The Impact of Trade Unions on Work Related Training in Australia

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Abstract

This paper uses data from the Household, Income and Labour Dynamics Survey in Australia (2009-2014) to examine the role played by unions in workplace training. We focus on the incidence, intensity, transferability of training, as well as associated wage effects. We find that there is some evidence that unions have a positive effect on the incidence and transferability of training. We find no evidence of a union effect on training intensity. We also find that unions influence wage growth in a way that is consistent with the view that unions trade off wage growth for training opportunities. Our results are not consistent with the predicted role on unions in the standard Becker model. They are consistent with predictions about union influence in imperfectly competitive labour markets, or with the idea that unions directly negotiate better training opportunities.

Keywords: Union training effects, training incidence, training intensity, transferable skills, HILDA.
JEL Classification numbers: J01, J51, J24

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1. Introduction

Endogenous growth theory gives investment in human capital a central role in the growth performance of modern economies (Romer, 1990). Workplace training plays an important role in this human capital formation and is crucial in allowing workers to acquire the new skills required to adapt to changes in tastes and technology. There is a significant international literature investigating the effect of unions on workplace training. Despite its importance, research into the effects of unions on work related training in Australia is limited. This is mainly due to data limitations. The paper attempts to extend this small Australian literature. The paper has the following structure. In the next section the theoretical and empirical literature on the effects of unions on workplace training is reviewed. In section 3 the data limitations mentioned above are discussed in detail. We deal with these by using information on collective agreements to proxy union-covered and information on individual contracts to proxy union-non-covered. The section contains a justification for this approach as well as a discussion of its limitations. Section 4 discusses our data and presents some descriptive statistics. In section 5 the empirical approach is outlined as are the results. We find some evidence that unions have a positive effect on the incidence of workplace training and may trade-off wages to achieve this. In section 6 some concluding remarks are made.

2. Literature review

2.1 Review of the theoretical literature

In this section we review the theoretical and empirical literature on union effects on workplace training. The key issues are whether or not the labour market is viewed as competitive or non-competitive, and whether unions effect training directly through bargaining or indirectly via wages.

2.2 Indirect effects via wages in perfectly competitive labour market

In a perfectly competitive labour market workers are paid their marginal product and the firm extracts no rent out of the employment relationship. General training provides skills that are equally valuable to all employers in the relevant market. As these skills are transferable between firms, firms cannot finance this training since they cannot be certain of recouping the costs. General training therefore needs to be financed by the worker. This may occur by the worker accepting a low wage during the training period. This requires wages to be flexible, and hence able to be lowered to reflect the lower marginal product during the training period. It also requires that workers are not credit constrained, and are therefore able to survive during the low pay training period. Under these conditions workers will invest optimally in general training (Becker, 1962).

It is well known that trade unions tend to compress wages by raising the wages of the lowest paid, and restraining wages at the top of the distribution (Freeman and Medoff, 1984). Whereas under perfect competition the wage-skill profile and the productivity-skill profile coincide, wage compression implies that the wage-skill profile is flatter than the productivity-skill profile. At low skill levels the wage-skill profile is above the productivity-skill profile. At high skill levels the wage-skill profile is below the productivity-skill profile. A compressed wage structure in an otherwise competitive labour market will result in inefficiently low investment in general training. This is so since it prevents workers from accepting low wages during training and also inhibits their ability to reap the benefits in the form of higher wages in the post-training period. Thus clear predictions emerge from this model. Trade unions will be associated with less general training and lower returns to any general training that occurs.

2.3 Indirect effects via wages in an imperfectly competitive labour market

Recent research has relaxed the assumption of perfect competition in the labour market, and as a result generated quite different predictions in relation to the role of unions in workplace training outcomes. Firms with monopsonistic power in the labour market are able to extract rents from the employment relationship by paying wages that are below marginal product (Manning, 2005). The wage-skill profile lies below the productivity-skill profile by a constant amount equal to the rent. In principle this rent could be used to finance general training. However in a series of papers Acemoglu and Pischke (1999a, 1999b) have demonstrated that the existence of rent *per se* is not sufficient for the firm to be willing to pay for general training. What is required is rent <u>and</u> a compressed wage structure. If the rent the firm can earn from trained and untrained workers is the same, then the firm would prefer untrained workers since they get the same rent while incurring zero training costs. But if the wage structure is compressed in a monopsonistic labour market, the wage-skill profile lies below the productivity-skill profile and the gap between the two profiles (the rent) increases with skill level. In this case post-training productivity will increase at a faster rate than do post-training wages, and the firm may make more rent (net of training costs) from trained than untrained workers. Therefore, if unions compress wage structures, the prediction is that they may facilitate firm financed general training. [2] The prediction for returns to training is ambiguous. Wage returns to general training will be lower as a result of the union induced wage compression. This lowers the return at the higher end of the wage distribution that trained workers receive compared to what they would get under a less compressed wage structure. On the other hand wage returns will be higher as a result of the greater investment in training that results from the compressed wage structure.

2 In the literature numerous sources of wage compression are modelled, not just unions. Pischke (2005) points out that wage compression emerges naturally from the operation of imperfectly competitive labour markets; asymmetric information, search and bargaining can all give rise to wage compression. He also points out that it can emerge from institutional considerations like minimum wages and unions. See Acemoglu and Pischke (1999a and 1999b) for more detail about non-union based explanations for wage compression and how these impact on training.

Another line of research focuses on the fact that monopsonistic firms financing general training face poaching and quitting externalities. These externalities effect the choices the firms make and lead to socially sub-optimal levels of training. The sub-optimal outcomes result from the fact that these externalities make a firm's marginal private benefit from the training it provides less than the marginal social benefit. From the worker's perspective the monopsony power of the firm means wages are below marginal product. This reduces the worker's incentive to invest in training. But any training the worker has is general and so for any trained worker there is an incentive to 'quit' and work for an outside firm who may pay a wage closer to their post-training marginal product. Moreover outside firms have the incentive to seek opportunities to 'poach' trained workers since they avoid the training costs. The presence of these quitting and poaching externalities leads to an inefficiently low level of training. The literature identifies two scenarios in which unions may help improve these outcomes. First, an industry wide union can move outcomes to the social optimum by setting industry wide wages and training opportunities in a way to maximise the utility of a representative worker. In doing so the union internalises the externality and may produce the socially optimal outcome (Booth, Francesconi and Zoega, 2002). Second, a firm level union may also lead to more training by using its power to increase the relative wages of its members and therefore deter inefficient quits (Booth and Chaterji, 2008; Booth, Francesconi and Zoega, 2002). The predictions from this line of research are more training and higher returns to training in unionised environments.

