TECHNICAL REPORT

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Employer-supported training in Australia: participation, demand and supply

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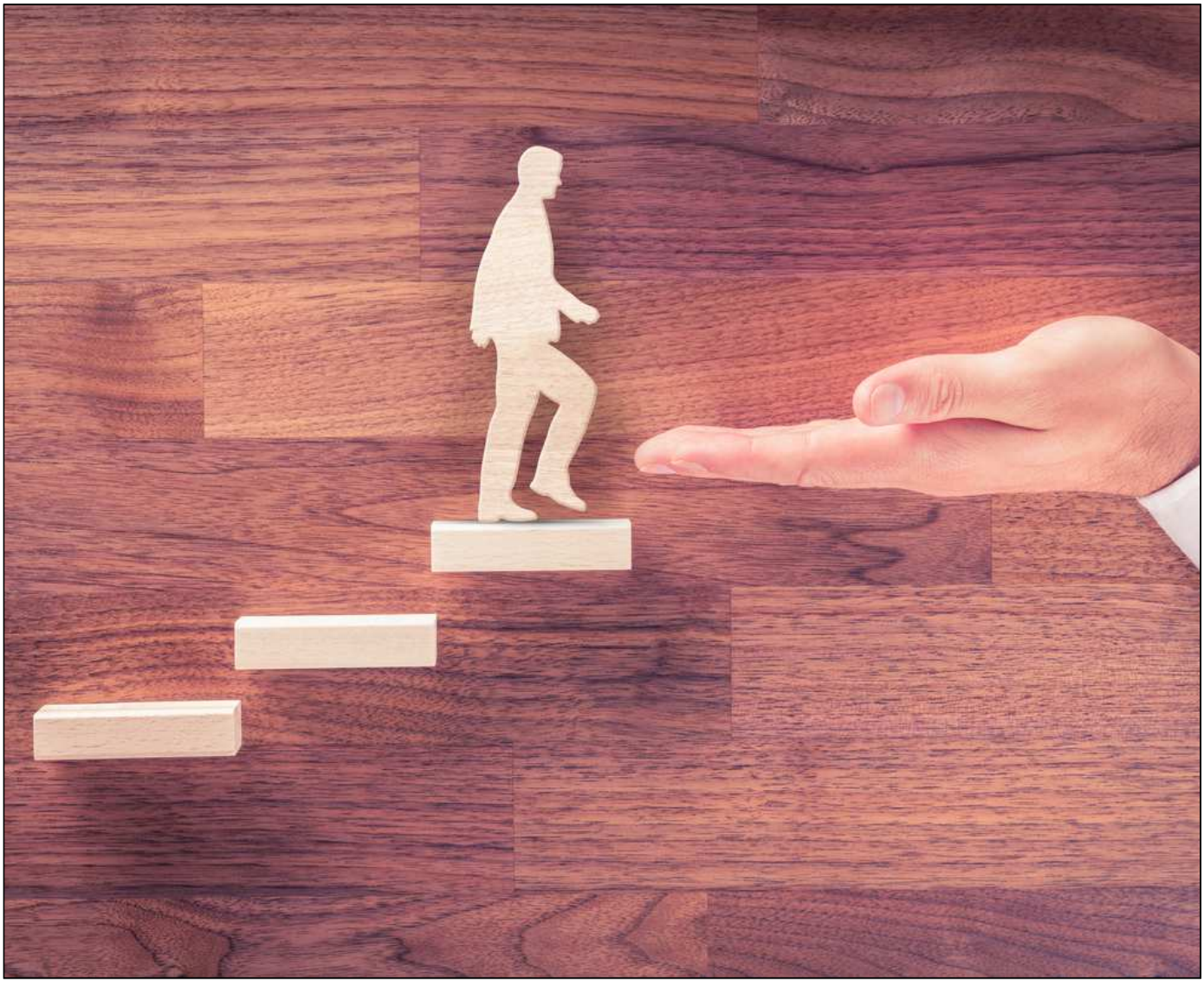

INFORMING POLICY AND PRACTICE
IN AUSTRALIA'S TRAINING SYSTEM

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Additional information relating to this research is available in *Workplace training: employer and employee perspectives* and *Employers' perspectives on training: three industries*. They can be accessed from NCVER's Portal <http://www.ncver.edu.au>.

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Executive summary

The results show an unequal distribution of employer-supported training across different groups of employees.

This report provides an analysis of employer-supported training in Australia. Employer-supported training is the largest share of adult education and training in all Organisation for Economic Co-operation and Development (OECD) countries. It has benefits for individuals, firms and society. Cross-country studies have shown a positive association between innovation and the proportion of firms in a country providing employer-supported training. Research has also shown that skills development complements the adoption of new technology and innovative human resource management practices to improve the productivity and competitiveness of firms.

In this study, we analyse data from the 2011—12 Survey of Adult Skills (PIAAC[1]) for Australia to investigate which individual, labour force and firm characteristics are important in explaining participation in employer-supported training. However, participation is the equilibrium outcome between the supply (employers' willingness to supply training) and the demand (employees' willingness to train) and does not tell us whether the observed inequalities in participation amongst groups of employees is a result of employer behaviour or employee behaviour. Additional information in the PIAAC data on unmet demand for training (training that employees wanted to undertake but could not, mainly because of an unwillingness on the part of the employer to support it) allows us to extend the study to explain whether the observed inequalities in participation are related to supply or demand factors. This is important for policy on workforce development in that it helps in the more effective design of targeted programs to address inequalities in participation in training.

The results show an unequal distribution of employer-supported training across different groups of employees. For instance, the observed lower participation in training among part-time employees is very much related to employers' reluctance to support their training and very little to do with part-time employees' willingness to train.

Scope of the study

The study is restricted to employees aged 16—65 years, interviewed for the Survey of Adult Skills in 2011—12, who undertook formal or non-formal training in the 12 months prior to their interview. Formal training leads to a recognised Australian Qualifications Framework (AQF) qualification; non-formal training does not. The latter includes activities such as organised on-the-job training; seminars or workshops; and training provided by supervisors or co-workers. Informal training, which almost all employees report having undertaken, is not part of this study. It includes learning by doing; being shown or watching others how to perform a task on the job as the need arises; and acquiring knowledge and skills through a variety of means such as reading manuals and journals. Employer support for training can be either through full or part payment of the costs of the training or by allowing employees time off from work to undertake the training.

1 The OECD's Programme for the International Assessment of Adult Competencies (PIAAC) conducts the Survey of Adult Skills.

The results probably reflect the changes in the labour market over the last couple of decades. Female labour force participation has increased, as has their share of employment in high-skilled occupations, which tend to be associated with higher participation in employer-supported training.

Method

We use a probit model to estimate the effects of various individual, job and firm characteristics on the probability of an employee participating in employer-supported training. In this model the dependent variable is binary, taking the value one (1) if the employee participated in training and zero otherwise.

Using the additional information on unmet demand for training, we use a structural model to identify the supply from the demand. In this model, employers will supply training if they believe training will result in a net benefit to the firm. Similarly, employees will undertake training if they believe the training will result in a net benefit to them. The likely correlation between the employer and employee decisions (although, arguably, the decisions are jointly determined) means they have to be modelled jointly. We use a Heckman selection framework to specify them, with a probit model for the selection equation (employee's demand or willingness to support training) and for the outcome equation (employer's supply or willingness to support training). A range of individual, job and firm characteristics are included as explanatory variables. Such a model is sometimes referred to as a bivariate probit with sample selection.

Key findings

About 70% of all employees participated in formal or non-formal training, with employers supporting a significant majority of them through payment of the full or part cost of the training or providing time off from work to undertake the training.

Despite this, about a quarter of all employees had unmet demand. Some of the reasons for unmet demand were:

- 'too busy at work', implying that the employer was unwilling to adjust their job tasks to allow time for training
- cost of training
- issues related to lack of childcare and family responsibilities.

Our analysis identified a number of significant individual, labour force and firm characteristics that contributed to the unequal distribution in participation in employer-supported training.

Unlike some earlier studies, we find gender is not significant in predicting participation. Not only do males and females have a similar demand for training, but also employers do not appear to discriminate by gender when making decisions on whom to support for training. The results probably reflect the changes in the labour market over the last couple of decades. Female labour force participation has increased, as has their share of employment in high-skilled occupations, which tend to be associated with higher participation in employer-supported training.

Age is not statistically significant in predicting participation in training, even though the difference in the probability of participation between the youngest and oldest employees can be as much as 14 percentage points. The joint modelling of the supply and demand decisions however indicates that older employees have a lower willingness to train but that there is no discrimination against older employees on the part of employers. To increase the training of older workers, which is important for improving

productivity and for prolonging older employees' participation in the labour force, policies would, therefore, be more effective if they focused on changing employee rather than employer behaviour.

With the increasing rate of part-time work in the labour market, the training of part-time employees should be a policy concern, as ignoring the issue has the potential to affect future productivity growth and innovation.

We find only weak evidence for employer bias against the support for training for immigrant employees who do not speak English well. This is in contrast to some previous studies, which found employer bias and suggested the additional cost of complementary native language (English in the case of Australia) instruction as a possible barrier. In Australia, government-subsidised literacy programs (for example, Workplace English Language and Literacy [WELL]), available around the time when the Survey of Adult Skills was conducted, may have offset such costs.

An employee's willingness to train increases with their educational attainment. This supports the notion that 'learning begets learning'. Furthermore, employers tend not to discriminate between employees with higher education and those with vocational qualifications when making decisions on whom to support for training, but they are much more reluctant to support the training of employees with only school-level attainment.

Employees who are more literate are much more likely to participate in training because they are more willing to train and because employers are more willing to support their training. A partial explanation of this result is that employees who are more literate have better access to information on training opportunities. In addition, employers may use literacy to screen employees' suitability for training. In contrast, an employee's readiness to learn has a significant effect only on the employee's willingness to train: employers' decisions on whom to support for training are unaffected by this characteristic of employees. A possible explanation of this result is that employers are unable to observe easily the employee characteristics[2] included in the construction of the index of readiness to learn.

Part-time employees are significantly less likely to participate in training than are full-time employees. This is mainly a result of the reluctance on the part of employers to support the training of part-time workers, who have just as much demand for training as full-time employees. With the increasing rate of part-time work in the labour market, the training of part-time employees should be a policy concern, as ignoring the issue has the potential to affect future productivity growth and innovation.

Unlike some previous studies, we find no evidence for the employment contract type (excluding apprenticeships) having any effect on the employee's willingness to train or the employer's willingness to support their training. It is possible that employees on short-term contracts are more likely to be undertaking training in any given period, given that they participate more frequently in induction training as they move from job to job. The results relating to casual employees are however surprising, but suggest that, despite the casualisation of jobs that were traditionally ongoing, training is still required in these jobs. In other words, the results support the notion that training goes with the job and not with the person.

2 The characteristics include metacognitive abilities that structure the learning process and affect the efficiency with which new information is processed.

Multiple risk factors can have a compounding effect on an employee's demand for training, as well as on a firm's willingness to support their training.

