in Section 3, other than social-demographic characteristics e.g. gender and education, job specific characteristics might also affect a person's participation decision. Looking solely at statistical trends, [Chart 2](#) shows that there are considerable variations in the participation rate across occupations. Professional workers have the highest rate while cleaners and labours have the lowest. Since professional workers are better educated and earning higher salaries than other workers, the relationship revealed by Chart 7 might be driven by other job related characteristics that are correlated with a worker's occupation.

Chart 2: Training participation rate by occupation, 2005



4.1.2 Similarly, [Chart 3](#) reports the training participation rates by industry. The figure shows that the cross industry variations in training participation rates are even greater than those of the cross occupation variations. Workers in “Electricity, Gas and Water” and “Education” have the highest training participation rate. The high participation rate of the latter group is largely due to the prevalence of the teaching development program at almost all schools. Because all schools allocate a few days per year for teachers’ development, it is not surprising that teachers have a higher training participation rate. The high capital labour ratio is likely to be responsible for the high training participation rate in the utility industry. A high capital labour ratio implies a lower ratio of labours costs to total costs. Consequently, training costs only contribute to a small fraction of total production costs as well. Hence, firms in the utility industry are not very sensitive to training costs. At the other end of the spectrum, workers in the “Hotel and Restaurants” have the lowest participation rate with a value of 10%.⁴

Chart 3: Training participation rate by industry, 2005



Key findings from Estimation

4.1.3 Broadly, the key results from our estimation models ([Table 1](#)) confirm the following:

⁴ Due to the small size of the “fishery” and “domestic work activities”, their participation rates in training programs are not discussed.

- ***Education is one of the most important determinants on training participation, with the better educated much more likely to participate in training compared to their less educated counterparts.*** Although the impact of an additional year of education on participation decreases, it did not become negative even at the highest education level.
- ***There is a positive relationship between earnings and training participation. However, due to limited information on costs borne by the trainees, it is difficult to pin down whether this positive relationship is due to the differences in the ability to pay or differences in incentive to participate.*** Notwithstanding this, as our later analysis does not show that training significantly increases workers' wage, we can conclude that the causality has to go from income to participation rather than the other way around.
-
- ***Age has a small positive impact on training participation for workers who are under 37 years old. Its effect becomes negative for older workers.*** We suggest that this is because employers have less incentive to send their senior workers for training either due to the higher opportunity cost or the narrower time horizon of reaping the benefits out of the training program.
- ***Production & related workers were most likely to participate in training. At the other end, "Working proprietors" and "managers & administrators" are least likely to participate in any type of trainings.*** This is due to the fact that both the direct and opportunity costs of training are very high for those workers. According to the MOM (2005), the average training cost for "professionals, managers, executives and technicians" is \$958 while the corresponding value is only \$180 for "production, cleaning and related workers". The higher opportunity costs are the results of their higher responsibility in their jobs in terms of planning and supervising. Thus their absence from work affects not only their own production, but also the production of workers who are under their supervision. From the supply side, given the small training market size for these workers, training programs that are targeted to them are limited, which also reduces their probability of participating.
- ***The next two occupations with lowest participation rates (relative to production & related workers) are "clerical workers" and "service workers, and shop and market sales workers".*** The lower participation rate reflects the fact that it is more efficient to acquire skills via learning-by-doing rather than through some types of formal trainings for workers in these two occupations. The negative coefficients on "Plant & Machine Operators & Assemblers" dummy and on "Cleaners, Labourers & relative workers" dummy also suggest that workers of these two occupations are less likely to be trained than the reference group.

However, since the differences are not significant at the 10% level, it is difficult to draw a definite conclusion from Table 3.

- ***Females are more likely to participate in training programs, but the gender difference is not statistically significant.*** The coefficient on the interaction term between matured women (at least 25 years old) and the number of children is negative but insignificant, thereby suggesting that married women with children might be less likely to participate in training programs than others. This is because the time cost of training for married women with children is higher if the training is conducted outside working hours. Therefore, they have a weaker incentive to participate in those types of training programs.
- ***Married workers seem to be less likely to participate in training programs.*** If we can link the marital status with number of younger children, the coefficients could be even larger. This is largely due to their higher opportunity cost. In contrast, the widowed and divorced/separated are more likely than singles to take part in training. Because these individuals are likely to be the sole earners of their families, they have a stronger motivation to upgrade their skills to avoid being laid off or to increase their chances of being promoted.
- ***Employees are most likely to participate in training, followed by self-employed (without employees) and employers. However, the difference self-employed without any employees and those with employees is not statistically significant.*** The lower participation rate of employers suggests that supervising employees reduces an individual's participation rate.
- ***Although working hours has no significant effect on training participation, temporary workers are less likely to participate in training program.*** This indicates that employers are more willing to subsidize their long term employees. Tenure does not affect the probability of participation either.

Table 1: Estimated effects of personal and job characteristics on training participation

Variable	Personal and labour market characteristics (N=1598)	
	Coefficient	Standard error
Age	0.0074	0.0316
Age ²	-0.0001	0.0004
Female	0.1549	0.0949
Marital status (Reference group: Single)		

Married	-0.1026	0.1064
Divorced/Widowed	0.5314**	0.2096
Education	0.3287**	0.1096
Education ²	-0.0111**	0.0043
No education	1.6275**	0.6514
Married female*number of kids under age 15	-0.0491	0.0697
Occupation (Reference group: Production craftsmen and related workers)		
1. Managers & administrators	-0.6262**	0.2347
2. Professionals	-0.0214	0.2201
3. Associate professionals & technicians	-0.1928	0.2002
4. Clerical workers	-0.5909**	0.2063
5. Service workers and shop and market sales workers	-0.3297	0.2203
8. Plant & machine operators & assemblers	-0.0932	0.2064
9. Cleaners, labourers & related workers	-0.3293	0.2617
13. Working proprietors	-0.5824*	0.3454
Industry dummies (Reference group: Manufacturing)		
5. Electricity, gas and water	1.2545**	0.4987
6. Construction	-0.0581	0.1960
7. Wholesale & Retail Trade	-0.2602*	0.1400
8. Hotels & Restaurants	-0.1394	0.2275
9. Transport, Storage & Communications	0.0096	0.1402
10. Financial Intermediation	0.3892**	0.1632
11. Real Estate, Renting & Business Activities	-0.0077	0.1330
12. Public Administration & Defence	0.6737**	0.1805
13. Education	0.7397**	0.1867
14. Health & Social Work	0.3537*	0.1845
15. Other Community, social & personal service activities	0.0685	0.2092
Employees	0.5419**	0.2714
Self-employed without employees	0.4369	0.2905
Log earnings	0.2260**	0.0819
Full-time/part-time dummies (Reference group: Full-time permanent worker)		
2. Full-time temporary worker	-0.4840**	0.2111
3. Part-time permanent worker	0.2206	0.3326
Weekly working hours	-0.0054	0.0041
Tenure in present job dummies (Reference group: Less than 6 months)		
2. 6 months to 1 year	-0.0608	0.1873
3. 1 year to less than 5 years	0.1127	0.1381
4. 5 years to less than 10 years	0.1639	0.1572
5. 10 years to less than 20 years	0.0168	0.1660
6. 20 years or more	-0.1772	0.1876