2.3 Bargaining over the compensation package

A more direct role for unions to influence training outcomes comes through union-firm bargaining over wages and conditions. Most models of union behaviour, such as the monopoly model and the efficient bargaining model, employ a union utility function that has both wages and employment as arguments (for a definitive survey of the trade union literature see Booth, 1995). In other words the union is interested in both the wage and employment prospects of its members. One way in which employment prospects can be fostered is through training to maintain and enhance skills. The testable prediction to come from this hypothesis is that union-covered firms will provide more training and better returns to training than will similar non-union-covered firms. This will be especially so if the firm operates in non-competitive product markets where strong unions can extract some of the surplus in the form of better wages and training. If the product market is more competitive we get a variation in this hypothesis. Unions may achieve better training outcomes by trading-off wage growth for training, which will nevertheless improve the longer term wage and employment prospects of union-covered workers (Booth, Francesconi and Zoega, 2003).

Green, Machin and Wilkinson (1996) have pointed out that such workforce stability in turn provides an incentive for firms to invest in training workers because they are more likely to get the opportunity to earn a return on these training expenditures. Unions in the UK (Green, Machin and Wilkinson, 1996) and Australia (Cooney, 2012) have begun to show a greater interest in securing training opportunities for their members often through provisions in collective agreements.

2.4 Review of the empirical literature

The evidence from the international literature is mixed. Using USA data from the Panel Survey of Income Dynamics (PSID) for white male heads of households for the years 1976 and 1978, Mincer (1993) found a negative and statistically significant relationship between union membership and the length of time it took an employee to become fully trained. Mincer acknowledged that this measure of training, while the best available in the PSID, is far from ideal. He nevertheless interpreted this result as implying that unions reduced the amount of training completed within any given time period. Barron, Black and Loewenstein (1987) analysed employer level data from the USA Employment Opportunity Pilot Project. They found a negative relationship between the union variable and the incidence of training. The estimated effect was statistically insignificant making this evidence weak. A study using 1997 data from the Canadian Adult Education and Training Survey found a statistically significant negative relationship between being a union member and training (Green and Lemieux, 2007). These studies offer support for the predictions coming from Becker's model.

Other studies support alternative views. Research for the UK tends to find that unions have a positive impact on training probability and, when studied, also a positive impact on training related wage outcomes. For instance Booth, Francesconi and Zoega (2003), using the British Household Panel Survey from 1991-96 find strong evidence that union coverage at the workplace is positively associated with both the incidence and intensity of workplace training. Moreover they also find that both wage levels and growth rates are positively impacted by union coverage at the workplace. In an earlier UK study Booth (1991) using the British Survey of Social Attitudes from 1987 also found evidence of a positive relationship between workplace training and the presence of unions at the workplace. Greenhalgh and Mavrotas (1994) used the Individual Study from the Training in Britain survey and found a positive relationship between trade union membership and training. In addition, Green, Machin and Wilkinson (1996) drew on both individual-level data – the Autumn 1993 Quarterly Labour Force Survey – and establishment-level data – the 1991 Employers Manpower and Skills Practices Survey and examined the relationship between union recognition in the workplace and the incidence of training and the intensity of training. They found that both measures of training were strongly and positively related to union recognition in the workplace.

Studies finding a positive relationship between unions and training in the USA include Lynch (1992), Veum (1995) and Osterman (1995). Lynch (1992) and Veum (1995) using the National Longitudinal Survey of Youth, found that the probability of workplace training was positively related to the extent of union coverage at the workplace. These studies, based on young workers, may not be representative of the broader workforce. Osterman (1995) used establishment level USA data for non-managerial non-supervisory employees and found a positive relationship between union presence and training. These results from the UK, Canada and the USA tend to favour the imperfectly competitive theories, and or, the hypothesis that unions bargain directly for better training outcomes for their members.

The Australian evidence is limited and the results are mixed. Kennedy *et al.* (1994) used data from the Australian Workplace Industrial Relations Survey 1989-90

(AWIRS). AWIRS is a matched establishment individual data set which has measures of individual union membership as well as indicators of how 'active' the union is. Interestingly, Kennedy *et al*. find that while individual membership is insignificant, the 'active' union indicator had a positive and statistically significant impact on a number of training measures. On the other hand a later study using AWIRS 1995-96 found no statistically significant effects of either individual union membership or the presence of recognised unions at the workplace on whether workers received employer provided training (Almeida-Santos and Mumford 2004). Unfortunately AWIRS was discontinued after the 1995-96 wave and so cannot be used for more contemporary research.

More recently, Waddoups (2014) used cross-section data from the 2005 Survey of Education and Training (SET) to examine the relationship between individual union membership and the incidence, transferability between employers, and employee perceived efficacy of training. He found that union members were more likely to receive employer sponsored training, and that this training was more likely to improve job performance than was the case for non-union members. The transferability of skills generated in this training did not seem to be effected by union status. A limitation of studies based on cross-section data is that the nature of that data does not allow issues of heterogeneity and selectivity to be addressed, as it is reasonable to suppose such issues are relevant.

2.5 Summary comments on literature review

In sum, the literature presents a number of predictions about the effect of unions on the incidence, intensity and wage impacts of workplace training. Our data is not detailed enough to allow us to definitively distinguish between all of these approaches. Such a task would be made more complicated by the fact that several of these ideas could be at work simultaneously producing complicated patterns in the data. Our data does permit us to determine whether the patterns in the data support the predictions of Becker's model, or whether they support in broad terms the predictions of the alternatives. It is to this more limited goal that the paper makes a contribution. In the next section we attempt to justify our use of collective agreements as a proxy for union-covered, and individual contracts as a proxy for union-non-covered.