Participation in training in the private sector is significantly lower than in the public sector, largely because private sector employers are more reluctant to support their employees' training. Employees in the private and public sectors have a similar willingness to train. An information campaign promoting the benefits of training may be one way to encourage private employers to support the training of their workers.

Employer-supported training is much less likely to occur in smaller firms than in larger firms, a finding that is consistent with many other studies. From the perspective of the employer, the smaller internal training market in small firms makes organising training less economical than in large firms. Why employees in smaller firms have a significantly lower demand for training is however difficult to explain. Further research on skill formation in small firms, including the role of informal learning, could perhaps shed light on this issue.

Finally, multiple risk factors (e.g. hours of work, educational attainment, occupation and industry) can have a compounding effect on an employee's demand for training, as well as on a firm's willingness to support their training. Policies to address multiple risk factors are generally more difficult to design and implement.

Concluding remarks

This study has shown that the analysis of participation, which is the equilibrium state between supply and demand, while important, provides only a partial understanding of the dynamics of employer-supported training. Disentangling the factors of supply and demand, as undertaken in this study, is important for the better targeting of public policy on workforce development.

Introduction

Due to a lack of appropriate data, research untangling the factors of supply and demand is limited.

This study uses data from the 2011—12 Survey of Adult Skills (PIAAC) for Australia to analyse the factors of supply and demand of employer-supported training.

While quality initial education, including early childhood education, must remain a priority to foster long-run economic growth, strategies to increase human capital should also focus on the education and training of the current workforce, the majority of whom will still be working in the medium term (OECD 2003).

Context

The amount of training that individuals receive during their working lives has a significant impact on their wages, career prospects and employability. Spillover effects occur through the informal transfer of skills and knowledge to work colleagues, and other firms benefit by recruiting the trained worker. Firms benefit through improved productivity and lower staff turnover. Employer-supported training is positively associated with the level of innovation in a country (Cedefop 2012); and it complements adoption of new technology and innovative human resource management practices in improving the productivity and competitiveness of firms (Laplagne & Bensted 1999). In spite of the positive benefits, some employees do not take part in training, either because they do not want to or because the employer does not support them.

Appropriate policy responses to encourage training require an understanding of the factors of both the supply and the demand. Supply here means the training that employers are willing to provide to their employees, while demand means the training employees would like their firms to provide and support.[3] Generally, empirical research focuses on the determinants of participation in training (the equilibrium outcome between the supply and demand).[4] While this is important, it does not tell us whether the observed inequality in training amongst groups of employees is a result of *employer* behaviour (supply-side factors) or *employee* behaviour (demand-side factors). For instance, much research cannot explain whether the decrease in training participation by age, observed in many datasets, is due to employer discrimination against older workers or a lack of demand from older workers. This additional information is vital for policymakers when developing targeted policy responses for workplace training.

Due to a lack of appropriate data, research untangling the factors of supply and demand is limited. Information on unmet demand for training collected in some surveys allowed some scholars to model the supply and demand decisions jointly in a structural framework (Oosterbeek 1998; Leuven & Oosterbeek 1999; OECD 2003; Bassanini & Ok 2004; Croce & Tancioni 2007; Maximiano 2012). Unmet demand is training that an employee wanted to undertake but could not, mainly because of an unwillingness on the

3 The market for training can be broken into two sub-markets: an upstream market, in which the employer buys training from a provider; and a downstream market, in which the employer resells the training to their employees, with the price for training hidden in wages. This study is about the downstream market.

4 For this purpose, reduced form models are usually used.

part of the employer to provide or support it. Fortunately, the Survey of Adult Skills includes information on unmet demand.

This study

We use the data from the Survey of Adult Skills for Australia to first study the effects of individual, labour force and firm characteristics on participation in employer-supported training. With the additional information on unmet demand, we then model the supply and demand decisions, using a structural framework.

The next section provides a brief review of the literature on investment in enterprise-based training. The third section describes the data and the fourth section the results on participation in employer-supported training. The fifth section contains the results from the joint modelling of the supply and demand decisions. The last section draws some conclusions.

Data description

The Programme for the International Assessment of Adult Competencies (PIAAC), managed by the OECD, developed the Survey of Adult Skills. The survey measures adults' proficiency in key information-processing skills — literacy, numeracy and problem solving in technology-rich environments — and gathers information and data on how adults use their skills at home, at work and in the wider community. Initially, 25 countries in Europe, the Americas and Asia, including Australia, implemented the survey, and, as of 2016, the number had risen to 40. The Australian Bureau of Statistics (ABS) was responsible for the survey in Australia, which it conducted between August 2011 and March 2012.

Scope

There are two versions of the data from the Survey of Adult Skills for Australia — Australian and international. In this study, we use the international version, which has better supporting documentation. The data are representative of the Australian population aged 15—74 years in 2011—12.

As this study is on employer-supported training, the analysis is restricted to individuals between the ages of 16 and 65 years who worked as paid employees[5] at some time in the 12 months prior to their interview for the survey.[6]

Employer-supported training is defined to include both formal[7] education and training and non-formal[8] training undertaken in the 12 months prior to the interview and supported by employers through full or part payment of the costs of training, or by allowing employees time off from work to undertake the training.[9]

Characteristics of employees

The data contain a large amount of information about each employee's personal attributes, educational background and job characteristics, and some limited information about the firm where the employee worked. The data also contain information on the training, including whether the firm supported it or not.

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5 Includes any person who is an employee in their current job or, if not currently working, then an employee in their last job.

6 In the Survey of Adult Skills (PIAAC) the definition of adult education and training (AET) population is all adults, excluding youths aged 16—24 years in their initial cycle of studies. The population in scope for our study overlaps with this population (OECD, 2013a).

7 Formal education and training is structured, has specified content, has learning objectives and leads to a recognised qualification under the AQF.

8 Non-formal training includes: open or distance education courses; organised on-the-job training or training by supervisors or co-workers; seminars or workshops; or other kind of course or private lesson. The ABS has changed its definition of non-formal training since the 2009 Survey of Education and Training Experience (SETE). The new definition is consistent with UNESCO (2012).

9 Informal training, which includes learning by doing; being shown or watching others how to perform a task on the job as the need arises; and acquiring knowledge and skills through a variety of means such as reading manuals, journals etc. is excluded from this analysis.

About 70% of all employees participated in training and most of them received employer support for it.

Table 1 shows the profiles of four employee groups: (1) employees who participated in training with employer support; (2) employees who participated in training without employer support; (3) employees who did not participate in any training; and (4) all employees. The job and firm characteristics relate to the individual's current employment and if they were not in work at the time, then to their last job.

About 70% of all employees participated in training and most of them received employer support for it. The profiles of the four groups vary in different ways. For example, compared with the other groups, employees who did not participate in any training are more likely to be male; have low levels of educational attainment, literacy[10] and readiness to learn[11]; and work in blue collar or elementary occupations in the private sector, small firms and in manufacturing, wholesale trade and retail trade. [12] Among employees who are undertaking training without employer support, a relatively large proportion is on casual contracts.[13] A number of employees in the group are likely to be full-time students undertaking formal training but working part-time.

10 The Survey of Adult Skills measures the literacy and other information-processing skills of each person in the survey.

11 The index of readiness to learn comprises six items to assess respondents' metacognitive abilities that structure the learning process and affect the efficiency with which new information is processed (OECD 2011). The responses to these six items are used to create an index about readiness to learn, which is standardised to have a mean of two (2) and a standard deviation of one (1) across the pooled sample of all participating countries in PIAAC (OECD 2013a; OECD 2013b). The higher the value of the index, the higher is a person's readiness to learn.

12 The 1-digit International Standard Industry Classification (rev. 4) (ISIC) has been collapsed into five industry groups for the purposes of this study because of the small sample size of many industry sectors at the 1-digit level. The definitions of the groups are in the table notes. For example, 'manufacturing' represents manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water and waste) and construction.

13 There are six types of employment contracts: indefinite, fixed term, temporary employment agency, apprenticeship, no contract and other. In the Australian data, no employees are on temporary agency contracts. We assume employees without a contract are on a casual contract (without leave entitlements). This assumption is reasonable as the proportion of employees without a contract approximately corresponds to the proportion of employees on a casual contract, as reported in ABS (2012) (confirmed in email communication with the ABS).

Table 1 Selected characteristics of employees aged 16–65 years[1] by whether they participated in training or not, 2011–12 (%)

Characteristic	Participated in training		Did not participate in training	All
	With employer support	Without employer support		
Gender				
Female	48.2	53.6	42.5	47.1
Male	51.8	46.4	57.5	52.9
Age (average years)	38.2	32.6	40.9	38.4
Children				
Yes	56.9	40.3	63.2	56.9
No	43.1	59.7	36.8	43.1
Living with spouse				
Yes	62.9	45.0	62.2	60.7
No	37.1	55.0	37.8	39.3
Australian-born or English-speaking				
Yes	87.7	84.0	85.5	86.6
No	12.3	16.0	14.5	13.4
Books at home				
< 26	19.3	18.0	28.5	21.9
26–100	34.6	29.0	36.8	34.6
100 >	46.1	52.9	34.7	43.4
Parents' education[2]				
Diploma or higher	35.0	43.7	21.2	32.0
Certificate III/IV or Year 12	26.5	31.2	25.5	26.7
Certificate II or lower	38.5	25.1	53.3	41.3
Educational attainment[3]				
Higher education	37.1	31.0	13.6	29.4
VET (excl. certificate I/II)	31.2	27.8	28.5	30.0
School (incl. certificate I/II)	31.8	41.1	57.9	40.7
Literacy (average)	294.3	293.7	268.8	286.6
Readiness to learn (average)	2.29	2.27	1.92	2.18
Hours worked				
Full-time	74.6	43.3	67.3	68.9
Part-time	25.4	56.7	32.7	31.1
Average tenure (years)[4]	7.5	4.7	7.2	7.1
No. of employers in last 5 years				
1	41.6	34.7	43.7	41.5
2	25.9	25.8	24.7	25.5
> 2	32.5	39.5	31.6	33.0
Skill level of occupation				
Skilled	54.5	40.6	27.7	44.9
Semi-skilled white collar	25.7	36.4	28.9	27.8
Semi-skilled blue collar	14.4	12.6	26.5	17.8
Elementary	5.5	10.4	16.9	9.5
Contract type				
Permanent	68.0	52.7	63.2	64.9
Fixed term	12.4	13.2	8.3	11.3
Apprenticeship	2.3	1.4	0.0	1.5
Casual	17.2	32.7	28.5	22.3

About a quarter (24.9%) of all employees had unmet demand for training.

Table 1 Selected characteristics of employees aged 16–65 years[1] by whether they participated in training or not, 2011–12 (%) (cont.)

Characteristic	Participated in training		Did not participate in training	All
	With employer support	Without employer support		
Sector				
Private	66.9	81.2	87.2	74.6
Public/non-profit	33.1	18.8	12.8	25.4
Firm size				
1–10	20.9	35.4	35.2	26.8
11–50	29.6	31.6	34.9	31.4
51–250	26.5	18.6	19.1	23.4
> 250	23.0	14.5	10.8	18.4
Industry band[5]				
Manufacturing	19.0	17.5	30.0	22.1
Wholesale & retail trade	23.5	33.7	38.0	29.0
Professional services	18.7	17.4	14.5	17.3
Education & health	35.5	28.6	15.2	28.7
Other services	3.3	2.9	2.3	2.9
All	58.7	11.3	30.0	100.0
Sample size	2925	511	1434	4874

Notes: Calculations use full sampling weights and exclude missing values. The percentages presented in this table are rounded to one decimal place. Rounding can lead to instances where numbers might not add to rounded totals (i.e. All).