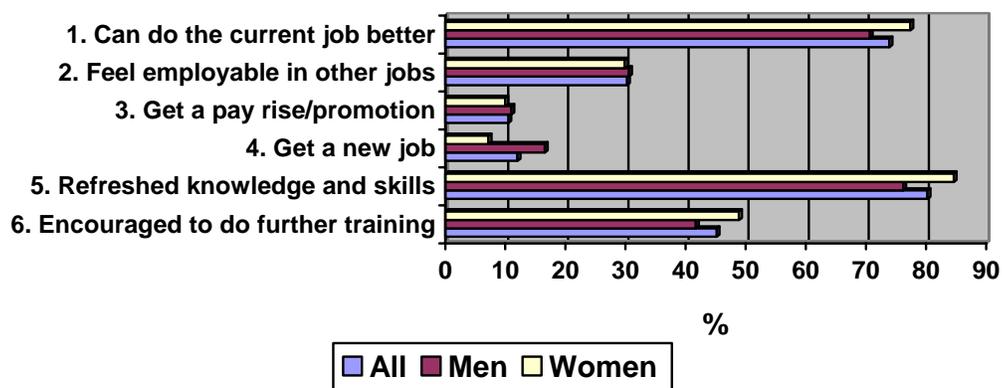
Note: * Statistically significant at 10% ** statistically significant at 5%

Race has also been included as control variables.

4.2 Determinants of Outcomes of Training for Employed Trainees

4.2.1 The percentages of the positive responses to six training outcome related questions analyzed in this section are shown in Chart 4. Respondents are allowed to choose multiple responses. In the order of the highest to the lowest percentages of positive responses among all respondents are outcome 5 (refreshed knowledge and skills), 1 (can do the current job better), 6 (encouraged to do further training), 2 (feel employable in other jobs), 4 (get a new job), and 3 (get a pay rise/promotion).

Chart 4: Percentage of positive responses to outcome related questions



4.2.2 Those who underwent training generally reported positive outcomes. The two most common outcomes cited were that training helped them do their jobs better and refreshed their knowledge and skills (both over 70%). Close to one-half felt they were motivated to participate further training (45%).

4.2.3 About 30% of respondents answered that they felt employable in other jobs after training. This outcome may happen for two reasons. One is that the nature of training was general so that skills acquired through training could be applied to the trainee's current job as well as to some other jobs, even though the trainee did not intend to seek employment in other jobs. The other is that workers who wanted to get employment in a new job chose to receive training to make them employable in the job they sought. This matter will be further discussed in the analysis on estimation results regarding this outcome.

4.2.4 Small percentages of respondents, 11% and 12% among all, reported that they got a pay rise/promotion (outcome 3) or got a new job (outcome 4) after training. These two outcomes are arguably the most objective and desirable among the outcome measures we use. While the percentages seem to be small, it is likely that among trainees these outcomes are underreported. Some trainees, even though

they were helped by training to get a pay rise/promotion or a new job, may not have been able to recognize the link, if the link was indirect. It is also possible that there is a time lag between training and the positive outcomes.

4.2.5 Outcome 1: Can do the current job better

4.2.5.1 *Overall, personal characteristics do not appear to be strongly correlated with this training outcome.* When only the personal characteristics are included, everything else equal, women are more likely than men to report that they can do the current job better after training. The estimation results suggest that about 8% more women report this outcome than men, everything else equal. The probability of experiencing this outcome has \cap -shaped relationship with age, peaking at age 37, according to the results controlling for both personal and job related characteristics. However, the effect of age is not statistically significant. The results for outcome 1 are given in Table 2.

Table 2: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 1 (can do the current job better) at the mean

Variable	Personal characteristics only (N = 436)		Personal and job related characteristics (N = 416)	
	Coefficient	Standard error	Coefficient	Standard error
Age	0.0191	0.0184	0.0223	0.0213
Age ²	-0.0002	0.0002	-0.0003	0.0003
Female	0.0768	0.0477	0.0753	0.0555
Education	0.0108	0.0653	0.0032	0.0751
Education ²	-0.0000	0.0025	0.0001	0.0029
No education	0.1375	0.2659	0.1699	0.2162
Occupation dummies (Reference group: Production craftsmen and related workers)				
1. Managers & Administrators			0.0414	0.1448
2. Professionals			0.0230	0.1397
3. Associate professionals & technicians			-0.0981	0.1451
4. Clerical workers			-0.1197	0.1649
5. Service workers and shop and market sales workers			0.0650	0.1356
8. Plant & machine operators & assemblers			0.0010	0.1560
9. Cleaners, labourers & related workers			-0.2850	0.2395
13. Working proprietors			-0.4294	0.3402
Industry dummies (Reference group: ...)				

Manufacturing)		
5. Electricity, gas and water	0.1349	0.1139
6. Construction	-0.1315	0.1486
7. Wholesale & Retail Trade	-0.0808	0.1055
8. Hotels & Restaurants	-0.1668	0.2091
9. Transport, Storage &	-0.2148**	0.1170
Communications		
10. Financial Intermediation	0.0281	0.0878
11. Real Estate, Renting & Business Activities	-0.0880	0.0890
12. Public Administration & Defence	0.0936	0.0780
13. Education	0.0386	0.0884
14. Health & Social Work	0.1368	0.0737
15. Other Community, social & personal service activities	0.0228	0.1284
Log earnings	-.1070**	0.0539
Full-time/part-time dummies (Reference group: Full-time permanent worker)		
2. Full-time temporary worker	0.0103	0.2261
3. Part-time permanent worker	NA	NA
4. Part-time temporary worker	0.0572	0.1716
Weekly working hours	0.0046	0.0031
Tenure in present job dummies (Reference group: Less than 6 months)		
2. 6 months to 1 year	-0.0137	0.1141
3. 1 year to less than 5 years	0.1146	0.0749
4. 5 years to less than 10 years	0.1880**	0.0620
5. 10 years to less than 20 years	0.1015	0.0820
6. 20 years or more	0.0594	0.1021

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years \times number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%. ** Statistically significant at 5%.

NA = Not in the sample.

4.2.5.2 *As for job related characteristics, we find that the higher the trainee's earnings, the less likely the trainee is to experience this outcome.* It is likely that those with high earnings are already working at a high degree of efficiency so that they have little room for improvement. At the mean, as earnings rise by 1%, the probability of having this outcome falls by about 11 percentage points.

4.2.5.3 *Trainees with 5 to 10 years of tenure on the job are most likely to report positively to this question.* Those with less than a year of tenure are far less likely to do so than those with longer tenures. Two explanations are possible

for this. First, most programs may be designed for those who already have some experience and knowledge on the job. Second, it is possible that those with a very short tenure are still “shopping” for a lifetime job and yet to have strong commitment to their job so that they lack strong motivation for the training. In general, the relationship between tenure and experience of this outcome has inverted-U shape. The probability of experiencing this outcome increases with the tenure up to 5 to 10 years of tenure, but decreases as the tenure gets longer.

4.2.5.4 ***The findings also indicate that workers of relatively low earnings who have worked for 5 to 10 years on the job are the best candidates for training to improve skills on the current job.***

4.2.6 **Outcome 2: Feel employable in other jobs**

4.2.6.1 The results for outcome 2 are given in Table 3. We should be careful in interpreting the results on this outcome, because this outcome, among other things, depends on the objective of the training the trainee received. If the training was to improve skills on the job the trainee held at the time of training, the trainee would not likely to report this outcome even if the training was very effective. On the other hand, if the trainee was looking for a new job and participated in training that would make him or her employable in other jobs, the trainee would be likely to report this outcome even if the training was just moderately successful. The results on this outcome should be interpreted with such caveats.