3. Unions, collective agreements and individual contracts in Australia

Exploring the relationship between unions and training is difficult in Australia because of the relative absence of data sets that provide information about unions and training at the workplace- or enterprise-level. The Australian Workplace and Industrial Relations Survey (AWIRS) was conducted in 1989-90 and 1995 before it was abandoned. This survey did provide workplace-level data on union presence at the workplaces, and also on how actively unions pursued their goals at the workplace (Wooden, 2001). Since then the only data available concerning union membership and training is individual-level cross-sectional data from the Australian Bureau of Statistics (ABS) such as the Survey of Education and Training or individual-level panel data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. This individual-level data only identifies whether an individual worker is, or is not, a union member. Under the Australia Human Rights Commission Act (1986) it is illegal to discriminate on the basis of trade union membership, and as such union negotiated wages and conditions at a workplace cannot be limited to only union members at the workplace. The same problem applies to attempts to identify union wage effects in Australia. This notwithstanding, union wage effects for Australia have been identified with the aid of an individual membership union indicator (see Cai and Waddoups, 2011; Nahm, Dobbie and MacMillan, 2017). There are a number of reasons advanced in the literature for why individual union membership might be associated with a union wage effect (see Nahm, Dobbie and MacMillan, 2017 for a discussion). However it is difficult to think of similar ways to justify linking individual union membership with access to union negotiated workplace training.[3]

As noted above, unions in the UK (Green, Machin and Wilkinson, 1996) and Australia (Cooney, 2012) have begun to show a greater interest in securing training opportunities for their members often through provisions in collective agreements. Therefore, one strategy for examining the impact of unions on training is to compare the training provided to workers whose terms and conditions of work are determined by a collective agreement with those whose terms and conditions of employment are determined by individual arrangements. Moreover, information about whether workers are employed under individual arrangement or a collective agreement is gathered in the HILDA survey. The effectiveness of this strategy in turn depends on whether collective agreements can be demonstrated to be a good proxy for union influence, something we discuss next.

In Australia, the terms and conditions of employment can be determined in four broad ways (i) by an award (ii) by a collective agreement (iii) by an individual arrangement and (iv) by owner managers of incorporated enterprises. Awards are determined by the Fair Work Commission typically after a period of consultation with the relevant employer and employee associations representing the firms and workers covered by the award.[4] Collective agreements are negotiated at the enterprise level, as opposed to the industry level, and involve the relevant employer and groups of employees typically represented by trade unions or other employee associations. Individual arrangements include individual contracts between an employer and an individual employee. While unions could theoretically negotiate an individual agreement on behalf of a member, it is unusual for this to occur because of the commitment of unions to collective agreement making. The last mode of wage-setting includes owner managers who largely unilaterally set their own terms and conditions of employment.

3 We note that Waddoups (2014) using Australian data from the 2005 wave of the Survey of Education and Training did find some evidence of a union training effect using individual union membership as the union identifier. No discussion of how such an effect could occur was provided.
4 The Fair Work Commission was established in 2009 and is the national or federal industrial relations tribunal created by the Fair Work Act (2009). Prior to this the tribunal was called the Australian Industrial Relations Commission.

The relative incidence of these different types of pay-setting methods for the period covered by this study are reported in Table 1. According to the table the proportion of employees covered by the different types of wage-setting has not changed much between 2010 and 2014. The only small change is an increase in award coverage and a fall in the proportion of all employees covered by collective agreements. Specifically, in 2010, 43.5 per cent of employees had their terms and conditions of employment determined by a collective agreement and by 2014 coverage had fallen to 41.4 per cent. By contrast, the proportion of workers covered by awards increased from 15.2 per cent to 18.8 per cent over the same period.

Table 1: The Percentage of All Employees Covered by Different Pay-Setting Methods

	All employees		
Method of pay-setting	*2010 (%)*	*2012 (%)*	*2014(%)*
Award	15.2	16.1	18.8
Collective Agreement (Federally Registered)	31.5	32.0	32.6
Collective Agreement (State Registered)	11.9	9.8	8.6
Collective Agreement (Unregistered)	0.1	0.2	0.2
Individual Agreement (Registered and Unregistered)	37.3	38.7	36.4
Owner/Managers of Incorporated Enterprises	4.1	3.3	3.4

Source: Table adapted from the Department of Employment's Trends in Federal Enterprise Bargaining September Quarter 2016. Data originally from ABS, Employee Earnings and Hours, Cat. No. 6306.0, May 2010, May 2012, May 2014 and unpublished data.

In terms of the current study, the two types of pay setting of interest are collective agreements and individual arrangements. When investigating the training experiences of workers, those covered by awards are not analysed because awards do not stipulate training opportunities. In addition, owner managers by definition are not represented by unions and this group is also not analysed. Workers covered by individual arrangements are included because these arrangements are typically negotiated without unions. Therefore, these workers can be regarded as non-union and their training opportunities not due to union influence. By contrast, if collective agreements are typically negotiated by unions, or more precisely the overwhelming majority of workers covered by collective agreements are covered by union negotiated agreements then the training opportunities of workers under collective agreements can be assumed to be due to union influence. Further evidence needs to be considered to determine if this assumption is reasonable.

From 1991 in Australia collective bargaining at the enterprise or workplace level became the dominant form of collective agreement making (Gahan and Pekarek, 2012). Table 2 shows the relative importance of registered union negotiated collective agreements compared to non-union collective agreements over the period 2009 to 2015 that were Federally registered. Federally registered collective agreements represent more than 75 per cent of all collective agreements. A union versus non-union breakdown of State registered agreements is not available, so Federal agreements are relied on here. In terms of the number of agreements, the proportion that are union agreements has increased from 42 per cent in 2009 to 62 per cent in 2015. At the same time the proportion of agreements that are non-union has decreased from 58 per cent to 38 per cent.[5] More informatively, union collective agreements cover a much greater proportion of workers covered by collective agreements and this proportion has been increasing overtime from 75 per cent in 2009 to 89 per cent in 2015 (DEEWR, 2010). By contrast, the coverage of non-union agreements has fallen from 25 per cent in 2009 to 11 per cent in 2015 (DEEWR, 2010). This data clearly indicates that the overwhelming number of workers covered by collective agreements are covered by union agreements. In addition, over the period 2007 to 2009, 80 per cent of union collective agreements and 76 per cent of workers covered by union collective agreements had one or more training provisions in the agreement, whereas the figures for non-union agreements were much lower, 52 per cent and 58 per cent respectively. Overall, these statistics indicate that for the clear majority of workers whose terms and conditions of work are set by a collective agreement, they are covered by a union collective agreement. Furthermore, union collective agreements are more likely to include training provisions than non-union agreements. Consequently, in this study the training experiences of workers covered by collective agreements are assumed to be due to union influence and the training experiences of workers employed on individual agreements are assumed to be not due to union influence.