1. Excludes 16 to 19-year-olds in compulsory education at the time of the interview.
2. Diploma or higher is equivalent to ISCED[14] 5 or 6; certificate III/IV or Year 12 to ISCED 3 (excluding 3C short) and 4; and certificate II or lower to ISCED 1, 2, 3C short.
3. Higher education is equivalent to ISCED 5A and 6; VET to ISCED 3C (two years or more), 4C and 5B; and school to ISCED 1, 2, 3A-B, including below ISCED 1.
4. Refers to tenure with current firm if employed, otherwise it refers to tenure with last firm.
5. Manufacturing = manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

Source: ABS (2015).

Unmet demand for training

The Survey of Adult Skills also collected information on the training a person wanted in the previous 12 months but was unable to access. Table 2 shows the percentage of employees who participated in training, or not. It also shows the percentage who had unmet demand for training, or not; and among those who participated in training, whether the training was supported by employers, or not. The table shows that about a quarter (24.9%) of all employees had unmet demand for training; 19.2 % had participated in training and 5.7% had not.[15] A number of employees participated in training but did not receive employer support for it.

Table 3 shows that the most common reason for unmet demand for training was 'too busy at work' and the second most common reason was 'too expensive/could not afford'. Other barriers cited were lack of childcare and family responsibilities.

14 ISCED = International Standard Classification of Education.

15 Unmet demand for training among employees in 2009 was higher at 29.1% (ABS 2009).

Table 2 Participation in training and unmet demand by employer support, employees aged 16–65 years, 2011–12 (%)

Whether participated in training or not	Whether had unmet demand for training or not	With employer support	Without employer support	All
Yes	Yes	16.3	3.0	19.2
	No	42.5	8.3	50.8
	All	58.7	11.3	70.0
No	Yes	0.0	5.7	5.7
	No	0.0	24.2	24.2
	All	0.0	29.9	29.9
Total	Yes	16.3	8.6	24.9
	No	42.5	32.6	75.1
	All	58.7	41.3	100.0

Notes: Calculations use full sampling weights and exclude missing values. The percentages presented in this table are rounded to one decimal place. Rounding can lead to instances where numbers might not add to rounded totals (i.e. All).

Excludes 16 to 19-year-olds in compulsory education at the time of the interview.

Source: ABS (2015).

Table 3 Unmet demand for training by reason for wanting to train, employees aged 16–65 years, 2011–12 (%)

Reason for wanting additional training	Participated in training		Did not participate in training	All
	With employer support	Without employer support		
Wanted additional training	16.3	3.0	5.7	24.9
Did not have the prerequisites	*0.3*	*0.1*	*0.1*	*0.5*
Too expensive/could not afford	*2.7*	*0.6*	*1.1*	*4.4*
Lack of employer's support	*1.4*	*0.3*	*0.4*	*2.0*
Too busy at work	*5.6*	*0.6*	*1.6*	*7.7*
Offered at an inconvenient time or place	*2.2*	*0.4*	*0.5*	*3.1*
Did not have time because of childcare or family responsibilities	*2.3*	*0.3*	*1.1*	*3.7*
Unexpected event prevented me from taking education/training	*0.4*	*0.1*	*0.1*	*0.6*
Other	*1.5*	*0.6*	*0.7*	*2.8*
Did not want training	42.5	8.3	24.3	75.1
All	**58.7**	**11.3**	**30.0**	**100.0**

Notes: Calculations use full sampling weights and exclude missing values. The percentages presented in this table are rounded to one decimal place. Rounding can lead to instances where numbers might not add to rounded totals (i.e. All).

Excludes 16 to 19-year-olds in compulsory education at the time of the interview.

Source: ABS (2015).

Determinants of participation

This section presents results from estimating the effects of various individual, job and firm characteristics on participation in employer-supported training. Participation is the equilibrium outcome between the supply and demand. The results provide a benchmark for contrasting the results for supply and demand in the following section.

We first specify the model for studying the effects of various explanatory variables on participation and then present the results from estimating the model. Before presenting the results, we discuss the choice of the explanatory variables included in the model.

Model

We use a probit model to estimate the probability of an employee participating in employer-supported training.[16] In this model the dependent variable is binary, taking the value one (1) if the employee participated in training and zero otherwise. The model includes a set of explanatory variables, discussed below.

Choice of explanatory variables

The choice of explanatory variables to include in the model is partly determined by what previous research has shown to be important and partly by the variables available in the Survey of Adult Skills. Many individual, job and firm characteristics are important in predicting the probability of participation in training (Blundell, Dearden & Costas 1996; Groot 1999; Long et al. 2000; OECD 2003; Leuven 2005; Asplund 2005; Bassanini et al. 2007; Hansson 2008). However, because of the institutional differences across countries and the changing structures of labour markets, the effects of the variables vary by country and by the collection period of the data for the study.

Personal characteristics

Gender

Booth (1991) found that females in the United Kingdom were less likely to receive job-related training and attributed the result to employer discrimination. Royalty (1996), using data from the United States, also found a gender effect but explained the result in terms of gender-specific job turnover rates. On the other hand, several studies for the Netherlands, using various data sources, showed that gender was not a significant factor on participation (Oosterbeek 1996, 1998; Maximiano 2012).

In Germany, the effect of gender on employer-supported training has varied according to the data used for the analysis. Pischke (2001), using data from the German Socioeconomic Panel, showed that females were significantly less likely to receive employer-supported training. Albert, GarcÍA-Serrano and Hernanz (2010), using the European Community Household Panel (ECHP) data, on the other hand, showed that

16 The model can be seen as the reduced form of an underlying structural model that incorporates both demand and supply factors.

gender was not a significant factor in Germany, the UK, Spain and Portugal, but women in France and Italy were significantly less likely to participate in enterprise-based training. In Australia, Wooden and Baker (1995) showed that women were less likely to participate in employer-supported training, but a more recent study by Draca and Green (2004) showed that gender had no significant effect. The presence of young children in the family and lack of affordable childcare may also be a source of reduced participation by women (Long et al. 2000).

Participation in employer-supported training decreases with the age of the employee.

Age

Participation in employer-supported training decreases with the age of the employee, although Barnes and Dixon (2010) show this not to be the case for females in New Zealand. The longer payback period from investing in the training of younger workers is one of the main reasons for the age effect. New entrants, who are generally younger workers, require initial or induction training to become productive.

Immigrant status

Some studies have found that immigrant workers have a lower probability of participation in employer-supported training when compared with native workers, although the evidence is at best weak. The OECD (2003) explained that employers' reluctance to provide training to immigrants may relate to the additional costs involved in providing complementary language courses. Groot (1999) suggested discrimination as the source of the effect. The result may also depend on the definition of immigrant status. In Australia, VandenHeuvel and Wooden (1995) found that immigrant women from non-English-speaking background countries were significantly less likely to participate in enterprise-based training. Similarly, in New Zealand, Barnes and Dixon (2010) found that only immigrants from Pacific and Asian countries had a lower probability of participation. These studies demonstrate the heterogeneity among the immigrant population and the importance of differentiating between those who speak the native language and those who do not. In the current study, we define immigrant status as foreign-born and non-English speaking at home. We do this because we believe the lack of English is more likely to be a barrier to training than the fact that a person was born overseas.

Education

Educational attainment has a positive effect on participation in employer-supported training. First, the returns from investment in training are higher (and quicker) for people with higher levels of ability[17] (Booth 1991; Green 1993; Lynch & Black 1998; Acemoglu & Pischke 1998). Education acts as a screen for workers' potential for successfully undertaking training. It seems more effective to train a worker who has already demonstrated an interest in learning through their previous educational attainment. Previous education can then form the basis for building new skills. Some

17 The lack of reliable data on ability (cognitive capacity, often measured by an IQ test) and motivation (attitude) means that they are often missing in models examining participation in training. Instead, most studies use educational attainment as a proxy for it.

Some firms put additional resources in the screening and hiring of workers whom they expect to train later, which suggests that they consider training to be complementary to formal education.

firms put additional resources in the screening and hiring of workers whom they expect to train later, which suggests that they consider training to be complementary to formal education (de Grip & Hovenberg 1996; Albert, GarcÍA-Serrano & Hernanz 2010; Burdett & Cunningham 1998; Barnes & Dixon 2010). Second, highly qualified workers are more able to co-invest in their own training, as they tend to be less credit-constrained than low-skilled workers (OECD 2003). Other information related to previous educational attainment available in the Survey of Adult Skills is the worker's level of literacy and readiness to learn. The OECD (2003) showed that literacy had a positive effect on the supply of training but not on demand.

Mobility

While an extensive literature exists on the relationship between firm-based training and firm turnover (Doeringer & Piore 1985; Blinder & Krueger 1996), there is little in the literature on the effect of an employee's mobility, measured as job-to-job mobility, on their participation in training. One exception is Dearden et al. (1997), who showed that job-to-job mobility was lower among workers who had participated in training in previous periods. In the current study, the measure of a worker's mobility is the number of employers they had in the previous five years.

Tenure

To enable a worker to adapt their existing skills and competencies to the specific demands of the new job, induction training is often required when he or she first commences a job (Greenhalgh & Mavrotas 1996; Barron, Berger & Black 1999), with further training sometimes delayed (Loewenstein & Spletzer 1997). The delay may provide employers with the opportunity to determine new employees' commitment to the firm. This suggests a U-shaped relationship, which is largely confirmed by Bassanini et al. (2007), although other studies are less clear.

Shields (1998) found the effect of tenure significant only for full-time female employees in the UK. Barnes and Dixon (2010) found that employees with fewer than six months tenure were much less likely to participate in training than other employees in New Zealand, which suggests that employers are biding their time to find out more about the workers' suitabiliy for training, a result contrary to the theoretical prediction. In Canada, Wen et al. (2015) found a significant but small positive effect of tenure on participation in formal employer-supported training.

Australian studies also show mixed results. Kennedy et al. (1994) found a positive effect and suggested reward for seniority as the reason. Draca and Green (2004) also found a positive effect but only for male workers. In contrast, Miller (1994) found no significant effect of tenure.

Job characteristics

Occupation

Participation in employer-supported training typically increases with the skill level of the occupation (Asplund 2005; Long et al. 2000). Pischke (2001) showed that blue collar workers in Germany received significantly less employer-supported training (apprenticeships are excluded) than white collar workers. Barnes and Dixon (2010) also

reported higher participation in higher-skilled occupations in New Zealand, although for males the evidence was weaker.

Participation in employer-supported training typically increases with the skill level of the occupation.

Hours worked

Hours worked is one of the strongest predictors of participation in enterprise-based training (Asplund 2005; Long et al. 2000; Groot 1999). Draca and Green (2004) showed that, in Australia, part-time male (female) workers were 10 (8) percentage points less likely to participate in employer-supported training than full-time male (female) workers. Barnes and Dixon (2010) also found similar results for New Zealand.