4.2.6.2 ***Among personal characteristics, education is a significant determining factor on this outcome.*** Education is estimated to have a positive relationship with experience of this outcome up to 14 years and then a negative relationship at the higher level. For trainees who work in low-skilled and semi-skilled jobs and of relatively low qualification, training provides them with new skills and knowledge that can help them to find other similar level jobs. In contrast, training is not likely to help highly skilled workers in finding new jobs of their levels, as these jobs require workers to have many years of education and training. Although those who have no education appear to feel strongly that they become employable in other jobs after training, the coefficient of no education dummy is statistically insignificant even at the 10% level. Age appears to have a U-shaped relationship with this outcome. The probability of having this outcome falls until age 35 then increases with age. However, effects of age and other personal characteristics are statistically insignificant.

4.2.6.3 ***Higher earnings are negatively associated with this outcome.*** A 1% increase in earnings is associated with 9.7 percentage point drop in experiencing this outcome. It is difficult to pin down the reason, but the objective of training received by the trainees is likely to play an important

role. Workers with higher earnings from the current job are likely to be more satisfied with his or her job than workers with lower earnings. Therefore, those with higher earnings are likely to pursue training with which they can upgrade their skills directly related with the current job. On the other hand, workers with lower earnings are likely to pursue training in another line of work with better opportunities so that they can switch to a new job.

Table 3: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 2 (feel employable in other jobs) at the mean

Variable	Personal characteristics only (N = 436)		Personal and job related characteristics (N = 413)	
	Coefficient	Standard error	Coefficient	Standard error
Age	-0.0040	0.0195	-0.0139	0.0227
Age ²	0.0001	0.0002	0.0002	0.0003
Female	-0.0077	0.0499	-0.0588	0.0579
Education	0.1104	0.0701	0.1818**	0.0843
Education ²	-0.0047*	0.0027	-0.0064**	0.0032
No education dummy	0.4414	0.4585	0.6758	0.2577
Occupation dummies (Excluded: 7. Production craftsmen and related workers)				
1. Managers & Administrators			-0.0783	0.1431
2. Professionals			-0.1367	0.1273
3. Associate professionals & technicians			-0.1056	0.1317
4. Clerical workers			0.0562	0.1622
5. Service workers and shop and market sales workers			0.0206	0.1650
8. Plant & machine operators & assemblers			0.0586	0.1888
9. Cleaners, labourers & related workers			0.5583**	0.1910
13. Working proprietors			NA	NA
Industry dummies (Excluded: 4. Manufacturing)				
5. Electricity, gas and water			0.5615**	0.1787
6. Construction			0.1375	0.1620
7. Wholesale & Retail Trade			-0.0946	0.0850
8. Hotels & Restaurants			-0.0107	0.1769
9. Transport, Storage & Communications			-0.0815	0.0904
10. Financial Intermediation			-0.0391	0.0922
11. Real Estate, Renting & Business			-0.0507	0.0775

Activities		
12. Public Administration & Defence	-0.0793	0.0859
13. Education	0.0520	0.0982
14. Health & Social Work	0.1495	0.1200
15. Other Community, social & personal service activities	-0.1777	0.0886
Log earnings	-0.0971*	0.0573
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	NA	NA
3. Part-time permanent worker	0.4397*	0.2434
4. Part-time temporary worker	0.3327	0.2414
Weekly working hours	0.0018	0.0029
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0760	0.1061
3. 1 year to less than 5 years	0.0612	0.0911
4. 5 years to less than 10 years	0.0949	0.1083
5. 10 years to less than 20 years	-0.0095	0.1102
6. 20 years or more	0.0240	0.1337

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years × number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%.

** Statistically significant at 5%.

NA = Not in the sample.

4.2.6.4 *Among occupational groups, labourers, cleaners, and other manual workers (group 9) are most likely to feel employable in other jobs after training.* The probability that trainees in this occupation group experience this outcome is higher than those in the reference group (production craftsmen and related workers) by 56% at the mean. Since their own jobs require little training, if they participate in training, they are likely to want to be trained in skills that help them find jobs in other occupations.

4.2.6.5 *We also find that temporary and part-time workers, who are likely to be looking for a new job, are more likely to report this outcome than full-time permanent workers.*

4.2.6.6 Broadly, the findings suggest that those who are in most need for a new job such as low-income or low-skilled workers report this outcome, either because they are likely to participate in training that can help them or because they benefit from training in finding a new job.

4.2.7 Outcome 3: Get a pay rise/promotion

4.2.7.1 *Among occupational groups, managers & administrators (group 1), professionals (group 2), associate professionals and technicians (group 3) are least likely to experience this outcome.* (see table 4 for key results) The probability that they experience this outcome is 9% to 13% lower than the probability that the reference group (production craftsmen and related workers) experiences this outcome. They are amongst the highest paid occupations. Earnings also appear to have a negative relationship with this training outcome. The results suggest that the positive effect of training on a pay rise/promotion is likely to happen among workers with lower pay. For higher paying workers, training seems to be of little significance to pay rise or promotion.

Table 4: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 3 (get a pay rise/promotion) at the mean

Variable	Personal characteristics only (N = 427)		Personal and job related characteristics (N = 385)	
	Coefficient	Standard error	Coefficient	Standard error
Age	-0.0018	0.0128	0.0019	0.0132
Age ²	-0.0000	0.0002	-0.0000	0.0002
Female dummy	0.0008	0.0328	-0.0033	0.0315
Education	0.0123	0.0471	0.0543	0.0489
Education ²	-0.0007	0.0018	-0.0015	0.0018
No education dummy	0.1217	0.5083	0.8241	0.4401
Occupation dummies (Excluded: 7. Production craftsmen and related workers)				
1. Managers & administrators			-0.0897**	0.0208
2. Professionals			-0.1207**	0.0431
3. Associate professionals & technicians			-0.1259**	0.0527
4. Clerical workers			-0.0667	0.0313
5. Service workers and shop and market sales workers			-0.0053	0.0702
8. Plant & machine operators & assemblers			-0.0086	0.0748
9. Cleaners, labourers & related workers			-0.0094	0.1111
13. Working proprietors			NA	NA
Industry dummies (Excluded: 4. Manufacturing)				
5. Electricity, gas and water			0.0195	0.1122

6. Construction	NA	NA
7. Wholesale & Retail Trade	-0.0567	0.0255
8. Hotels & Restaurants	-0.0068	0.1154
9. Transport, Storage & Communications	-0.0266	0.0419
10. Financial Intermediation	0.0272	0.0605
11. Real Estate, Renting & Business Activities	-0.0248	0.0357
12. Public Administration & Defence	-0.0449	0.0322
13. Education	-0.0247	0.0407
14. Health & Social Work	0.0403	0.0714
15. Other Community, social & personal service activities	0.1105	0.1253
Log earnings	-0.0472	0.0303
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	NA	NA
3. Part-time permanent worker	-0.0504	0.0408
4. Part-time temporary worker	NA	NA
Weekly working hours	0.0002	0.0016
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	0.1366	0.1496
3. 1 year to less than 5 years	0.1135*	0.0756
4. 5 years to less than 10 years	0.1253	0.1065
5. 10 years to less than 20 years	0.1094	0.1198
6. 20 years or more	-0.0189	0.0679

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years \times number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%.