5 The Department of Employment notes that a degree of caution should be taken in interpreting the breakdown of agreements as union or non-union because under the Fair Work Act 2009 'it is possible for a union to have been involved in bargaining for an agreement and then not be covered by the approved agreement. It is also possible for a union to be covered by an agreement because they were a bargaining representative, even if they did not take an active role in the negotiations.' (Department of Employment, 2016, p. 43). Notwithstanding this caveat, analysis of the union and non-union breakdown of collective agreements approved during 2008 – the year prior to the Fair Work Act 2009 – showed very similar proportions to 2009 in terms of the number of agreements (46 per cent union and 54 per cent non-union) and the number of workers covered (78 per cent union and 22 per cent non-union) (DEEWR, 2010). Therefore, it would seem reasonable to take the figures on union and non-union agreements at face value for the period 2009 to 2014 while continuing to bear in mind the concern expressed by the Department of Employment.

Table 2: Federal Collective Agreements Current on the last day of the December Qtr each year by Union Coverage 2009 - 2015

	2009	*2011*	*2013*	*2015*
Union				
No. of CA	9,306	9,505	13,889	9,032
%	42	42	60	62
No. of Employees (1,000s)	1,541	2,128	2,312	2,032
%	75	83	88	89
Non-Union				
No. of CA	12,983	12,957	9,360	5,562
%	58	58	40	38
No. of Employees (1,000s)	518	437	304	241
%	25	17	12	11

Source: Data are taken from the Department of Employment Trends in Federal Enterprise Bargaining March Quarter 2012, June Quarter 2013 and September Quarter 2016.

4. Description of the Data

The data has been extracted from the Household, Income and Labour Dynamics in Australia (HILDA) survey, which is a household-based longitudinal survey covering a broad range of social and economic questions. All the members of the households that responded in the initial national probability sample formed the panel to be pursued in each subsequent wave (year). The present study analyses six waves from wave 9 (2009) to wave 14 (2014), bounded by the availability of key variables.[6]

The sample includes: male employees who are directly interviewed, full-time worker for the whole period, born in or after 1949, pay is set either by collective agreement (hereafter referred to as union covered) or individual agreement/contract (hereafter referred to as union non-covered). The decision to include only male full-time workers is consistent with other studies in this general area (see for instance, Booth, Francesconi and Zoega, 2003; Booth and Katic, 2011). The decision to focus on full-time employees is justified on the basis that part-time and casual employees by definition have less access to entitlements than full-time employees. Logically, it also follows that because part-time and casual employees are less attached to the firm, employers have less incentive to offer them training opportunities. The decision to include only males is designed to facilitate comparison with other key studies in the area, in particular, Booth *et al.* (2003) that also only considers male full-time employees. The analysis based on the changes in the union and training status, which will be explained later, requires data that are available for continuous waves. So although the panel could be unbalanced, the sample used is a balanced one that only includes those whose data are available for all six waves. The use of a balanced panel

6 The major variable that restricts the sample period is the variable used to create the union-coverage variable (the collective agreements variable). Although it is available from wave 8 (2008), the sample period starts from wave 9 because including only those individuals for whom all necessary variables are available from wave 8 reduces the sample size significantly.

also prevents the sample from being affected by other factors, such as discontinuation of employment or new entry, effects which are not explicitly analysed. This results in the sample of 3,966 observations consisting of 6 yearly observations across 661 individuals.

Table 3 shows training incidence and intensity, and average hourly wages by union coverage. According to the table, about 37 per cent of worker-years received work-related training, of which the average length was approximately 52 hours a year. The overall average real hourly wage rate is 39.75 dollars, with the average wage for those who had training ($40.45) being slightly (and insignificantly) higher than that for those without training ($39.34). The bottom panel of the table shows average wages in the year of training and the year before training. Although the average wage in the period of training ($41.25) is about 3 per cent higher than the average in the year before training ($39.96), the difference is statistically insignificant at 5 per cent. The latter remains true even if the sample is divided into union-covered and union non-covered.

Out of all 3,966 cases of wage setting, about 45 per cent were covered by union and 55 per cent were non-covered.[7] Those who are union-covered are more likely to receive training and to be trained more intensely, and tend to earn a lower wage on average than those non-covered ($37.76 versus $41.40), with the differences (−$3.64) being statistically significant at one per cent. The difference is more pronounced for those who received training (−$5.06) than for the non-trained (−$3.15)

The control variables used for the wage equations include: work experience (years) and its square, occupation tenure (years) and its square, firm tenure (years) and its square, regional unemployment rate (per cent); and dummies for marital status, disability, country of birth, change of occupation in the previous year, permanent employment, education levels, regions, occupations, industries, public sector, non-profit organisation, ranges of the size of company, and waves. The models for training incidence and training intensity include age in addition to all the control variables for the wage equations.

There is the potential for feedback relationships between wages and union coverage, between wages and training, and between training and union coverage (Booth, Francesconi and Zoega, 2003). The use of collective agreements and individual contracts as opposed to individual union membership should mitigate against this somewhat. While for some workers, working under a collective agreement or an individual contract may be the result of a choice, for many others it can more reasonably viewed as feature of the job rather than the result of an individual choice. Nevertheless the present study attempts to test for, and when necessary, deal with potential endogeneity. To that end the paper utilises the following two dummy variables as external instrumental variables to test for endogeneity of union coverage

7 Union density in Australia is currently around 17 per cent (ABS, cat, no.6310.0, 2015). Our decision to treat collective agreements as in effect union agreements therefore considerably overstates the numerical reach of unions in Australia. However, the reality of the Australian industrial relations system is that unions do have a reach that goes beyond density, i.e. union negotiated outcomes can and often do apply to unionists and non-unionists. Moreover 'threat' effects give additional amplification to union influence.

and training. The first instrumental variable is a dummy based on the response to a question that asks whether the respondent often or very often gets involved in, or encourages others to get involved in activities for a union, political party, or group that is for or against something. The second instrument is a dummy based on whether the respondent is dissatisfied with their current main job considering all things such as total pay and job security. When the variables are found to be endogenous, the same set of instrumental variables are used to control for the endogeneity in the control function approach to estimating the model. The sample statistics for the explanatory variables and instrumental variables are presented in Table A.1 in the appendix.