Type of contract

There is a large body of empirical evidence showing that workers on temporary contracts, including casual contracts, participate significantly less in firm-based training than workers on ongoing contracts (Jonker & de Grip 1999; Booth, Francesconi & Frank 2000; Arulampalam & Booth 1998; OECD 2003; Arulampalam, Booth & Bryan 2004; Wallette 2005).[18] Booth, Francesconi and Frank (2000) also show that seasonal/casual workers in the UK have a lower probability of participating in on-the-job training. In Australia, Draca and Green (2004) found that casual workers in the mid-1990s were between 17 and 19 percentage points less likely to receive employer-supported training than other workers. The rationale for employers being less willing to invest in the training of temporary workers is the same as for their investing less in the training of part-time workers: the returns on investment are lower, as well as the risk higher of the worker leaving the firm. On the other hand, as has been argued by some, employers might want to offer training to learn about the worker's ability before offering them a permanent contract. This would then imply a positive relationship between temporary contracts and participation in training. According to Arulampalam, Booth and Bryan (2004), labour hire firms, who mainly have temporary workers, use training to screen workers' ability.

Firm characteristics

Industry

The differences in participation in employer-supported training across industry may reflect the differences in the pace of technological change, with higher participation in industries that are ahead of the curve in adopting new technologies (Groot 1999).

Sector

Empirical evidence shows workers in the public sector are significantly more likely to be participating in firm-based training than workers in the private sector (OECD 1999; Bassanini et al. 2007; Draca & Green 2004). According to Booth (1991), employer-supported training will always be less in the private sector because of the greater

18 The definition of a temporary contract can vary from country to country. For instance, Wallette (2005) distinguished five different types of temporary contracts in Sweden. A casual contract is also a type of temporary contract. It is important to take account of the differences in definition when comparing results across countries.

The economies of scale, organisational structure and comparatively large internal training markets of large firms make it relatively easy for these firms to provide and support the training of its employees.

uncertainty about the returns from training in the face of market fluctuation, a situation the public sector does not experience. The higher union density in the public sector also helps to explain the higher rates of training in the sector. Unions tend to push for higher levels of training because skill levels can be used as a lever in wage bargaining.

Firm size

Studies for almost all countries show that the probability of participation in enterprise-based training increases with the size of the firm (OECD 2003; Pischke 2001; Draca & Green 2004; Bassanini et al. 2007; Croce & Tancioni 2007; Albert, GarcÍA-Serrano & Hernanz 2010). The economies of scale, the organisational structure and the comparatively large internal training markets of large firms make it relatively easy for these firms to provide and support the training of its employees. In small firms, the smaller distance between employers and workers means informal training is perhaps more effective for skills development. Smaller firms also have tighter liquidity constraints and have fewer opportunities to fully realise the benefits of training through the internal reallocation of workers (OECD 2003).

Results

The Survey of Adult Skills used a complex sampling design. Therefore, the data include the final sampling weight and 60 replicate weights for calculating population estimates that reflect the true underlying population.[19] Also provided with the data are 10 plausible values for each of the three cognitive domains: literacy, numeracy and problem-solving in a technology-rich environment. The cognitive item responses for each domain were calibrated, analysed and scaled to derive the plausible values.[20]

A number of explanatory variables had missing values because either the individual refused to provide the information relevant to the question or they did not know the answer. Rather than discarding these observations from the analyses, we imputed their values using multiple imputation methods.[21]

Table 4 shows the estimates from the probit model. In the model, age, tenure, literacy score and readiness to learn are continuous variables.[22] Unlike the output from a linear model, where the coefficients have a direct interpretation, the coefficients in the output from a probit model are difficult to interpret because of the non-linearity of the underlying model. For this reason, we also report the mean marginal effect (average partial effect) of each explanatory variable. The mean marginal effect of a categorical variable shows the change in the probability of participation in employer-supported training relative to the reference category, controlling for all other variables in some way.[23] For example, the results show that the probability of participation for a part-time employee is 12.5 percentage points lower than for a similar full-time employee.

While many of the results in table 4 (p.27) are consistent with what has been reported in the literature, including the coefficients having the expected signs, others are not. As our main interest is on disentangling the factors of supply and demand, we only briefly discuss the main results on participation below.

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19 Replicate weights allow a single sample to simulate multiple samples, thus allowing for the calculation of standard errors from data derived from complex sample designs. We use standard errors to obtain precise confidence intervals and conduct significance tests. Using sampling weights helps to minimise the biases in the estimates.

20 Plausible values are a statistical means to replicate a probable score distribution, which summarises how well each respondent answered a small subset of the assessment items, and how well other respondents from a similar background performed on the rest of the assessment item pool. The data includes, for each person in the sample, 10 plausible values for each proficiency. See von Davier, Gonzalez & Mislevy (2009) for further explanation and discussion of plausible values.

21 For each plausible value for literacy, three multiple imputed datasets were generated. This means we had in total 30 multiple imputed datasets. Details of the methods used for imputing the values of each variable are available from the author on request.

22 Age tenure and readiness to learn are included in quadratic form in the model to capture the possible non-linearity in the relationship between the probability of participation and these variables.

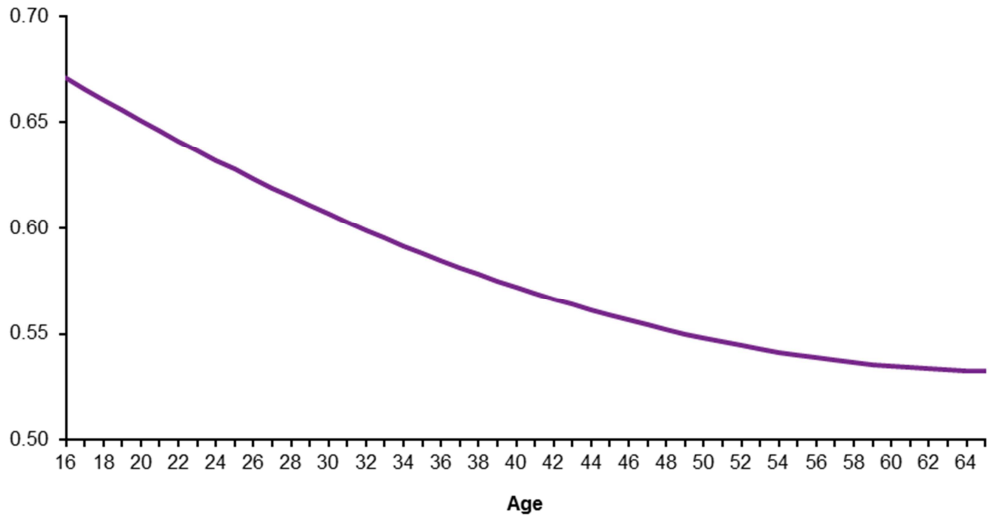
23 One way to control all other variables is to use their observed values. In this case, the average partial effect is the mean of the partial effects over the whole sample. In effect we are comparing two hypothetical populations, for example, one all male and the other female, who have the exact same values on the other independent variables in the model. In linear regression, this is the relevant slope coefficient but in non-linear models this no longer the case.

Literacy score has a strong positive effect on participation.

Age

The results show that age is statistically not a significant determinant of participation in employer-supported training. The results are consistent with those reported in the literature. Figure 1 shows the average predicted probability[24] of participation by age. It indicates that the difference in the probability of participation between the youngest and oldest is still substantial.

Figure 1 Average predicted probability of participation in employer-supported training by age



Gender

Gender is also not significant in explaining the variation in participation, a result which is consistent with some recent findings, for example, Maximiano (2012) but, as the review by Asplund (2005) shows, contrary to some earlier findings.

Immigrant status

Contrary to VandenHeuvel and Wooden (1995), we find immigrant status is not a significant determinant of participation in employer-supported training in Australia.

Education

Employees who have attained a vocational education and training (VET) qualification are just as likely to participate in training as those who have attained a higher education qualification. In contrast, employees who have only attained a school-level qualification are significantly less likely to be participating.

The employee's literacy score has a strong positive effect on participation. The average predicted probability of participation increases by approximately 0.8 percentage points

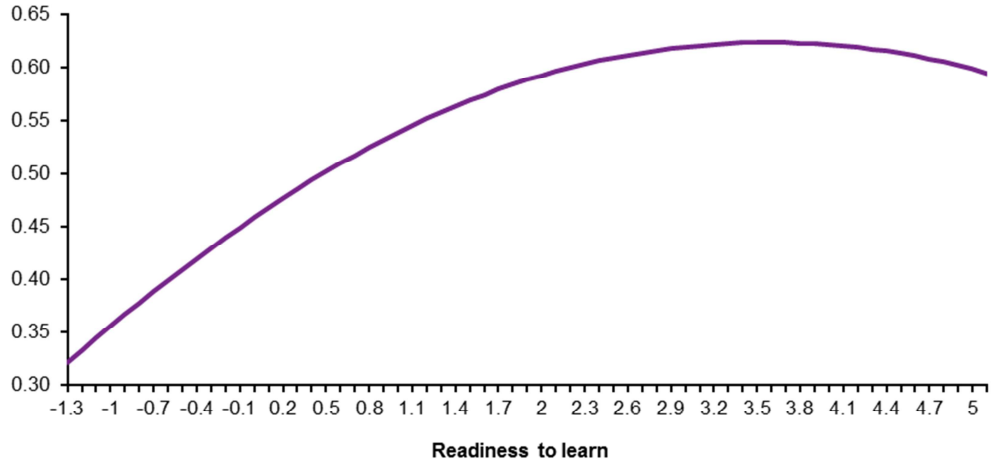
24 The average predicted probability is the average of the predicted probabilities calculated by fixing the value of the variable of interest at a particular value and letting all other variables range over their actual values.

for every 10-point increase in the literacy score. Australian employees' literacy scores range from 63 to 395.

Similarly, the employee's readiness to learn has a strong positive influence on their participation in training. Figure 2 shows that the average predicted probability of participation increases sharply with the index of readiness to learn until about the average value (2.18) of the index before plateauing.

Compared with employees in manufacturing, those in health and education are significantly more likely to participate in employer-supported training.

Figure 2 Average predicted probability of participation in employer-supported training by index of readiness to learn



Hours of work

Consistent with findings from numerous previous studies, we find part-time workers are significantly less (12.6 percentage points) likely to participate in employer-supported training than full-time employees.

Employment contract

Unlike previous studies, we find the employment contract type is statistically not a significant determinant of participation. Increasingly, fixed-term and casual contracts are replacing permanent contracts for jobs traditionally requiring training. However, as the training requirement in these jobs has not changed, it suggests the notion that training goes with the job. It is also possible that employees on casual and fixed-term contracts, which are usually short-term, are more likely to be observed undertaking training in any given period because of their more frequent participation in induction training as they move from job to job.

Occupation

Participation in training increases with the skill level of the occupation: employees in semi-skilled blue collar and elementary occupations are 9.6 and 13.8 percentage points less likely to participate than are employees in skilled occupations. These results are not so surprising given the effects of education on participation in table 4.