** Statistically significant at 5%.

NA = Not in the sample.

4.2.7.2 ***Workers who have worked on the job for less than 6 months or for more than 20 years are less likely than workers with other tenure lengths to experience a pay rise or promotion after training.*** Those who have worked for 1 to 10 years are most likely to do so.

4.2.7.3 The findings suggest that workers who are paid relatively low salary and have worked for 1 to 10 years on the job are most likely to experience a pay rise or promotion after training. Note that this finding is similar to the finding on the first outcome (can do the current job better). It is logical that workers who are likely to experience productivity increases after training are also

likely to get a pay rise or promotion. Although age appears to have a negative effect on the probability that the trainee experiences this outcome, the effect is small and insignificant.

4.2.8 Outcome 4: Get a new job

4.2.8.1 The results for outcome 4 are given in Table 5. Interpreting the results regarding this outcome has the similar problem as interpreting the results on the second outcome (feel employable in other jobs). Three conditions should be met for a trainee to experience this outcome. First, the trainee should search for a new job at the time of or after the training. Second, labour market situation at the time of or after the training should allow the trainee to get a new job. Third, training should be helpful in providing the trainee with new skills or in his or her job search activity. We are interested primarily in whether the third condition is met or not. However, given the data, we cannot separate it from the other two.

Table 5: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 4 (get a new job) at the mean

Variable	Personal characteristics only (N = 436)		Personal and job related characteristics (N = 410)	
	Coefficient	Standard error	Coefficient	Standard error
Age	-0.0053	0.0120	-0.0028	0.0098
Age ²	0.0000	0.0002	0.0000	0.0001
Female dummy	-0.0762**	0.0318	-0.0563**	0.0278
Education	-0.0329	0.0417	0.0141	0.0358
Education ²	0.0010	0.0016	-0.0003	0.0014
No education dummy	-0.0967	0.0214	0.0066	0.2484
Occupation dummies (Excluded: 7. Production craftsmen and related workers)				
1. Managers & Administrators			0.0456	0.1063
2. Professionals			-0.0270	0.0491
3. Associate professionals & technicians			-0.0253	0.0495
4. Clerical workers			0.0173	0.0754
5. Service workers and shop and market sales workers			0.0827	0.1236
8. Plant & machine operators & assemblers			0.1008	0.1503

9. Cleaners, labourers & related workers	0.0850	0.2171
13. Working proprietors	NA	NA
Industry dummies (Excluded: 4. Manufacturing)		
5. Electricity, gas and water	0.1109	0.1610
6. Construction	0.0517	0.0869
7. Wholesale & Retail Trade	-0.0024	0.0413
8. Hotels & Restaurants	NA	NA
9. Transport, Storage & Communications	0.0113	0.0510
10. Financial Intermediation	-0.0428	0.0236
11. Real Estate, Renting & Business Activities	0.0158	0.0438
12. Public Administration & Defence	-0.0017	0.0421
13. Education	-0.0432	0.0242
14. Health & Social Work	0.0664	0.0797
15. Other Community, social & personal service activities	0.1116	0.1248
Log earnings	-0.0448*	0.0251
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	0.4736**	0.3217
3. Part-time permanent worker	0.0901	0.2131
4. Part-time temporary worker	0.0550	0.1716
Weekly working hours	0.0017	0.0013
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0400	0.0197
3. 1 year to less than 5 years	-0.0256	0.0309
4. 5 years to less than 10 years	-0.0325	0.0286
5. 10 years to less than 20 years	-0.0090	0.0384
6. 20 years or more	-0.0286	0.0349

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years \times number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%.

** Statistically significant at 5%.

NA = Not in the sample.

4.2.8.2 *Gender is found to be strongly correlated with experience of this outcome.*

Men are more likely to experience this outcome than women by about 8% at the mean. However, as discussed previously, these findings do not necessarily mean that the training has different impacts by the trainee's

gender on this outcome as it could be possibly due to the trainees' job search activity or prevailing labour market situation. Age is found to be negatively correlated with experience of this outcome. However, the effect is statistically insignificant and small, as one more year of age decreases the probability only by 0.3-0.5%.

4.2.8.3 This interpretation is consistent with findings on the relationship between trainee's job related characteristics and experience of this outcome. First, we find that earnings are negatively correlated with this outcome. As the earnings increase by 1%, the probability of experiencing this outcome falls by 4 percentage points. Note that workers of higher earnings are less likely to seek a new job than workers of lower earnings, because they are likely to be satisfied with the current job. So it is likely that this result is due to different degrees of search activity by earnings. Second, temporary and part-time workers are more likely to experience this outcome than full-time permanent workers. Different degrees of search activity by the trainees' employment status can explain this.

4.2.8.4 *The findings suggest that male, low-income, and part-time or temporary workers are more likely to experience this outcome than female, high-income, and full-time or permanent workers.* The results are generally consistent with the view that the trainees' reports reflect their job search activity rather than the true effect of training.

4.2.9 Outcome 5: Refresh knowledge and skills

4.2.9.1 *Age is an important determinant on this outcome (table 6).* Age has a positive relationship with this outcome up to age 36 and then has a negative relationship with the outcome. It implies that workers in their late 30s are most likely to experience this outcome. Those who have no education are less likely to experience this outcome than those with education, most probably because they lack base knowledge and skills to start with.

4.2.9.2 All the occupation dummy coefficients are estimated to be negative, which suggests that *production craftsmen and related workers (reference occupational group 7) are most likely to experience this outcome among occupational groups.* Labourers and manual workers (group 9), plant and machine operators and assemblers (group 8), service workers and sales works (group 5), and managers & administrators (group 1) are among the groups that are least likely to experience this outcome. The first three groups are relatively low-skilled workers so they may not have skills to be refreshed to begin with. The last group may not benefit much from training program unless it is highly specialized.

4.2.9.3 *Workers in public administration and defense (industry 12), health and social work (industry 14), and other community, social, and personal*

service sectors (industry 15) are most likely to experience this outcome. The three industry dummy coefficients are statistically significant at the 5% level. These industries are ones that require frequent updating of knowledge and retraining.