Table 3: Training and Wages by Union Coverage

	All Men	*Union Covered*	*Union Non-Covered*	*(Union – Non-union)*
Proportions (%)		45.34	54.66	(–9.32)
Training				
Incidence (%)	36.69	43.99	30.63	(13.36**)
Intensity given trained (hours)	52.24	59.45	43.65	(15.80**)
Hourly wages (A$)[a] – all	39.75	37.76	41.40	(–3.64**)
If trained	40.45	38.14	43.20	(–5.06**)
If non-trained	39.34	37.46	40.61	(–3.15**)
(Trained – Non-trained)	(1.11)	(0.68)	(2.59*)	
Pre-training & training-period wages (A$)				
Training-period	41.25	38.88	44.06	(–5.18**)
Pre-training	39.96	37.94	42.35	(–4.41**)
(Training-period – Pre-training)	(1.29)	(0.94)	(1.71)	
	(3.23 %)	(2.48 %)	(4.04 %)	
No. of observations	3,966	1,798	2,168	

a: Nominal hourly wages are deflated with the consumer price index for all groups.
**: significant at 1 per cent. *: significant at 5 per cent.

5. Empirical results and discussion

5.1 Effects of union coverage on training incidence, Intensity and transferability

The model used to measure the effect of union coverage on the incidence of training is given by

$$r_{it} = 1[\alpha^r + \gamma^r U_{it} + \beta^{r\prime} X_{it} + v^r_i + e^r_{it} > 0] \qquad (1)$$

where r_{it} is 1 if individual i in year t receives work-related training and 0 otherwise, U_{it} is 1 if union covered and 0 otherwise, X_{it} is the vector of the control variables explained in the previous section, v^r_i is heterogeneity of individual i, e^r_{it} is the random error term that is assumed to follow the standardised normal distribution, α^r and γ^r are scalar coefficients, and β^r is the coefficient vector for X. The function denoted by 1[.] is the index function taking on value 1 if the condition inside the square brackets is satisfied and 0 otherwise. Since it is widely accepted in the literature that variables like education are closely correlated with individual heterogeneity, estimating this model as a random-effects model is not appropriate. Estimating this as a fixed-effects probit model is also known to result in inconsistent estimates due to the incidental parameters problem when the number of time periods is small. We employ the Mundlak (1978) – Chamberlain (1980) device (Wooldridge, 2010, Ch. 15) where the heterogeneity term, v^r_i, is replaced by

$$v^r_i = \delta^{r'}\bar{X}_i + w^r_i \qquad (2)$$

where $\bar{X}_i = \sum_{t=1}^{T} X_{it}$, i.e., within-group means, δ^r is the coefficient vector, and $w^r_i \sim N(0,\sigma_{wr}^2)$, which is uncorrelated with X_{it}.[8]

The first two columns of Table 4 report the pooled probit and the Mundlak-Chamberlain estimates of the partial effect of union-coverage on the probability of training. The two estimates are similar. The estimates imply that, when other characteristics remain unchanged, union-coverage increases the probability of training by 4-5 percentage points. The pooled probit estimate is significant at 5 per cent. The Mundlak-Chamberlain estimates are statistically significant at 10 per cent (p-value is actually 0.07). The null hypothesis that the group-mean variables are jointly unimportant is strongly rejected with a p-value of 0.003, implying that heterogeneity across individuals is significant. Given this test result, the pooled probit estimate is likely to be biased and hence the Mundlak-Chamberlain result is more reliable.[9] There has been concern in the literature about potential feedback effects between training and union coverage. Endogeneity of union coverage was tested, but the null of exogenous union coverage could not be rejected at the usual level of significance (with the p-value of 0.38).[10]

Our finding that unionists are 4-5 percentage points more likely to receive training is consistent with similar research from Waddoups (2014) and Booth, Francesconi and Zoega (2003). Waddoups (2014) found that male union members in Australia were 8.7 percentage points more likely to receive in-house general training, and 4.7 percentage points more likely to receive in-house or external work related training. Waddoups used cross-sectional data from the 2005 wave of SET and so

8 The within-group means of the dummy variables for union coverage, change of occupation and industries are not included in the heterogeneity equation due to lack of within-group variation for a large proportion of individuals.

9 Only the coefficients of interest are reported in Table 4. Full results for the Mundlak-Chamberlain estimates are reported in Appendix Table A2. For brevity all other Tables in the paper report only the coefficients of interest. Full results for all the regressions reported in this paper are available on request.

10 For this test, the reduced-form probit model (Mundlak-Chamberlain type) for union coverage is estimated using the two instrumental variables explained above and all the internal explanatory variables in (1) other than union coverage as the explanatory variables. The generalised-residual term obtained from this regression is then added to the model defined by (1) and (2), and the significance of the coefficient for the generalised residual term is tested to determine whether or not union coverage is endogenous.

was not able to control for heterogeneity and did not consider endogeneity. Booth, Francesconi and Zoega (2003) used the BHPS for the period 1991-1996. As such they were able to attempt to control for heterogeneity. They also did not consider endogeneity. Moreover unlike HILDA and SET, the BHPS has a variable indicating whether each respondent is in a workplace covered by a union or not. So their union indicator is closer to the ideal than either ours or that used by Waddoups. Booth, Francesconi and Zoega (2003) find that in a pooled cross-sectional model male employees are 9.2 percentage points more likely to receive training if they are union-covered. Once individual heterogeneity is controlled for using a fixed effects model the probability falls to 5.2 percentage points (and is just significant at 5 per cent). It is interesting that the results from Booth, Francesconi and Zoega (2003) and Waddoups (2014) are similar to ours. But caution should be exercised when making comparisons as the three studies each have significant differences in terms of how the union indicator is defined and the econometric methodology employed.

The effect of union coverage on training intensity is analysed using only those who received training. This renders selection into the sample non-random. The model for training intensity is thus defined as follows, taking account of non-random selection into the sample.

$$h_{it} = \alpha^h + \gamma^h U_{it} + \beta^{h\prime} X_{it} + v^h_i + e^h_{it} \quad (3)$$

where h_{it} is the total length of training individual i received during year t (hours), and the other variables and the coefficients are similarly defined as before. The h_{it} is observed only if $r_{it} = 1$, the probability of which is determined by the reduced-form probit model given by

$$r_{it} = 1[\alpha^s + \gamma^s U_{it} + \beta^{s\prime} Z_{it} + v^s_i + e^s_{it} > 0]. \quad (4)$$

The Z includes all the external and internal instrumental variables. The model is estimated by the Heckman's two-step method with heterogeneity being controlled by the Mundlak-Chamberlain device as explained above. Note that the device for equation (4) includes $\bar{Z}_i = \sum_{t=1}^{T} Z_{it}$, which includes the within-group means of X_{it} and the external instrumental variables. The middle two columns of Table 4 report the OLS and the Heckman estimates of the coefficients for union coverage. The two estimates are similar. The estimates imply that union coverage increases the length of training by about 9-12 hours, *ceteris paribus*, which is just over one day. The estimates in the present study are, however, statistically insignificant. We do suspect that the intensity variable could be subject to measurement error. While it is easy to remember if any training was undertaken in the previous twelve months (the incidence variable) remembering exactly how many days of training was undertaken might be more difficult. Having said that, our results for intensity are quite different from those of Booth, Francesconi and Zoega (2003). They estimated that union covered workers received a statistically significant 4.3 days more training per annum using a cross-sectional Tobit model, and 3 days more using a censored least absolute deviations model. As a final point we note that union coverage was also tested for endogeneity in our intensity equation, the null of exogeneity could not be rejected (p-value of 0.21).