Industry and sector

Compared with employees in manufacturing, those in health and education are significantly more likely to participate in employer-supported training. Similarly, the probability of participation is significantly higher for employees in the public than in the private sector.

Firm size

Not surprisingly, firm size has a significant effect on participation. For instance, the probability of participation in training for an employee in a large firm (more than 250 employees) is as much as 15 percentage points higher than for a similar employee in a small firm (1—10 employees).

Table 4 Participation in employer-supported training: probit (reduced-form model) coefficients and mean marginal effects (MME) (%)

Variable	Coefficient	MME (std err)
Age	-0.022	-0.313 (0.919)
Age (squared)	0.000	
Gender (ref. = female)		
Male	-0.027	-0.899 (1.878)
Living with spouse (ref. = yes)		
No	-0.054	-1.810 (2.431)
Have children (ref. = yes)		
No	-0.045	-1.506 (2.549)
Australian-born or English-speaking (ref. = yes)		
No	-0.109	-3.671 (2.721)
Books at home (ref. = < 26)		
26–100	-0.020	-0.146 (2.104)
100 >	-0.009	-0.927 (2.556)
Parents' education[1] (ref. = diploma or higher)		
Certificate III/IV or Year 12	-0.004	-0.676 (2.383)
Certificate II or lower	-0.028	-0.312 (2.282)
Educational attainment[2] (ref. = higher education)		
VET (excl. certificate I/II)	-0.033	-1.106 (2.405)
School (incl. certificate I/II)	-0.297 ***	-10.212 (2.649)
Literacy	0.002 ***	0.076 (0.024)
Readiness to learn	0.269 **	3.578 (1.125)
Readiness to learn (squared)	-0.038 *	
Hours worked (ref. = full-time)		
Part-time	-0.366 ***	-12.546 (2.102)
Contract type (ref. = permanent)		
Fixed-term	-0.015	-0.510 (3.291)
Apprenticeship	1.331 ***	32.760 (4.393)
Casual	-0.104	-3.534 (2.385)
Skill level of occupation (ref. = skilled)		
Semi-skilled white collar	-0.081	-2.765 (2.647)
Semi-skilled blue collar	-0.279 **	-9.638 (3.859)
Elementary	-0.397 ***	-13.816 (3.994)
No. of employers in last 5 years (ref. = 1)		
2	0.078	2.593 (2.537)
> 2	0.055	1.858 (2.915)
Tenure	0.015	0.403 (0.315)
Tenure (squared)	0.000	
Firm size (ref. = 1–10)		
11–50	0.172 ***	6.040 (2.098)
51–250	0.416 ***	14.303 (2.555)
> 250	0.438 ***	15.009 (2.661)
Sector (ref. = private)		
Public/non-profit	0.292 ***	9.808 (2.837)
Industry band[3] (ref. = manufacturing)		
Wholesale & retail trade	-0.013	-0.449 (3.122)
Professional services	0.179 *	6.123 (3.371)
Education & health	0.236 **	8.027 (3.800)
Other services	0.275	9.318 (6.651)
Constant	-0.272	
Sample size		4 874

Notes: 1. Diploma or higher is equivalent to ISCED 5 or 6; certificate III/IV or Year 12 to ISCED 3 (excluding 3C short) and 4; and certificate II or lower to ISCED 1, 2, 3C short.
2. Higher education is equivalent to ISCED 5A and 6; VET to ISCED 3C (2 years or more), 4C and 5B; and school to ISCED 1, 2, 3A-B including below ISCED 1.
3. Manufacturing = manufacturing agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

*, **, *** statistically significant at 10, 5 and 1%, respectively.

Average predicted probability

Table B1 in the appendix shows the average predicted probabilities of participation in employer-supported training for typical employees characterised by their: hours of work, educational attainment, occupation and industry. For example, the average predicted probability of participation for a 'typical' full-time employee who has attained a higher education qualification and who is working in a skilled occupation in the health and education sector is 0.756. In contrast, the probability of participation for a part-time employee who has only attained a school-level qualification and is working in an elementary occupation in the wholesale and retail trade sector is just 0.297. This example illustrates the compounding effect of different factors on participation.

Determinants of supply and demand

Understanding the drivers of this joint decision process is important for developing appropriate policy to address any market failure in workforce training.

The theoretical literature explicitly distinguishes between the factors of supply and demand, emphasising that training results from a joint decision of the employee and the employer, with benefits accruing to both parties (Arulampalam, Booth & Elias 1997a; Acemoglu & Pischke 1998; Hashimoto 1981; Becker 1975). Understanding the drivers of this joint decision process is important for developing appropriate policy to address any market failure in workforce training.

The lack of appropriate data to allow the separation of employee and employer preferences has been cited as the reason for some studies being unable to model the joint decision in a structural framework (Arulampalam, Booth & Elias 1997b). As Leuven and Oosterbeek (1999) note, the firm is often the focus when interpreting the results from the reduced-form models (probit model on participation), which implicitly assume the decision on training is solely that of the firm. This may be justified if all training was general but this is not necessarily the case, as components of training are for firm-specific skills. Furthermore, it is unclear how market failures, such as credit constraints and imperfect and asymmetric information, are reflected in the reduced-form model (Leuven & Oosterbeek 1999).

In some datasets, information about unmet demand for training has allowed researchers to construct a structural model for supply and demand, the first of which was Oosterbeek (1998). As the Survey of Adult Skills also has information on unmet demand, we are able to use Oosterbeek's model to study the factors of supply and demand for employer-supported training in Australia.

Model

Following OECD (2003), the market for training can be broken into two sub-markets, an upstream market, in which employers buy training from a provider; and a downstream market, in which employers resell the training to their employees, with the price for training hidden in wages.

In principle, the supply (by the employer) and demand (by the employee) are distinguishable in the downstream training market. Most datasets, however, only have information on participation, which is the resulting equilibrium between supply and demand at the equilibrium price. In other words, we cannot identify the supply from the demand in these data. With additional information on unmet demand for training, Oosterbeek (1998) showed how to construct a structural model to identify the supply from the demand in the downstream market. We outline the construction of this model below.

An employee will have a positive demand for training only if they believe the training is likely to provide them with net benefits. Similarly, a firm will supply training to an employee only if it believes the activity is likely to result in a net benefit for it. Based on this, four possibilities exist in relation to any training:

a) Both the employee and firm derive a net benefit.

b) Only the employee derives a net benefit.

c) Only the firm derives a net benefit.

d) There is no benefit to the employee or the firm.

Only in situation a, where both parties derive a benefit, does training take place. In all other situations, training does not take place because the net benefit for at least one of the parties is zero. Usually this means that the last three situations are indistinguishable. With the information on workers' unmet demand for training, it is possible to identify the demand for training and distinguish situation b from c and d.

An employee is considered to have a positive demand for training (derive a net benefit) if they are currently undertaking training which is not supported by the firm or they have unmet demand. From this information, it is possible to estimate the probability that a person has demand for training as a function of various explanatory variables. Assuming that the demand curves for two groups of employees are downward-sloping and do not cross, it is then possible to estimate the relative demand at a given price.

Without additional assumptions, the method of identifying demand outlined above is valid only for employees not receiving employer support for training (OECD 2003). Employees who receive employer support may or may not believe the training is beneficial for them. If, however, we assume that all employees who undertake training find it beneficial, then we can use the data for the whole sample of employees to estimate the demand for training. This assumption can be justified as follows: in a competitive labour market employers cannot force their employees to train against their will, even at zero cost to the employee, because the employee always has the option of leaving the current firm for another firm which offers the same wage but does not require the employee to train (Oosterbeek 1998).[25] Furthermore, in the Survey of Adult Skills almost all employees participating in training found it useful for doing their job and by implication beneficial.

Under this assumption, we can estimate the demand for training on the whole sample of employees with a probit model, where the binary dependent variable takes the value one (1) if the employee undertakes any training (employer-supported or not) or has unmet demand, and takes the value zero otherwise.

Only if employees believe the training is beneficial for them can we observe the supply of training by employers. In other words, we can observe supply on a censored or selected sub-sample. The supply decision can thus also be specified as a binary dependent variable, which equals one (1) if the employee participates in employer-supported training, and zero otherwise.

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25 An alternative assumption that can be made is that by threatening lay-offs or offering monetary compensation, an employer can always force a worker to train and, therefore, the demand (at zero cost) for workers receiving employer-supported training might not be positive and its sign is unobservable. In this case, demand is estimated consistently only for the sub-sample of employees not receiving employer-supported training. Bassanini & Ok (2004) and OECD (2003) obtained similar results under both assumptions. Maximiano (2012) proposed a more general specification, one that does not require making any assumptions.

As the two decisions are correlated, if not jointly determined, they can be specified in a Heckman selection framework, with a probit model in the selection equation (employee's demand for training) and a probit model also in the outcome equation (employer's supply of training), with a range of individual, job and firm characteristics as explanatory variables. Such a model is sometimes referred to as a bivariate probit with sample selection. The description of the model using mathematical notation is included in appendix A.

Age has a significant effect in determining demand for training but not supply.

Results

Table 5 (page 36) shows the results from estimating the model described above. In the outcome equation, we exclude two explanatory variables: books at home and parental education. In sample selection models it is generally recommended to exclude from the outcome equation at least one explanatory variable in the selection equation (Wooldridge 2010).[26]

Age

Age has a significant effect in determining demand for training but not supply, which means that employers do not use age when making decisions on whom to support with training. Figure 3 shows the variation in the average predicted probability of the supply and the demand for training by age. The probability of demand declines sharply with age, until about age 50 years and then plateaus. In contrast, the probability of supply varies very little with age. Thus, the declining participation in training with age observed in figure 1 is mainly a result of declining demand by employees and not due to employer discrimination against older employees.

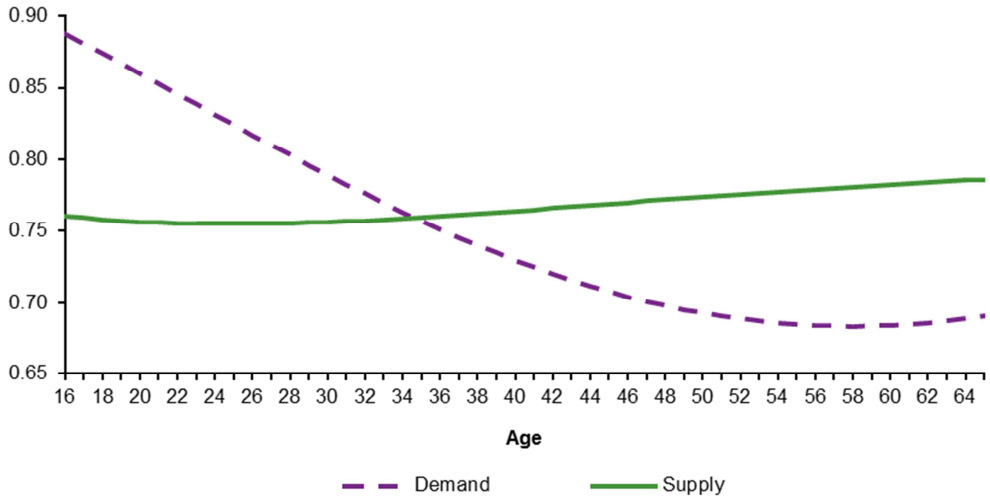
The results relating to employee behaviour are consistent with the model of dynamic human capital decision-making put forward by Ben-Porath (1967), whereby the optimal time allocated to learning decreases with age. At the beginning of a person's life, it is optimal to invest in full-time education, including apprenticeships. Part-time learning (including workplace training) and working is optimal for the rest of life, but the rate of return to training declines with the remaining length of their career.