Table 6: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 5 (refreshed knowledge and skills) at the mean

Variable	Personal characteristics only (N = 436)		Personal and job related characteristics (N = 418)	
	Coefficient	Standard error	Coefficient	Standard error
Age	0.0211	0.0164	0.0253	0.0178
Age ²	-0.0003	0.0002	-0.0004*	0.0002
Female dummy	0.0683	0.0429	0.0577	0.0465
Education	-0.0383	0.0600	-0.0805	0.0679
Education ²	0.0013	0.0023	0.0025	0.0025
No education dummy	-0.6148	0.4245	-0.8148	0.2256
Occupation dummies (Excluded: 7. Production craftsmen and related workers)				
1. Managers & Administrators			-0.4510*	0.2658
2. Professionals			-0.1548	0.1988
3. Associate professionals & technicians			-0.3061*	0.2007
4. Clerical workers			-0.2602	0.2555
5. Service workers and shop and market sales workers			-0.5784**	0.2384
8. Plant & machine operators & assemblers			-0.4518*	0.2736
9. Cleaners, labourers & related workers			-0.7685**	0.1523
13. Working proprietors			NA	NA
Industry dummies (Excluded: 4. Manufacturing)				
5. Electricity, gas and water			0.0880	0.0827
6. Construction			0.1127	0.0548
7. Wholesale & Retail Trade			0.0545	0.0595
8. Hotels & Restaurants			0.0262	0.1262
9. Transport, Storage & Communications			0.0092	0.0725
10. Financial Intermediation			-0.0064	0.0726
11. Real Estate, Renting & Business Activities			0.0619	0.0516
12. Public Administration & Defence			0.1228**	0.0365

13. Education	0.0674	0.0578
14. Health & Social Work	0.1319**	0.0362
15. Other Community, social & personal service activities	0.1244**	0.0417
Log earnings	0.0145	0.0413
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	-0.2798	0.2707
3. Part-time permanent worker	0.0535	0.1446
4. Part-time temporary worker	0.1197	0.0554
Weekly working hours	0.0021	0.0024
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0433	0.1094
3. 1 year to less than 5 years	0.0031	0.0720
4. 5 years to less than 10 years	0.0767	0.0637
5. 10 years to less than 20 years	0.0660	0.0685
6. 20 years or more	0.1069	0.0579

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years × number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%.

** Statistically significant at 5%.

NA = Not in the sample.

4.2.10 Outcome 6: Encouraged to do further training

4.2.10.1 *Only a few variables are found to be significantly correlated with this outcome (Table 7). The three highest-paid occupational groups are least encouraged to do further training among occupational groups.* They are by 25% to 32% less likely to feel that way than the workers in the reference occupation at the mean. They may feel least compelled to do further training probably because they are satisfied with the current status. All occupation coefficient dummy coefficients are estimated negative, which suggests that production craftsmen and related workers are most likely to report this outcome. Age has negative effects on this outcome, that is, older trainees are less encouraged to do further training than younger ones. However, the effect of age and other personal characteristics on this outcome is found to be statistically insignificant.

4.2.10.2 *Among industries, workers who are working in transport, storage, and communications sector are least likely to report this outcome.* This is related to the finding on the first outcome (can do the current job better). Workers in these industries are least likely to report the first outcome, other

things being equal. As they find that training does not help them to do perform better in their current job, they are unlikely to be motivated to do further training.

Table 7: Estimated effects of personal and job related characteristics on the probability of experiencing outcome 6 (encouraged to do further training) at the mean

Variable	Personal characteristics only (N = 436)		Personal and job related characteristics (N = 422)	
	Coefficient	Standard error	Coefficient	Standard error
Age	-0.0157	0.0218	-0.0171	0.0251
Age ²	0.0001	0.0003	0.0001	0.0003
Female dummy	0.0743	0.0557	0.0475	0.0645
Education	-0.0507	0.0766	-0.0871	0.0877
Education ²	0.0018	0.0029	0.0039	0.0033
No education dummy	-0.4005	0.1790	-0.4306	0.1155
Occupation dummies (Excluded: 7. Production craftsmen and related workers)				
1. Managers & Administrators			-0.2361	0.1369
2. Professionals			-0.3103**	0.1293
3. Associate professionals & technicians			-0.2573*	0.1326
4. Clerical workers			-0.0890	0.1520
5. Service workers and shop and market sales workers			-0.1721	0.1476
8. Plant & machine operators & assemblers			-0.1704	0.1505
9. Cleaners, labourers & related workers			-0.3440*	0.1277
13. Working proprietors			-0.3199	0.1899
Industry dummies (Excluded: 4. Manufacturing)				
5. Electricity, gas and water			0.2529	0.1896
6. Construction			-0.1840	0.1304
7. Wholesale & Retail Trade			-0.1303	0.1016
8. Hotels & Restaurants			0.1056	0.2092
9. Transport, Storage & Communications			-0.2241**	0.0949
10. Financial Intermediation			-0.0655	0.1049
11. Real Estate, Renting & Business Activities			-0.0682	0.0920
12. Public Administration & Defence			0.0758	0.1136

13. Education	-0.0341	0.1041
14. Health & Social Work	0.0892	0.1194
15. Other Community, social & personal service activities	-0.00151	0.1549
Log earnings	-0.0309	0.0610
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	-0.1783	0.2047
3. Part-time permanent worker	0.2456	0.2497
4. Part-time temporary worker	-0.01198	0.2165
Weekly working hours	-0.0019	0.0033
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0547	0.1367
3. 1 year to less than 5 years	-0.0037	0.1016
4. 5 years to less than 10 years	0.0731	0.1139
5. 10 years to less than 20 years	-0.0380	0.1232
6. 20 years or more	0.0009	0.1410

Note: Race dummy coefficients, citizen/PR dummy coefficient, marital status dummy coefficients, female older than 25 years × number of children coefficient, employer/employee/self-employed coefficients are not shown.

* Statistically significant at 10%.

** Statistically significant at 5%.

NA = Not in the sample.

5. Policy Implications and Conclusion

5.1 The study showed that well-educated individuals and workers with higher earnings are much more likely to participate in training programs than others, even after controlling for industry and occupation. The decision to participate in training is not driven by their unobserved job related characteristics.

5.2 We also find that workers in some industries, such as wholesale and retail trade, are less likely to participate in training programs than workers in manufacturing industry. Workers' occupation affiliations have a significant effect on their training participation as well. For example, sales persons in all industries have a lower training participation rate than workers in other occupations. The difference in the cross-occupation and cross-industry participation rates likely reflects the difference in incentives to participate. Further studies on pinning down the factors that generate the differences in incentive, such as job turnover rate, government subsidies, skills requirement, could generate fruitful results.

- 5.3 Overall results on the estimation of the determinants of training outcomes indicate that relatively low paid workers are the ones that benefit most from training. Continued training support for this group is thus critical. Earnings are negatively correlated to many training outcomes and the highest paid occupational groups are often the ones to benefit least from training, which may reduce the sense of urgency for this group to re-skill themselves to adapt to a changing economy. Workers who have worked on the job for 1 to 10 years are likely to have the most successful training.
- 5.4 While the better educated are more likely to participate in training, the overall results suggest that low-skilled workers benefit more from structured training. This probably reflects concerted effort by the government to train and re-train workers to maintain their employability and relevance in the labour market. Recent evidence indicates that the labour market structure might be moving towards greater use of more flexible contractual arrangements. In this case, employer-based structured training might be less effective to train and re-train older workers and those on contracts as employers are less likely to support such vulnerable workers for training. The effectiveness of training could be increased by adopting a more flexible and targeted individual-based training system, which reinforces WDA's move towards worker-based funding schemes.

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PAST STUDIES

Benefits of training

The most apparent tangible benefit that employees can gain from undertaking training is the positive wage effect. Using data from a large US company for the period between 1986 and 1990, Bartel (1995) finds that training has a positive effect on wages. Wages of workers that have undergone on-the-job training are 10.6% higher than those who did not undergo training. Further, the study also found that one additional day of training raises wages by 1.6%.

Using data from the Swedish Level of Living Survey for 1968, 1981 and 1991, Regner (2002) concludes that employees in jobs that require long on-the-job training (OJT) earn significantly more than those in jobs that require shorter training. The estimated wage premiums for medium OJT and lengthy OJT are 7.7% and 15.7% respectively.