To measure the effect of unions on how much transferable training occurs the model defined by (1)-(2) is re-estimated using the observations where training occurred, after replacing the dependent variable with the binary variable representing transferability of training. Training is defined as transferable if the respondent answered 'to a great extent' or 'to a very great extent' to the question 'to what extent do you think you could use the new skills you have acquired from any of this training if you got a new job with a different employer?' The estimates of the coefficients for union coverage are reported in the last two columns of Table 4. They imply that, out of all those who received work-related training, union-covered workers are 7-8 percentage points more likely to receive transferable training than union-non-covered workers. The pooled-probit estimates and the Mundlak-Chamberlain estimates are significant at 10 per cent, with the Mundlak-Chamberlain estimate just failing to be significant at 5 per cent (p-value is 0.054). Union coverage was also found to be exogenous in this equation. Our results offer some evidence that union-coverage is associated with a greater likelihood of transferable/general training. This result is in contrast to Waddoups who found no effect of union membership on transferability. This may be a case where Waddoups' use of individual union membership mitigates against him being able to find any effect. We do note the point made by Waddoups (2014, p.760-61) that this 'transferable' variable is possibly subject to greater measurement error than incidence, and we would add for the same reason intensity. While incidence and intensity relate to things that have actually happened and are therefore in principle able to be remembered accurately, the nature of the transferability question is such that it is asking respondents about a counterfactual that has not happened.

In sum, the findings reported here suggest that unions increase the incidence of work related training and of transferable training. There is no evidence that unions increase the intensity of training. As such these results do not support the Becker model and may offer some evidence in support of the other approaches outlined.

Table 4: Effect of Union Coverage on Training Incidence and Intensity

	Training Incidence		*Training Intensity (given trained)*		*Transferable Training (given trained)*	
	Pooled Probit	*Mundlak-Chamberlain Probit*	*Pooled OLS (Trained only)*	*Mundlak-Chamberlain Heckman*	*Pooled Probit*	*Mundlak-Chamberlain Probit*
Effect of Union Coverage[b]	0.05* (0.02)[a]	0.04# (0.02)	9.10 (6.58)	11.53 (7.61)	0.07# (0.04)	0.08# (0.04)

a: Huber-White sandwich standard errors in parentheses.
b: Evaluated at the sample means.
*: significant at 5 per cent. # significant at 10 per cent

- Tests for the endogeneity of union coverage: the coefficient for the generalised residual term
Training incidence equation: z = 0.88 (p-value = 0.376)
Training intensity equation: z = –1.26 (p-value = 0.208)
Transferable training equation: z = –1.12 (p-value = 0.264)

5.2. Effects of union coverage and training on wages

5.2.1 Relationship in Levels

The model we employ to analyse the effects of union coverage and training on wages in levels is defined as

$$ln y_{it} = \beta_0 + \gamma_1 U_{it} + \gamma_2 T_{it} + \gamma_3 U_{it} \times T_{it} + \beta' X_{it} + v_i + e_{it} \quad (5)$$

where y_{it} is real hourly wage earned by individual i in year t (in dollars), U_{it} is 1 if union covered and 0 otherwise, and T_{it} is either the dummy variable taking on 1 if received training and 0 otherwise (incidence), or the length of training in hours (intensity). The other terms are as defined above, with the exception that X does not include age. Joint tests for endogeneity of the three variables associated with union coverage and training indicate that union coverage and training incidence are jointly endogenous (p-value being 0.005). The test statistic for joint endogeneity of union coverage and training length is insignificant at 5 per cent (with the p-value being 0.064). The endogeneity associated with union coverage and training is controlled for by including the residuals (generalised residuals when the variable is binary) from the reduced-form regressions for U, T and U×T in equation (5). This approach is referred to as the control-function (CF) approach.[11]

Table 5 reports the estimates of the coefficients for these three variables. In light of the endogeneity test results, the control-function fixed-effects (FE/CF) estimates are the most reliable in the case where training incidence is used, while the fixed-effects (FE) estimates are the most reliable in the case of training intensity. The training incidence equation indicates that while training and union coverage are not significant when entered separately, the interaction between these two variables is statistically significant and implies that the average wage for those who received

11 See, for example, Wooldridge (2010, Ch. 6) for more detailed explanation of this approach.

training while union-covered is higher than the average wage for union-non-covered employees who did not receive training by 18.9 per cent (if insignificant coefficients are interpreted as zeros).[12] This result supports the view that union-coverage mediates higher wage returns to training. This result is consistent with Booth, Francesconi and Zoega (2003, p.80) who found that union-covered trained workers earned 6 per cent more than non-union-covered non-trained workers.

It is important to note that the intensity equation includes only those workers who received training, and that in this case the variable 'training' measures training intensity in this equation. The results indicate that the intensity of training has no effect on wages (the variable 'training' is insignificant). This is not what would be expected and may be due to measurement error in this variable. Whereas respondents can reasonably be expected to be able to recall accurately whether they undertook any training in the previous twelve months (the 'incidence' question), they may have more difficulty accurately recalling the number of days spent in training in the previous twelve months. It should also be noted that while in Booth, Francesconi and Zoega, the intensity variable was positive and significant, it was numerically very small, implying little impact of variation in training intensity on wage levels (Booth, Francesconi and Zoega, 2003, p.80). Likewise the training union interaction variable reported in the intensity equation in Table 5 is also insignificant. The only significant variable is the union dummy. This result implies that, irrespective of training intensity, wages are lower for union-covered workers than for union-non-covered by 10.2 per cent on average, *ceteris paribus*.[13] Given that all the workers in this sample are involved in workplace training, this result could be viewed as evidence in favour of the wage compression model. The wage compression model suggests that the return to training may be lower for union-covered than for otherwise comparable union-non-covered workers.