The OECD (2003) also found that older workers have a lower demand for training, although it also found that employers were less willing to support training for the youngest workers (16—25 years). In contrast, in the Netherlands, Oosterbeek (1998) found the decline in participation by age was due to both supply and demand factors: older workers were less willing to train and firms had a preference for training younger workers. There are two ways to interpret the results from these two studies. For the firm the benefits depend on the worker's remaining time with the firm, which is longer for younger workers. On the other hand, because job mobility is higher for younger workers, employers may prefer supporting the training of older workers. More recent

26 The estimate of the correlation coefficient ($\rho = 0.856$) in this equation was found to be significantly different from zero at the 10% level, which means that the specification of the model as a bivariate probit (with sample selection) is justified.

data for the Netherlands however indicate the lower participation among older workers to be mainly a result of employer reluctance to support their training (Maximiano 2012).

Figure 3 Average predicted probabilities of demand and supply of employer-supported training by age



Gender

Gender is not significant in explaining the variation in either the demand or the supply decisions. In the Netherlands, Oosterbeek (1998) found females had a higher demand for training than males, but employers showed a preference for males when making decisions on whom to support with training. He explained his results as indicating that women have a higher need to compensate for the frequent career interruptions, but, from the employer perspective, the uncertainty about women's re-entry to work after career interruption exposed their training investment to risk. Maximiano (2012), also for the Netherlands but using different data, found no gender effect with respect to supply or demand. In Italy, Croce and Tancioni (2007) found no gender difference in the demand for training but females were significantly less likely to receive employer support for training. The results from more recent studies, including ours, perhaps reflect the structural changes in the labour market over the last decade, in particular the gains in employment and skills acquisition made by women. Wen et al. (2015) offer a similar explanation for the higher returns from employer-supported formal education for female Canadian workers.

Immigrant status

The estimated coefficients for the immigrant status (not Australian-born and not speaking English at home) are negative but statistically not significant, which suggests that, if there is any employer discrimination against immigrants with respect to supporting their training, then it is at best weak. The additional cost of providing complementary English language instruction, which could be an impediment to supporting the training of immigrant workers, was perhaps less of a problem at the time of the Survey of Adult Skills because employers had access to some government-subsidised programs for this specific purpose. Furthermore, because of labour market

segmentation, immigrants often work in jobs where minimal English language skills are required anyway.

The demand for training increases significantly with the employee's educational attainment.

Education

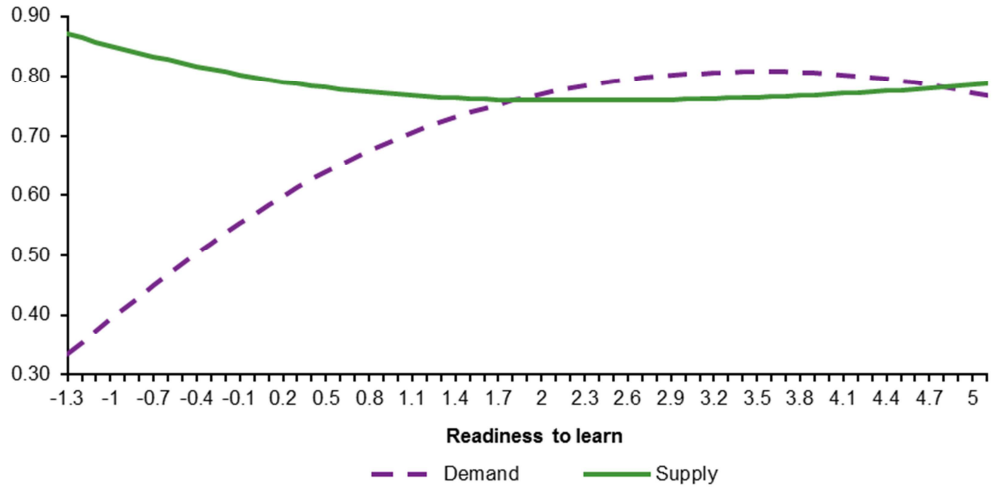
The demand for training increases significantly with the employee's educational attainment. Employers' supply decisions are however unaffected by the employees' educational attainment unless they have attained only school-level qualifications. The increasing participation in training with educational attainment is thus a result of both supply and demand decisions.

Unlike the OECD (2003), which found an employee's literacy level only significant in the supply decision, we find literacy is a significant factor for both the supply and demand decisions. The results support the notion that learning encourages more learning (Lillard & Tan 1992). Higher levels of literacy mean that employees have better access to information about training opportunities. Employers, on the other hand, may use literacy to screen employees for their ability and suitability for training.

While readiness to learn has a significant positive effect on the employee's demand for training, it has little effect on the employer's decision to support training. A closer look at the construction of the index of readiness to learn shows that the characteristics of the employee that make up the index are perhaps not observed easily by employers. It is thus unsurprising that the index is not significant in the employer's decision to support training or not.

Figure 4 shows that the average predicted probability of training demand increases sharply with the index of readiness to learn, until it reaches about the average value of the index (2.18), after which it remains more or less constant. The supply curve shows very little variation across the whole range of the index.

Figure 4 Average predicted probabilities of demand and supply of employer-supported training by index of readiness to learn



Part-time employees have a similar demand for training as full-time employees, but employers show a strong preference for supporting the training of full-time employees.

Hours of work

Part-time employees have a similar demand for training as full-time employees, but employers show a strong preference for supporting the training of full-time employees. The probability of an employer supporting the training of a part-time employee is 16.6 percentage points less than that of a full-time employee. Thus, the significantly lower participation in training among part-time employees reported in the previous section is almost all due to employers' unwillingness to support their training.

The OECD (2003) results are largely consistent with our findings, although their results were strongest for involuntary part-time workers. In contrast, Croce and Tancioni (2007) found little evidence of employer discrimination against part-time employees in Italy. They also reported part-time employees having a significantly lower demand for training than that of full-time employees, and suggested that the reasons for this may be the same as their reasons for choosing part-time work. While this may be true for voluntary part-time workers, it is unlikely to be true for involuntary part-time workers.

Employment contract

The employment contract (excluding apprenticeships) is not a significant determinant of supply or demand for employer-supported training. This means that employers do not take account of the type of contracts that employees are on when making decisions on whom to support for training. It also means that employees on casual and fixed-term contracts have as much demand for training as employees on permanent contracts. Notwithstanding the differences in the definitions of employment contracts across countries, these results diverge from the results of previous studies. The OECD (2003) and Croce and Tancioni (2007), for instance, found that temporary contracts had a significant negative effect on the supply decision. Maximiano (2012), on the other hand, found a significant negative effect on demand, although the supply decision was unaffected by the type of contract. As the labour market restructures, many of the permanent jobs, which normally attracted training, have become fixed-term or casual, but the training requirements in these jobs have not changed. This supports the notion that training goes with the job rather than with the employee and perhaps explains the results we are getting. On the other hand, the results could also be reflecting the frequent participation in induction training by employees on short-term contracts: as they move from job to job, they are more likely to be undertaking training in any given period.

Occupation

Both the demand for and the supply of employer-supported training increase with the skill level of the occupation, which is unsurprising given the correlation between educational attainment and occupation. The increasing participation in training by occupational skill level is thus due to both demand and supply factors.

Industry and sector

Employees' demand for training is significantly higher in the education and health industry than in any other industry. In contrast, employers show a similar willingness to

support training across all industries. This means that the higher participation in health and education is mainly a demand side issue. Health and education have a relatively higher percentage of employees in the public sector, with high educational attainment and high union membership, all factors associated with high levels of work-based training.

Firm size has a significant effect on both the supply and the demand for training.

Employers in the public sector are significantly (7.6 percentage points) more likely to support training than are those in the private sector. Employees' willingness to train is also higher in the public sector, but this result is much weaker. The observed higher participation in training amongst public sector workers is thus mainly due to the higher willingness of employers in this sector to support their training.

Firm size

Firm size has a significant effect on both the supply and the demand for training. In contrast, the OECD (2003) found that firm size was only significant for determining supply. More recent studies tend to concur with our findings (Croce & Tancioni 2007; Maximiano 2012). However, it is unclear why employees in smaller firms have less demand for training than do employees in larger firms.

Table 5 Demand and supply of employer-supported training: bivariate probit (with sample selection) coefficients and mean marginal effects (MME) (%)

Variable	Demand		Supply	
	Coefficient	MME (std err)	Coefficient	MME (std err)
Age (years)	-0.057 ***	-0.461 (0.066)	-0.025	0.037 (0.106)
Age-squared	0.000 ***		0.000	
Gender (ref. = female)				
Male	-0.003	-0.091 (1.912)	-0.034	-1.170 (2.277)
Living with spouse (ref. = yes)				
No	0.081	2.099 (2.098)	-0.093	-4.781 (2.116)
Have children (ref. = yes)				
No	-0.088	-2.290 (2.247)	-0.012	1.028 (2.491)
Australian-born or English-speaking (ref. = yes)				
No	-0.009	-0.246 (2.375)	-0.096	-3.364 (3.258)
Books at home (ref.= < 26)				
26–100	-0.030	-0.782 (2.170)		0.508 (1.320)
100 >	-0.018	-0.472 (2.222)		0.309 (1.383)
Parents' education[1] (ref. = diploma or higher)				
Certificate III/IV or Year 12	-0.084	-2.156 (2.008)		1.418 (1.611)
Certificate II or lower	-0.143 *	-3.713 (1.857)		2.416 (1.731)
Educational attainment[2] (ref. = higher educ.)				
VET (excl. certificate I/II)	-0.184 **	-4.482 (2.008)	-0.014	2.335 (2.577)
School (incl. certificate I/II)	-0.410 ***	-10.749 (2.322)	-0.257 **	-2.569 (3.129)
Literacy	0.003 ***	0.082 (0.020)	0.002 **	0.017 (0.021)
Readiness to learn	0.460 ***	5.072 (0.895)	0.159	-0.522 (1.411)
Readiness to learn (squared)	-0.065 ***		-0.019	
Hours worked (ref. = full-time)				
Part-time	0.004	0.102 (1.667)	-0.485 ***	-16.656 (2.336)
Contract type (ref. = permanent)				
Fixed term	0.016	0.426 (2.792)	-0.022	-1.065 (3.049)
Apprenticeship	2.194	23.730 (1.048)	1.229 ***	15.070 (4.670)
Casual	-0.069	-1.853 (2.210)	-0.108	-2.794 (2.517)
Skill level of occupation (ref. = skilled)				
Semi-skilled white collar	-0.160 **	-4.094 (1.959)	-0.042	1.078 (2.897)
Semi-skilled blue collar	-0.319 ***	-8.564 (3.339)	-0.245 **	-3.557 (3.739)
Elementary	-0.359 **	-9.753 (3.983)	-0.399 ***	-9.003 (4.586)
No. of employers in last 5 years (ref. = 1)				
2	-0.017	-0.449 (1.859)	0.103	3.950 (2.687)
> 2	-0.003	-0.078 (2.246)	0.058	2.138 (3.186)
Tenure (years)	-0.020	-0.249 (0.221)	0.026	0.899 (0.332)
Tenure-squared	0.001 *		-0.001	
Firm size (ref. = 1–10)				
11–50	0.022	0.607 (2.005)	0.209 **	7.791 (2.895)
51–250	0.307 ***	8.001 (2.256)	0.417 ***	10.335 (2.881)
> 250	0.349 ***	8.974 (2.468)	0.438 ***	10.420 (2.867)
Sector (ref. = private)				
Public/non-profit	0.190 *	4.816 (2.358)	0.310 ***	7.635 (2.527)

Table 5 Demand and supply of employer-supported training: bivariate probit (with sample selection) coefficients and mean marginal effects (MME) (%) (cont.)