In addition, Regner (2002) finds that the wage premium of long training is 20.8% for men but only 13.5% for women, and it is 18.1% in the private sector and 11% in the public sector. There are also significant differences in the effects of medium-length training between men and women but not between the sectors.

The effect of training also differs for employees of different seniority. Regner (2002) finds that the wage effect of OJT is larger for recently hired employees than for senior employees. The study also highlights that employees from the public sector benefit more from specific training, while their counterparts from the private sector benefit more from general training.

Budria and Pereira (2004) do not find significant differences in returns to training between the private and public sectors. However, they do find that returns to training are determined by experience in the private sector and education in the public sector.

Greenberg, Michalopoulos and Robins (2003) examine the effects of US government-sponsored training programs on three groups of people: men, women and youths. They conclude that the effects of training differ among the three groups – largest for women,

modest for men and negligible for youths and the effects are found to persist for several years. They also divide the training programs according to their cost and find that more expensive training programs are not necessarily the ones that provide the highest returns.

The view of Greenberg et al (2003) is also supported by Budria and Pereira (2004). After examining the pooled data for Portugal from 1998 to 2000, they found that although positive wage effect of training for women is larger than men, the effects are subject to greater variation across education and experience.

Krueger and Rouse (1998) examine whether the impacts of workplace training differ among companies in different industries. Using data on two US companies, one from the manufacturing sector and the other from the service sector, they found that while training has a small, positive effect on earnings for workers in the manufacturing company, it has no effect on earnings for workers in the service company.

Arulampalam, Booth and Bryan (2004) examine whether the returns of training are the same for employees in different wage groups. Using data from 10 European Union countries, they find that in nine of the ten countries examined, training yields similar percentage returns across the conditional wage distribution. The only exception is Belgium, where employees in the lower wage group seem to enjoy a larger return to training than those in higher wage group. Arulampalam et al (2004) also document that the mean returns to training differ across the 10 countries.

Literature Review on Returns to Training

Author(s)	Sample period and countries examined	Data and Methodology	Types of Training	Main Findings
Nivorozhkin and Nivorozhkin (2005)	Russia 2001, 2002 (survey years)	<ul style="list-style-type: none"> • 1547 individuals, of whom 406 are program participants • Dependent variable: Employment rate • Comparison of effect of training on participants and non-participants. The participants and non-participants are matched using propensity score methodology 	Government-sponsored vocational training	<ul style="list-style-type: none"> • Program participants are more likely to find a job than non-participants, especially for blue-collar training program participants. • The difference in the percentage of blue-collar training program participants that remain employed after 12 months and those of white-collar participants and non-participants is marginal
Cassidy, Gorg and Strobl (2005)	Ireland 1999 – 2002 (survey years)	<ul style="list-style-type: none"> • Plant-level panel data • Annual Business Survey • Dependent variable: TFP 	NA (paper utilizes expenditure on training as proxy for training)	<ul style="list-style-type: none"> • Training raises productivity of domestic firms only, but not for foreign firms
Arulampalam, Booth and Bryan (2004)	Austria, Belgium, Britain, Denmark, Finland, France, Ireland, Italy, Netherlands and Spain 1994 – 2000 (survey years)	<ul style="list-style-type: none"> • Quintile regression • European Community Household Panel survey • Dependent variable: log average hourly wages 	<ul style="list-style-type: none"> • Work-related general training 	<ul style="list-style-type: none"> • Percentage returns to investment in general training is the same across the conditional wage distribution for nine of the 10 countries. • Results for Belgium, however, show that individuals further to the left in the conditional distribution have higher returns to training. • There are differences in mean returns to training across countries.

Budria and Pereira (2004)	Portugal 1998 - 2000	<ul style="list-style-type: none"> • 27000 individuals • Portuguese Labor Force Survey • Dependent variable: earnings 	NA	<ul style="list-style-type: none"> • Returns to training are large and significant • Workers with low qualifications and long professional experience earn larger returns • Women receive larger returns than men, but their returns are subject greater variation across education and experience groups • Average effect of training is the same in private and public sector • Experience in the private sector and education in the public sector determine the returns to training • Training to improve current skills and training in the firm give largest returns
Collier, Green, Peirson and Wilkinson (2003)	UK 1991 – 1998	<ul style="list-style-type: none"> • 1693 firms in all sectors except agriculture, forestry and fishing and coal mining, (> 25 employees) • Dependent variable: firms closure rate 	<ul style="list-style-type: none"> • Employer-sponsored training • Two training measures - does the firm provide training for non-manual workers, manual workers or both - the proportion of employees receiving training 	<ul style="list-style-type: none"> • Raising investment in training workers lowers the risk of firm closure (a proxy for profitability) • In smaller firms (defined as firms with < 200 employees), training for manual workers leads to lower risk of closure • In larger firms, training for non-manual workers leads to lower risk of closure.
Molina and Ortega (2003)	North America 2000 (survey year)	<ul style="list-style-type: none"> • 405 publicly traded firms (370 US firms, 35 Canadian firms) • Dependent variable: firm performance (measured by Tobin's Q and total returns to shareholders) 	NA	<ul style="list-style-type: none"> • Higher level of training is associated with better firms performance • Lower voluntary and involuntary staff turnover • Higher employee satisfaction

Kuckulenz and Zwick (2003)	Germany 1998/1999 (survey years)	<ul style="list-style-type: none"> • 34000 employees • Qualification and Career survey • Dependent variable: earnings • One-step full-information maximum likelihood, Heckman's two-step consistent estimator and 2SLS estimation 	<ul style="list-style-type: none"> • Employer-sponsored training • External (participation at trade fairs, lectures, courses, seminars and reading specialist literature) vs. internal training (on-the-job training, quality circles and special tasks) 	<ul style="list-style-type: none"> • High-skilled workers profit more from training than low-skilled workers • Job entrants obtain higher earnings increase than workers with a long job tenure • Workers with temporary contract profit less from training than those with a permanent job contract • External training has a significant impact on wages, while wage effect of internal training is insignificant
Greenberg, Michalopoulos and Robins (2003)	USA	<ul style="list-style-type: none"> • Dependent variable: Earnings • Three group of subjects (studied separately) – men, women and youth • Meta-analysis of 31 studies of 15 voluntary training program 	<ul style="list-style-type: none"> • Government-sponsored training programs • Two types of training programs – classroom training and workplace training • Classroom training includes basic education, classroom training • Workplace training includes on-the-job training and subsidized work 	<ul style="list-style-type: none"> • Effects differ among the three groups – largest for women, modest for men and negligible for youths. • Effects of training persisted for several years after training was completed. • More expensive training programs are not necessarily superior. • Basic education was the least effective while classroom skills training were the most effective. • Higher level of unemployment does not make training more effective.
Regner (2002)	Sweden 1968, 1981, 1991 (survey years)	<ul style="list-style-type: none"> • 2636 observations • Swedish Level of Living Survey • Dependent variable: wage 	On-the job training	<ul style="list-style-type: none"> • Large positive effects on individual wages • Returns on jobs that require long training is higher than those that short training • Returns to training are high for recently hired employees and low for senior employees. • General training has greater positive effect