Table 5: Effects of Union Coverage and Training on Log Wages in Levels

	Using Incidence			*Using Intensity*	
Variable	*Pooled OLS*	*FE*	*FE/CF*[b]	*Pooled OLS*	*FE*
Union	−0.025	−0.018	0.049	−0.014	−0.108*
	(0.018)[a]	(0.019)	(0.063)	(0.033)	(0.050)
Training	−0.005	−0.001	0.116	−0.000	−0.000
	(0.017)	(0.012)	(0.116)	(0.000)	(0.000)
Union*Training	0.005	−0.004	0.173*	0.000	0.000
	(0.022)	(0.016)	(0.087)	(0.000)	(0.000)

a: Huber/White sandwich standard errors in parentheses. b: Control-function fixed-effects model. Endogeneity of U, T and U×T has been controlled for. *: significant at 5 per cent.

* Joints test for endogeneity of union, training, and union×training.

Incidence: Chi-square(3) = 12.67 (p-value = 0.005)
Intensity: Chi-square(3) = 7.260 (p-value = 0.064)

12 $e^{0.173} - 1$.
13 $1 - e^{-0.108}$.

5.2.2 Relationship in changes without interactions

The above model in levels analyses instant effects of union coverage and training on wages. However, the effects may occur with a lag. Alternatively, wages may be effected by the transitions that can be made between various union and training statuses. To analyse such effects, the following model is estimated after generating the dummy variables representing how the statuses of union coverage and training can change:

$$\Delta ln y_{it} = \beta_0 + \sum_{j}^{3} \alpha_j \Delta U_{j,it} + \sum_{k}^{3\text{ or }5} \gamma_k \Delta T_{k,it} + \beta' \Delta X_{it} + \Delta e_{it} \qquad (6)$$

where Δ denotes first difference over time (eg. $\Delta x_{it} = x_{it} - x_{i,t-1}$), U denotes union coverage status, and T denotes training. When T denotes training incidence, there are four status-changing modes for each of U and T: stay non-covered or untrained in both the previous and the current years (0), entry into union coverage or training (e), exit from union coverage or training (x), and stay covered or trained in both years (1). The ΔU_j's and ΔT_k's, where j and k are 0, e, x and 1, are dummy variables representing those modes for status changes. When T represents the number of hours of training, six modes of status change are defined as: stay untrained (0), entry into training (e), exit from training (x), trained in both years and the number of hours increased by more than 7 hours (1), trained in both years and the number of hours decreased by more than 7 hours (–), and trained in both years and the change in the number of hours is between –7 and 7 (s). The dummy variables representing the stay union non-covered (ΔU_0) and the stay untrained modes (ΔT_0) are excluded to avoid perfect collinearity. Note that the heterogeneity term disappears when all the variables are measured in changes over time. Similarly, the effect of any variable in X that is fixed over time cannot be measured and is hence excluded.

The models are estimated via the usual OLS method, with the standard errors computed using a robust estimator to account for possible non-spherical disturbances. The estimates of the coefficients for the union and training dummies are presented in Table 6. The results are similar regardless of whether training incidence or training intensity is used. All the coefficients for the training dummies are positive, meaning that receiving training in either year has a positive effect on wage growth (between 0.3 per cent for increasing intensity and 1.5 per cent for decreasing intensity). Union coverage, however, only has a positive effect when one exits from coverage. Compared with those who remain non-covered in both years, those who exit in the current year enjoy a higher wage growth rate by about 1.2 per cent ~ 1.3 per cent on average, *ceteris paribus*. On the other hand, those who are newly covered in the current year while non-covered in the previous year have a lower wage growth rate than that for those who remained non-covered in both years by 1.6 per cent. Average growth rate for those who stay covered in both years is lower than that for those who remain non-covered by 0.1 per cent. None of these estimates are, however, significant at the usual level of significance. Joint endogeneity of union and training dummy variables is tested and we fail to reject the null of their exogeneity for both models based on training incidence and training intensity (p-values being 0.60 and 0.81 respectively).

These results for training are similar to Booth, Francesconi and Zoega (2003) with the important qualification that in the latter study the estimates are statistically significant. The results for union status in Booth, Francesconi and Zoega (2003) are quite different from ours. In Booth, Francesconi and Zoega (2003) gaining union coverage is associated with statistically significant wage growth while losing union coverage leads to statistically significant reduction in wage growth. The fact that our results fail to attain statistical significance could be due to the fact that this model neglects what might be important interactions between union-coverage and training. The next model remedies this by considering all possible transitions and their interactions.

Table 6: Effects of Union Coverage and Training on Log Wages in Changes – without Interactionsa

Category	*Coeff.*	*Training Incidence*	*Training Intensity*
Union			
Entry	α_e	−0.016 (0.023)[b]	−0.016 (0.023)
Exit	α_x	0.012 (0.027)	0.013 (0.027)
Stay Covered	α_s	−0.001 (0.008)	−0.001 (0.008)
Training			
Entry	γ_e	0.007 (0.012)	0.007 (0.012)
Exit	γ_x	0.012 (0.012)	0.012 (0.012)
Stay Trained/Unchanged	γ_s	0.008 (0.010)	0.007 (0.017)
Increase Training	γ_+		0.003 (0.015)
Decrease Training	γ_-		0.015 (0.016)

a: The base category is stay non-covered and untrained. b: Huber/White sandwich standard errors in parentheses.

Joint test for endogeneity of union coverage and training dummies.
Incidence: Chi-square (8) = 6.42 (p-value = 0.600)
Intensity: Chi-square (10) = 6.09 (p-value = 0.808)

5.2.3 Relationship in changes with interactions

The following model also represents the relationship in changes but it includes interactions between changes in union coverage and changes in training.

$$\Delta ln\text{y}_{it} = \sum_{j}^{4}\sum_{k}^{4}\gamma_{jk}\left(\Delta U_{j,it} \times \Delta T_{k,it}\right) + \beta'\Delta X_{it} + \Delta e_{it} \qquad (7)$$

All the variables except ΔT for changes in training intensity are as defined above. To avoid close multicollinearity, the six categories of changes in training intensity are reduced to four categories by combining those for exit from training (ΔT_x), decrease in training intensity (ΔT_-), and no change in training intensity (ΔT_s) into one category, ΔT_x. The other three categories of change in training intensity are: remain untrained in both periods (ΔT_0), entry into training (ΔT_e), and trained in both years with an increase in length of training of more than 7 hours (ΔT_1). Consequently, sixteen dummy variables representing interactions between four union and four training categories are included in the model without an overall intercept term. Their estimates and robust standard errors are reported in Table 7.