Explanatory variable	Demand		Supply	
	Coefficient	MME (std err)	Coefficient	MME (std err)
Industry band[3] (ref. = manufacturing)				
Wholesale & retail trade	0.044	1.240 (2.043)	-0.041	-2.357 (3.302)
Professional services	0.138 *	3.792 (2.459)	0.134	2.395 (3.239)
Education & health	0.329 ***	8.498 (2.913)	0.173	0.780 (3.489)
Other services	0.248	6.567 (5.156)	0.237	4.117 (5.661)
Constant	0.883		-0.026	
Sample size		4 874		

Notes: 1. Diploma or higher is equivalent to ISCED 5 or 6; certificate III/IV or Year 12 to ISCED 3 (excluding 3C short) and 4; and certificate II or lower to ISCED 1, 2, 3C short.
2. Higher education is equivalent to ISCED 5A and 6; VET to ISCED 3C (2 years or more), 4C and 5B; and school to ISCED 1, 2, 3A-B including below ISCED 1.
3. Manufacturing = manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

*, **, *** statistically significant at 10, 5 and 1%, respectively.

Average predicted probability

Tables B2 and B3 in the appendix includes the average predicted probabilities of demand for training and those of supply of training for typical employees characterised by their hours of work, educational attainment, occupation and industry. For example, the probability that a full-time employee, who holds a higher education qualification and works in a skilled occupation in health and education, has a demand for training is 0.894. The probability of receiving employer support for training for the same employee is 0.842. In contrast, the corresponding probabilities for a part-time employee with a school-level qualification and working in an elementary occupation in manufacturing are 0.601 and 0.521, respectively.

Conclusion

This study has provided an analysis of employer-supported training in Australia using data from the Survey of Adult Skills conducted by the Programme for the International Assessment of Adult Competencies. The information on unmet demand for training from the survey enabled us to identify supply from demand. This is important for policy on workforce development as it provides for a more nuanced understanding of the dynamics of enterprise-based training.

The analysis showed unequal participation in employer-supported training across groups of employees identified by individual, labour force and firm characteristics. While many of these results are consistent with the results from previous studies, others are not.

The absence of any gender bias in employers' decisions on whom to support for training is probably a reflection of the changes in the labour market over the last couple of decades. Female labour force participation has increased, as has their educational attainment and share of employment in high-skilled occupations, factors all associated with higher participation in employer-supported training.

The study finds no evidence of employer bias against the training of older employees. However, employees' demand for training declines with age. Policies to increase the training of older workers, which is important for improving productivity and for prolonging older employees' participation in the labour force, would therefore be more effective if focused more on changing employee rather than employer behaviour.

The higher demand for training by more educated employees lends support to the notion that 'learning begets learning'. Employers, while not showing any preference for employees with higher education over those with vocational qualifications, are nonetheless reluctant to support the training of employees who have attained only a school-level qualification. Employers do not show a preference for employees on permanent contracts over those on other contracts (fixed-term and casual) when deciding whom to support for training. The results relating to employees on casual contracts were unexpected but, when placed in the context of the changing structure of the labour market and the notion that training goes with the job rather than with the employee, they begin to make sense. On the other hand, the results could also be a reflection of the frequent participation in induction training by employees on short-term contracts as they move from job to job. Future research could explore these issues further.

Part-time employees are much less likely to participate in training and this appears to be mainly a result of employer reluctance to support their training. As the rate of part-time work in the labour market continues to grow, future policy will need to focus on the lack of training opportunities for part-time employees: ignoring the issue has the potential to affect future productivity growth and innovation.

The lower participation in training in the private sector by comparison with the public sector is also largely due to employer reluctance. While public subsidies may be a way to encourage employers to offer more training, an information campaign explaining the benefits of training (for example, using real case studies) may be more cost-effective.

While the lower level of employer support for training in smaller firms is unsurprising, the lower demand is not. Further research may shed light on this issue, as well as on how skills and knowledge develop in small firms, in particular the role of informal training in the development.

Multiple risk factors can have a compounding effect on an employee's demand for training, as well as a firm's willingness to support their training.

Multiple risk factors (e.g. hours of work, educational attainment, occupation and industry) can have a compounding effect on an employee's demand for training, as well as a firm's willingness to support their training. Policies to address multiple risk factors are generally more difficult to design and implement.

The analyses have implications for public policy on workforce development. Public subsidies to enterprises to train their current employees may be appropriate in some circumstances, but the analyses in this paper suggest a more targeted strategy for cost-effectiveness. For achieving some outcomes, the policy has to address changing employer behaviour, and for achieving others, it has to change employee behaviour.

Future research could also investigate the interaction effects of some of the explanatory variables in the models, for instance, the interaction between hours worked and contract type.

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Appendix A: Investment in training: a brief review

There is an incentive for the firm to increase post-training wages to prevent voluntary resignations.

According to classical human capital theory, developed by Becker and others, training is an investment which raises future productivity, albeit at a cost (Mincer 1958; Schultz 1961; Becker 1962, 1964). Like investment in physical capital, it increases potential earnings over the life cycle, with returns deferred to the future. There are however differences between the two types of investment. First, unlike physical capital, human capital is embedded in an individual and it cannot be sold or transferred to another person, with only their services capable of being rented (Brunello, Garibaldi & Wasmer 2007). Second, there is the potential for workers to influence the outcome of the decision on human capital investment. For instance, following training, workers have the option of quitting the job on their own initiative or to engage in wage bargaining.

Becker (1964) separated on-the-job skills into two broad categories — general and firm-specific. General skills are transferable across firms and specific skills are useful only at one firm (sector or occupation). Becker further argued that, because general skills can raise productivity at any firm, the cost of acquiring these skills should be borne by the employee and, in a perfect labour market, the employee is able to obtain a wage increase as soon as they become more productive.

In contrast, specific skills are not transferable to other jobs. They simply generate a surplus or quasi-rent, which the employer and the employee can share. Optimal investment in firm-specific training can be realised only if the costs and benefits can be shared by the worker and the firm (Becker 1975; Hashimoto 1981; Acemoglu & Pischke 1998). Sharing ensures that both parties have an incentive to maintain the relationship after training and that the benefits of the training are negotiated and shared. The value of the specific training is only for the firm that provides it, in the sense that the training does not increase alternative job offers for the worker; however, once the investment is made, the firm faces a greater loss if the worker quits. For this reason there is an incentive for the firm to increase post-training wages to prevent voluntary resignations (Parsons 1987).

Empirical evidence often diverged from Becker's model, and was initially explained away as non-labour market imperfections, such as imperfect training and credit markets and coordination failure[27] (Bassanini & Ok 2004). Yet some other things could not be explained within this framework; for example, employers paying for general training, despite the risk of losing trained workers through poaching and a lack of evidence for workers' wages being cut during training (Loewenstein & Spletzer 1999; Acemoglu & Pischke 1999; Leuven 2005; Booth & Bryan 2007). To explain this, it was suggested that employers actually have market power in setting wages,[28] in that workers have imperfect

27 When returns from training and returns from the adoption of new technology are interdependent, employers and workers may decide not to invest if each expects low returns, leading to a bad coordination equilibrium and sub-optimal investment in training (Redding 1996).

28 Bassanini et al. (2007) use the term 'new oligopsony' to describe this. Oligopsony is a market form in which the labour supply curve facing a firm is not completely elastic.

Empirical studies on the firm-level productivity effect of training in Europe in fact show the productivity effect to be twice as large as the wage effect.

information about job opportunities (search frictions); they face costs when changing jobs (mobility costs)[29]; and they vary in their non-wage preferences, such as location, flexibility in hours, work culture, environment and collegial sociability (heterogeneous non-wage preferences).

If employers have the market power to set wages, then the wage returns from general training are likely to be less than the productivity returns and it would be profitable for firms to invest in general training (Bassanini et al. 2007). Empirical studies on the firm-level productivity effect of training in Europe in fact show the productivity effect to be twice as large as the wage effect (Dearden, Reed & Van Reenen 2006; Colombo & Stanca 2014; Konings & Vanormelingen 2014).

Employer-supported training accounts for the largest share of all adult education and training in all OECD countries (Bassanini & Ok 2004). Historical data identifying the net direct expenditure[30] on structured employer-supported training in Australia during the 2001—02 financial year (the latest year for which data are available) totalled $3652.8 million: $1036.7 million gross expenditure on trainers' wages and salaries and $2981.5 million direct training costs, offset by $365.5 million in training-related government subsidies and payments (ABS 2003). Remarkably, while real expenditure per employee changed little, government subsidies increased by more than 200% over the period 1996—2002.

29 In the sense that firms may also use back-loaded compensation schemes that induce costs for individuals who change employer (Salop & Salop 1976).

30 For a definition of net direct expenditure, see ABS (2003).

Appendix B

The model assumes the net benefit for the firm from training a worker is the increase in the productivity less the increase in wages and the cost of the training to the firm. We can represent this by the following equation:

$$b_f = (p_1 - p_0) - (w_1 - w_0) - c_f \quad (1)$$

where b_f is the net benefit to the firm, p_0 and p_1 the productivity before and after training, w_0 and w_1 the wages before and after training and c_f the cost of the training. The employee's gain from training is wage increase less the cost to them of training:

$$b_e = (w_1 - w_0) - c_e \quad (2)$$

where b_e is the net benefit to the employee and c_e the cost to them of training, which may include non-monetary costs. The worker's wage, w_a, at an alternative firm is assumed to be less than w_0. This means that both parties have an incentive to maintain the current relationship (Maximiano 2012).