				<p>than specific training</p> <ul style="list-style-type: none"> • Large effects of general training for private-sector employees • Significant effects of specific training for public-sector employees
Barrett and O'Connell (2001)	Ireland 1993 and 1996/97 (survey years)	<ul style="list-style-type: none"> • 215 firms that employed more than 10 people in manufacturing, construction and private services. • Dependent variable: productivity growth 	<ul style="list-style-type: none"> • employer-provided general vs. specific training 	<ul style="list-style-type: none"> • specific training has no statistically significant effect on productivity growth • statistically significant effect is found for general training even after controlled for factors such as workplace policies, firm size, corporate restructuring and existing level of human capital • impact of general training varies positively with the level of capital investment
Ballot and Taymaz (2001)	NA	<ul style="list-style-type: none"> • Simulations 	<ul style="list-style-type: none"> • 3 types of policies <ul style="list-style-type: none"> - subsidizes all education and training activities - requires firms to spend a certain percentage of the wage bill on training activities - government subsidies training activities if the firm hires unemployed people and pays the social security contributions for 1 year 	<ul style="list-style-type: none"> • minimum requirement on training activities induces an inefficient allocation of resources in many firms which cancels the productivity effect of training • subsidy raises productivity and the survival probability of firms • Timing of training subsidy is important for fostering growth. Training should come before a major technological change or early during the change • Subsidy should not focus on a particular type of training but cover both general and specific training since they are complementing factors for growth. • A system of subsidy for hiring and training the unemployed is efficient for the purpose of stabilizing unemployment.

Green, Felstead, Mayhew and Pack (2000)	UK 1996 (survey year)	<ul style="list-style-type: none"> • 2 surveys – individuals survey (1539 employees) and employers survey (149 large and 313 SMEs employers). • dependent variable: labor mobility • ordinal probit model 	<ul style="list-style-type: none"> • employer-sponsored training vs. employees • firm-specific training vs. transferable training 	<ul style="list-style-type: none"> • where the firm solely pays for the training, the relationship between training and mobility is negative • where training is entirely sponsored by individuals, the probability is significantly raised. • if skills are firm-specific, job search is likely to be very substantially reduced
Dearden, Reed and Reenen (2000)	UK 1983 – 1996	<ul style="list-style-type: none"> • labor force survey • dependent variable: labor productivity • panel data techniques 	<ul style="list-style-type: none"> • private sector training 	<ul style="list-style-type: none"> • training has a positive impact on labor productivity • overall effect of training on productivity was twice as large as the effects on wages
Krueger and Rouse (1998)	USA	<ul style="list-style-type: none"> • 2 firms: 1 manufacturing firm and 1 service firm • <u>For manufacturing firm</u> <ul style="list-style-type: none"> - 642 employees - pre-training sample period: Jul 91 and Oct 92 - training period: Nov 92 – Feb 94 - Post-training sample period: Mar 94 – Mar 95 • <u>For service firm</u> <ul style="list-style-type: none"> - 239 workers - pre-training sample period: Sept 91 and Nov 92 - training period: training period: Nov 92 – Feb 	<ul style="list-style-type: none"> • workplace education program 	<ul style="list-style-type: none"> • small, positive impact on manufacturing firm but insignificant for service firm. • employees (both firms) who received training are not more likely to leave the company than those who did not receive training • there is some evidence that training participants are more likely to be nominated for performance awards, but the difference is largely explained by other personal characteristics • training has small, positive effect on absenteeism

		<p>94</p> <ul style="list-style-type: none"> - Post-training sample period: Mar 94 – Mar 95 • dependent variables: earnings, turnover and job performance • Fixed-effect panel models 		
Bartel (1995)	USA 1986 – 1990	<ul style="list-style-type: none"> • 19000 observations • Dependent variables: Wage growth, job performance 	On-the-job training	<ul style="list-style-type: none"> • Training has positive and significant effect on both wage growth and job performance scores, even after correcting for selection bias in assignment to training programs.

Detailed Discussion of Estimation Findings

Table 1 reports the basic estimation results where we included only a limited number of explanatory variables, namely age and its squared term, gender, an interaction between matured women (=1 if a woman is older than 25 years old and 0 otherwise) and number of children, education and its squared, two race dummies, three marital status dummies, a citizenship dummy (=1 if the respondent is a Singapore permanent residence, and 0 otherwise). In addition to years of education, we also created a dummy variable equals to 1 if an individual does not have any formal education to capture the potential non-continuity in the sample.

To examine whether the observed relationship between occupation and participation is driven by occupation specific factors or by factors that are correlated with occupational choice, we further added occupation and other job related characteristics into our regression. We report estimation results after these characteristics are included in the regression in Table 2-4.

In the regression shown in Table 2, we select “Production craftsmen & related workers” as the reference group whose training participation rate is 19%. As a result, all the coefficients on the occupational dummies should be interpreted as the difference between the particular occupation and the reference occupation. Interestingly, adding job related characteristics has little impact on the coefficients on personal characteristics, particularly to those that have significant effects on participation. Actually, the standard errors on most of the estimates become smaller after job characteristics are included.

To disentangle the impacts of personal specific characters with those of industrial specific characters, we run another regression that includes both personal and industrial variables. In our regression analysis, we use manufacturing industry as our reference group whose training participation rate is 24.7%. Therefore, all the coefficients on industry dummies should be interpreted as the difference in training participation rate between a particular industry and the manufacturing industry. Table 3 reports the estimation results when industry affiliation is included in the regression.

Similar to the results in Table 2, adding industry affiliation has no significant effect on the coefficients on personal characteristics either. Moreover, coefficients on earnings, employment status, and working hours are also not sensitive to whether we control for occupation or industry.

By allowing occupation and industry to enter the regression separately, we can have a broader picture on the impact of occupation or industry on training participation. However, as workers from one industry could hold very different occupations, we cannot pin down whether cross-occupation (cross-industry) differences are driven by occupation (industry) specific effect or their joint effect.

For example, as sales persons are the majority of the work force in trade sector, the lower participation rate of workers in trade industry could be either the result of the lower participation rate of sales persons or the lower participation rate of workers of the entire trade industry. Similarly, as the majority of sales persons are employed by trading firms, we are not sure whether the lower participation rate of sales persons is the result of lower participation rate of sales persons or the lower participation rate in the trade sector. [Table 4](#) reports the estimation results where both the industry and occupation are controlled for.

Again, the coefficients on personal characteristics are comparable with their counterparts in previous regressions. The consistency in year of education, worker's own labour income coefficients suggests that the effects of these personal characteristics on training are not biased by the occupational or industry choice.

Even the coefficients on occupation and industry dummies are also not sensitive to whether they enter the regression separately or jointly. For example, results in both [Tables 4 and 2](#) suggest that “managers & administrators”, “clerical workers”, and “working proprietors” are the least likely to participate in training programs. This suggests that their low participation rate is not driven by a low participation rate in a particular industry. Interestingly, although sales workers are highly concentrated in the trade industry, controlling for industry dummies has hardly changed the estimated impact. The similarity in the magnitude of the coefficient suggests that the lower participation rate of sales workers is unlikely to be driven by the lower participation rate in any particular industry.

The coefficients on industry dummies that were significant when they were included separately are still significant after controlling for occupational composition. For example, while the coefficient on trade industry dummy is -0.3844 (significant at the 1% level) when occupation composition has not been controlled for, it is -0.2602 (significant at the 6.3% level) after controlling for occupation. This evidence suggests that both sales persons and non-sales persons are less likely to participate in training programs in the trade industry than their counterparts in manufacturing.

Table 1: Estimated effects of personal characteristics on the probability of training participation, (employed workers)

Variable	Personal characteristics only	
	Coefficient	Standard error
Age	0.0368	0.0274
Age ²	-0.0004	0.0003
Female dummy	0.0982	0.0816

PR dummy	-0.2254*	0.1257
Marital status dummies (Excluded: 1. Single)		
2. Married	-0.1131	0.0984
3. Divorced/Widowed	0.3769*	0.1991
Education	0.3535**	0.0966
Education ²	-0.0096**	0.0038
No education dummy	1.9415**	0.5912
Married female <input type="checkbox"/> number of kids under age 15	-0.0620	0.0647

Note: * Statistically significant at 10% ** statistically significant at 5%
Race has also been included as control variables.

Table 2: Estimated effects of personal and job characteristics (excluding industry) on training participation, employed workers

Variable	Personal and labour market characteristics	
	Coefficient	Standard error
Age	0.0000	0.0308
Age ²	0.0000	0.0004
Female dummy	0.1880	0.0910
PR dummy	-0.2743**	0.1292
Marital status dummies (Excluded: 1. Single)		
2. Married	-0.1090	0.1031
3. Divorced/Widowed	0.4696**	0.2058
Education	0.3291**	0.1070
Education ²	-0.0102**	0.0042
No education dummy	1.6628**	0.6376
Married female <input type="checkbox"/> number of kids under age 15	-0.0282	0.0684
Occupation dummies (Excluded: 7. Production craftsmen and related workers)		
1. Managers & Administrators	-0.7266**	0.2281
2. Professionals	0.0393	0.2126
3. Associate professionals & technicians	-0.0857	0.1909
4. Clerical workers	-0.5468**	0.1964
5. Service workers and shop and market sales workers	-0.3605*	0.2009
8. Plant & machine operators & assemblers	-0.0933	0.1983
9. Cleaners, labourers & related workers	-0.3001	0.2454
13. Working proprietors	-0.7537**	0.3404
Employees	0.6180**	0.2677
Self-employed without employees	0.5462*	0.2855
Log earnings	0.2239**	0.0793

Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	-0.4102*	0.2031
3. Part-time permanent worker	0.2954	0.3192
Weekly working hours	-0.0056	0.0040
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0432	0.1840
3. 1 year to less than 5 years	0.1551	0.1367
4. 5 years to less than 10 years	0.2235	0.1552
5. 10 years to less than 20 years	0.1062	0.1638
6. 20 years or more	-0.0481	0.1834

Note: * Statistically significant at 10% ** statistically significant at 5%

Race has also been included as control variables.

Table 3: Estimated effects of personal and job characteristics (excluding occupation on training participation, employed workers)

Variable	Personal and labour Market characteristics	
	Coefficient	Standard error
Age	0.0111	0.0306
Age ²	-0.0002	0.0004
Female dummy	0.0450	0.0893
Marital status dummies (Excluded: 1. Single)		
2. Married	-0.1287	0.1036
3. Divorced/Widowed	0.4572**	0.2068
Education	0.2546**	0.1009
Education ²	-0.0078**	0.0040
No education dummy	1.3182**	0.6149
Married female \square number of kids under age 15	-0.0713	0.0676
Industry dummies (Excluded: 4. Manufacturing)		
5. Electricity, gas and water	1.1797**	0.4790
6. Construction	-0.1062	0.1885
7. Wholesale & Retail Trade	-0.3835**	0.1318
8. Hotels & Restaurants	-0.2820	0.2119
9. Transport, Storage & Communications	-0.0703	0.1357
10. Financial Intermediation	0.3074**	0.1566
11. Real Estate, Renting & Business Activities	-0.0666	0.1276
12. Public Administration & Defence	0.5477**	0.1544
13. Education	0.8591	0.1803
14. Health & Social Work	0.3631	0.1768
15. Other Community, social & personal service activities	-0.0209	0.2033
Employees	0.6634**	0.2408

Self-employed without employees	0.5738**	0.2739
Log earnings	0.1825**	0.0726
Full-time/part-time dummies (Excluded: 1. Full-time permanent worker)		
2. Full-time temporary worker	-0.4833**	0.2061
3. Part-time permanent worker	0.2208	0.3286
Weekly working hours	-0.0042	0.0040
Tenure in present job dummies (Excluded: 1. Less than 6 months)		
2. 6 months to 1 year	-0.0303	0.1830
3. 1 year to less than 5 years	0.1305	0.1349
4. 5 years to less than 10 years	0.1733	0.1530
5. 10 years to less than 20 years	0.0110	0.1627
6. 20 years or more	-0.0894	0.1813

Note: * Statistically significant at 10% ** statistically significant at 5%
Race has also been included as control variables.

Table 4: Estimated effects of personal and job characteristics on training participation

Variable	Personal and labour market characteristics (N=1598)	
	Coefficient	Standard error
Age	0.0074	0.0316
Age ²	-0.0001	0.0004
Female	0.1549	0.0949
Marital status (Reference group: Single)		
Married	-0.1026	0.1064
Divorced/Widowed	0.5314**	0.2096
Education	0.3287**	0.1096
Education ²	-0.0111**	0.0043
No education	1.6275**	0.6514
Married female*number of kids under age 15	-0.0491	0.0697
Occupation (Reference group: Production craftsmen and related workers)		
1. Managers & administrators	-0.6262**	0.2347
2. Professionals	-0.0214	0.2201
3. Associate professionals & technicians	-0.1928	0.2002
4. Clerical workers	-0.5909**	0.2063
5. Service workers and shop and market sales workers	-0.3297	0.2203
8. Plant & machine operators & assemblers	-0.0932	0.2064
9. Cleaners, labourers & related workers	-0.3293	0.2617
13. Working proprietors	-0.5824*	0.3454
Industry dummies (Reference group: Manufacturing)		

5. Electricity, gas and water	1.2545**	0.4987
6. Construction	-0.0581	0.1960
7. Wholesale & Retail Trade	-0.2602*	0.1400
8. Hotels & Restaurants	-0.1394	0.2275
9. Transport, Storage & Communications	0.0096	0.1402
10. Financial Intermediation	0.3892**	0.1632
11. Real Estate, Renting & Business Activities	-0.0077	0.1330
12. Public Administration & Defence	0.6737**	0.1805
13. Education	0.7397**	0.1867
14. Health & Social Work	0.3537*	0.1845
15. Other Community, social & personal service activities	0.0685	0.2092
Employees	0.5419**	0.2714
Self-employed without employees	0.4369	0.2905
Log earnings	0.2260**	0.0819
Full-time/part-time dummies (Reference group: Full-time permanent worker)		
2. Full-time temporary worker	-0.4840**	0.2111
3. Part-time permanent worker	0.2206	0.3326
Weekly working hours	-0.0054	0.0041
Tenure in present job dummies (Reference group: Less than 6 months)		
2. 6 months to 1 year	-0.0608	0.1873
3. 1 year to less than 5 years	0.1127	0.1381
4. 5 years to less than 10 years	0.1639	0.1572
5. 10 years to less than 20 years	0.0168	0.1660
6. 20 years or more	-0.1772	0.1876

Note: * Statistically significant at 10% ** statistically significant at 5%

Race has also been included as control variables.