An employee will have a positive demand for training only if they believe the training will be beneficial for them $(b_e > 0)$. Similarly, a firm will supply training to an employee (willingness to support training) only if it believes the activity will provide it with a net benefit $(b_f > 0)$. If the employee's demand and the firm's supply are affected by a set of explanatory variables (individual, job and firm characteristics), then the empirical equivalent of equations (1) and (2) can be specified as:

$$y_{ie} = \boldsymbol{X}_i \boldsymbol{\beta}_e + \epsilon_{ie} \quad (3)$$

$$y_{if} = \boldsymbol{X}_i \boldsymbol{\beta}_f + \epsilon_{if} \quad (4)$$

where y_{if} is supply of training; y_{ie} is demand for training; $\boldsymbol{X}_i$ is a vector of explanatory variables; $\boldsymbol{\beta}_e$ and $\boldsymbol{\beta}_f$ are vectors of parameters to be estimated; and ϵ_{ie} and ϵ_{if} are the error terms.

The actual supply (y_{if}) and demand (y_{ie}) for training are not directly observed in the data. However, we are able to relate them to two binary variables I_{ie} and I_{if} as follows:

$$I_{ie} = \begin{cases} 1 \; if \; y_{ie} > 0 \\ 0 \; if \; y_{ie} = 0 \end{cases} \quad (5)$$

$$I_{if} = \begin{cases} 1 \; if \; y_{if} > 0 \\ 0 \; if \; y_{if} = 0 \end{cases} \quad (6)$$

where I_{ie} and I_{if} represent the employee and the firm's decision on training.

Based on the above specification, four situations are possible:

a) $I_{if} = 1 \; and \; I_{ie} = 1$

b) $I_{if} = 0 \; and \; I_{ie} = 1$

c) $I_{if} = 1 \; and \; I_{ie} = 0$

d) $I_{if} = 0 \; and \; I_{ie} = 0.$

Training takes place, and we observe it, only in situation a). In this case, both parties expect to obtain a net benefit from the training decision. In all other situations, training does not take place, as the net benefit for at least one of the parties is zero. This means that we cannot distinguish between these three situations. The Survey of Adult Skills however collected information on employees who undertook training but did not receive employer support and employees who wanted to undertake training but did not (unmet demand). If we assume that these workers believe training provides them a net benefit, then we can distinguish situation b) from c) and d).[31]

Assuming all employees undertaking training find it beneficial (Oosterbeek 1998), then I_{ie} is completely observed on the full sample of employees. This is because we can identify all employees who undertook training (employer-supported or not) or who had unmet demand. On the other hand, we observe I_{if} only if an employee's demand for training is positive, which means we observe it only on a censored or selected subsample. Therefore the correct form for equation (6) is:

$$I_{if} = \begin{cases} 1 \; if \; y_{if} > 0 \\ 0 \; if \; y_{if} = 0 \end{cases} and \; if \; I_{ie} = 1 \tag{7}$$

We specify equations (5) and (7) jointly because of the correlation between the supply and demand decisions. One can argue that they are actually jointly determined.

We can calculate the probabilities of the three types of observations in the sample as:

$$\begin{aligned} Prob\big(I_{ie} = 1 \; and \; I_{if} = 1\big) &= \Phi_2(\boldsymbol{X}_i\boldsymbol{\beta}_e, \boldsymbol{X}_i\boldsymbol{\beta}_f, \rho) \\ Prob\big(I_{ie} = 1 \; and \; I_{if} = 0\big) &= \Phi_1\big(\boldsymbol{X}_i\boldsymbol{\beta}_f\big) - \Phi_2(\boldsymbol{X}_i\boldsymbol{\beta}_e, \boldsymbol{X}_i\boldsymbol{\beta}_f, \rho) \\ Prob(I_{ie} = 0) &= \Phi_1(-\boldsymbol{X}_i\boldsymbol{\beta}_e) \end{aligned} \tag{8}$$

where Φ_1 is the univariate standard normal distribution and Φ_2 the bivariate standard normal distribution with correlation ρ. Consequently, we can write the log-likelihood function as:

$$\begin{aligned} \ln L = \sum_{i=1}^{n} & I_{iw} I_{ie} \ln \Phi_2(\boldsymbol{X}_i\boldsymbol{\beta}_e, \boldsymbol{X}_i\boldsymbol{\beta}_w, \rho) \\ & + I_{iw}(1 - I_{ie}) \ln[\Phi_1(\boldsymbol{X}_i\boldsymbol{\beta}_w) - \Phi_2(\boldsymbol{X}_i\boldsymbol{\beta}_e, \boldsymbol{X}_i\boldsymbol{\beta}_w, \rho)] \\ & + (1 - I_{iw}) \ln \Phi_1(-\boldsymbol{X}_i\boldsymbol{\beta}_w) \end{aligned} \tag{9}$$

The model above allows us to estimate the relative supply of, and demand for, training for different groups of workers. It is equivalent to a Heckman selection model with a probit model in the selection equation and a probit model in the outcome equation. The outcome equation represents the firm's willingness to train (supply decision) and the selection equation represents the employee's demand for training (demand decision). In this specification, the dependent variable in the outcome equation is binary, which equals one (1) if the employee participated in employer-supported training and 0 otherwise. The dependent variable in the selection variable is also binary, which equals one (1) if the employee either participated in employer-supported education and training or had unmet demand and zero otherwise.

31 In the literature these types of models are variously referred to as censored probit, double probit, bivariate probit with sample selection or bivariate probit with partial observability (Meng & Schmidt 1985).

Table B1 Average predicted probability of participation in employer-supported training by hours worked, educational attainment, occupation and industry band

Hours worked	Education attainment	Occupation	Industry band[1]				
			Manufacturing	Wholesale & retail trade	Professional services	Health & education	Other services
Full-time	Higher ed	Skilled	0.682	0.677	0.739	0.756	0.768
		White collar	0.654	0.650	0.714	0.732	0.744
		Blue collar	0.584	0.579	0.648	0.667	0.681
		Elementary	0.540	0.535	0.606	0.626	0.640
	VET	Skilled	0.671	0.666	0.729	0.746	0.758
		White collar	0.643	0.638	0.703	0.721	0.734
		Blue collar	0.571	0.567	0.636	0.656	0.669
		Elementary	0.527	0.523	0.594	0.614	0.628
	School	Skilled	0.577	0.572	0.641	0.661	0.675
		White collar	0.547	0.542	0.612	0.633	0.646
		Blue collar	0.473	0.468	0.540	0.561	0.576
		Elementary	0.429	0.424	0.496	0.517	0.532
Part-time	Higher ed	Skilled	0.551	0.546	0.617	0.637	0.651
		White collar	0.521	0.516	0.587	0.608	0.622
		Blue collar	0.447	0.442	0.514	0.535	0.550
		Elementary	0.404	0.399	0.470	0.491	0.506
	VET	Skilled	0.539	0.534	0.605	0.625	0.639
		White collar	0.508	0.504	0.575	0.596	0.610
		Blue collar	0.435	0.430	0.502	0.523	0.538
		Elementary	0.392	0.387	0.457	0.479	0.493
	School	Skilled	0.440	0.436	0.507	0.529	0.543
		White collar	0.411	0.406	0.477	0.498	0.513
		Blue collar	0.340	0.336	0.404	0.425	0.439
		Elementary	0.301	0.297	0.361	0.382	0.396

Note: 1. Manufacturing = manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

Table B2 Average predicted probability of demand for employer-supported training by hours worked, educational attainment, occupation and industry band

Hours worked	Education attainment	Occupation	Industry band[1]				
			Manufacturing	Wholesale & retail trade	Professional services	Health & education	Other services
Full-time	Higher ed	Skilled	0.829	0.839	0.859	0.894	0.880
		White collar	0.789	0.801	0.824	0.865	0.848
		Blue collar	0.746	0.758	0.784	0.831	0.812
		Elementary	0.734	0.747	0.773	0.822	0.802
	VET	Skilled	0.783	0.795	0.818	0.860	0.843
		White collar	0.738	0.751	0.777	0.825	0.806
		Blue collar	0.689	0.703	0.732	0.786	0.764
		Elementary	0.676	0.690	0.720	0.775	0.752
	School	Skilled	0.718	0.732	0.759	0.809	0.789
		White collar	0.667	0.682	0.712	0.767	0.744
		Blue collar	0.614	0.629	0.661	0.721	0.696
		Elementary	0.600	0.615	0.647	0.709	0.683
Part-time	Higher ed	Skilled	0.830	0.840	0.860	0.894	0.880
		White collar	0.790	0.802	0.825	0.866	0.849
		Blue collar	0.747	0.759	0.785	0.832	0.813
		Elementary	0.735	0.748	0.774	0.823	0.803
	VET	Skilled	0.784	0.796	0.819	0.861	0.844
		White collar	0.739	0.752	0.778	0.826	0.807
		Blue collar	0.690	0.704	0.733	0.787	0.765
		Elementary	0.678	0.692	0.721	0.776	0.753
	School	Skilled	0.719	0.733	0.760	0.810	0.790
		White collar	0.669	0.683	0.713	0.769	0.746
		Blue collar	0.615	0.630	0.662	0.722	0.697
		Elementary	0.601	0.616	0.649	0.710	0.685

Note: Manufacturing = manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

Table B3 Average predicted probability of supply of employer-supported training by hours worked, educational attainment, occupation and industry band

Hours worked	Education attainment	Occupation	Industry band[1]				
			Manufacturing	Wholesale & retail trade	Professional services	Health & education	Other services
Full-time	Higher ed	Skilled	0.830	0.811	0.853	0.842	0.868
		White collar	0.840	0.820	0.861	0.848	0.875
		Blue collar	0.798	0.775	0.821	0.805	0.838
		Elementary	0.746	0.721	0.773	0.756	0.793
	VET	Skilled	0.853	0.833	0.872	0.859	0.885
		White collar	0.864	0.845	0.881	0.867	0.893
		Blue collar	0.827	0.804	0.847	0.829	0.861
		Elementary	0.779	0.753	0.802	0.782	0.818
	School	Skilled	0.811	0.787	0.832	0.815	0.847
		White collar	0.826	0.803	0.845	0.826	0.859
		Blue collar	0.784	0.757	0.805	0.782	0.821
		Elementary	0.729	0.699	0.754	0.728	0.772
Part-time	Higher ed	Skilled	0.671	0.647	0.706	0.697	0.731
		White collar	0.679	0.654	0.712	0.700	0.736
		Blue collar	0.619	0.591	0.653	0.639	0.679
		Elementary	0.555	0.527	0.591	0.577	0.618
	VET	Skilled	0.696	0.670	0.728	0.715	0.751
		White collar	0.708	0.682	0.738	0.721	0.759
		Blue collar	0.651	0.622	0.682	0.663	0.705
		Elementary	0.587	0.558	0.621	0.601	0.646
	School	Skilled	0.632	0.603	0.665	0.648	0.689
		White collar	0.648	0.618	0.679	0.657	0.701
		Blue collar	0.588	0.556	0.620	0.596	0.643
		Elementary	0.521	0.490	0.554	0.531	0.579

Note: Manufacturing = manufacturing, agriculture, forestry, mining, quarrying, utilities (electricity, gas, water & waste) and construction. Wholesale & retail trade = wholesale & retail trade, transport & storage and accommodation & food. Professional services = information & communication, financial, insurance, scientific & technical, real estate and administration & support services. Education & health = education, health, public administration, defence & compulsory social security. Other services = other service activities, arts, entertainment & recreation, household as employer activities and activities of extra-territorial bodies.

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