Again, the results based on training incidence and training intensity are fairly close to each other. According to the incidence-based result, the effects are statistically significant at 5per cent only when workers receive training in both years. However, the effects of remaining trained are opposite depending on whether one enters union coverage (negative) or exits from coverage (positive). The average wage for employees who receive training in both years grows by 19 per cent (γ_{x1}) per year when they exit from union coverage but it decreases by 18 per cent (γ_{e1}) when they enter union coverage, *ceteris paribus*.[14] According to the training intensity-based result, wages decrease by 38 per cent (γ_{e1}) on average when one changes from union-non-covered to covered while increasing the intensity of training. We consider this unrealistically large effect to be unreliable since it is based on a very small number of observations in this category. This result should be ignored. Joint tests on endogeneity of the union and training dummies for both the training incidence based model and the training intensity based model failed to reject the null hypothesis of exogeneity.

These results are again very different from those of Booth, Francesconi and Zoega (2003). The later study finds that gaining union coverage is associated with large statistically significant wage growth. Moreover the combination of union coverage and training produces significant wage growth. In our results gaining coverage is associated with reduced wage growth. It is not obvious whether this difference reflects something fundamentally different in the way unions impact on wages (including how they mediate training effects) in the two countries, or whether it also partly or wholly reflects the proxy we have used for union coverage. Our data does not permit further exploration of this issue.

14 $e^{0.177} - 1 = 0.194$, and $1 - e^{-0.202} = 0.183$. While the change rates calculated this way may not be much different from the coefficient values when the changes are small, the former can be significantly different from the latter when the changes are large as is the case here.

Table 7: Effects of Union Coverage and Training on Log Wages in Changes – Including Interactions

t–1		*t*			*Incidence*		*Intensity*	
Union	*Train*	*Union*	*Train*		*coeff.*	*(s.e.)*[a]	*coeff.*	*(s.e.)*
No	No	No	No	γ_{00}	–0.013	(0.047)	–0.020	(0.047)
		No	Yes	γ_{0e}	–0.013	(0.052)	–0.020	(0.052)
		Yes	No	γ_{e0}	–0.008	(0.053)	–0.015	(0.053)
		Yes	Yes	γ_{ee}	–0.027	(0.078)	–0.034	(0.078)
No	Yes	No	no[b]	γ_{0x}	0.005	(0.047)	–0.004	(0.047)
		No	yes[c]	γ_{01}	–0.010	(0.048)	–0.031	(0.050)
		Yes	no[b]	γ_{ex}	0.020	(0.086)	–0.010	(0.068)
		Yes	yes[c]	γ_{e1}	–0.202*	(0.098)	–0.472**	(0.171)
Yes	No	No	No	γ_{x0}	–0.042	(0.054)	–0.049	(0.054)
		No	Yes	γ_{xe}	–0.051	(0.089)	–0.057	(0.089)
		Yes	No	γ_{10}	–0.014	(0.048)	–0.021	(0.048)
		Yes	Yes	γ_{1e}	0.004	(0.049)	–0.003	(0.049)
Yes	Yes	No	no[b]	γ_{xx}	0.086	(0.119)	0.130	(0.090)
		No	yes[c]	γ_{x1}	0.177*	(0.078)	0.114	(0.077)
		Yes	no[b]	γ_{1x}	–0.018	(0.049)	–0.021	(0.047)
		Yes	yes[c]	γ_{11}	–0.005	(0.048)	–0.002	(0.052)

a: Huber/White sandwich standard errors in parentheses.
b: When training intensity is used, this category includes exit from training, trained in both years and the length decreasing by more than 7 hours, trained in both years and the length changing by between –7 hours ~ 7 hours.
c: When training intensity is used, this category represents trained in both years and the length increasing by more than 7 hours.
**: significant at 1 per cent. *: significant at 5 per cent.

* Joint tests for endogeneity of category dummies.

Incidence: Chi-square(16) = 13.529 (p-value = 0.634)
Intensity: Chi-square(16) = 24.852 (p-value = 0.072)

6. Conclusion

In this paper we add to the small but important literature exploring union effects on workplace training in Australia. Our point of departure is that a major limitation on such research in Australia is data related. We utilise an approach that allows us to avoid the need to use individual union membership as the union identifier. While it is true that in the related area of union wage effects, a union effect can be identified using individual union membership, we argue that it is more difficult to justify the use of such an approach in relation to training. Under Australia's Industrial Relations framework training opportunities, and any wage effects that flow from those opportunities, cannot be quarantined to only union members, nor is it obvious that there are other mechanisms through which such quarantining could occur.

We find that there is evidence that workers who are union-covered have a higher incidence of workplace training, and that that training is more likely to be in transferable skills. We find no evidence that being union-covered delivers more intensity in training outcomes. However we note again that our use of collective agreements to proxy union-covered will bias away from finding any union training effect. The actual effect is therefore likely to be greater than we have found. This is not consistent with the prediction of the Becker model based on otherwise perfectly competitive labour markets. It is consistent with the predictions from many of the alternative models.

When looking at all workers (those who train and those who do not) we find that the level of wages (equation 5, Table 5) is highest for those workers who are involved in training, but only when that training occurs in conjunction with being union-covered. This supports the view that when we look at all workers (those who train and those who don't train) unions mediate higher training returns for those who train compared to those who do not train. This is not consistent with Becker, but is consistent with many of the alternative models.

If we restrict the sample to include only workers who engage in workplace training, as we do in the intensity regression reported in Table 5, we find that there is a statistically significant inverse relationship between wage levels and being union-covered. In other words returns to training are lower for union-covered workers than they are for comparable union-non-covered workers engaged in training. Taken in conjunction with the result that union-covered workers get more training in transferable skills, this result is consistent with the wage compression model. It could also be consistent with the idea that unions may trade-off wages for better training opportunities.

We also looked at wage growth with two specifications, one that interacted all the union training transitions and one that did not have interactions. The fully interacted specification proved (equation 7, Table 7) to be the best and produced the conclusion that wage growth occurred for those who trained in both periods, and that it was positive when moving from union to non-union, and negative when moving from non-union to union. While this was at odds with the findings from Booth, Francesconi and Zoega (2003), it is consistent with the idea that for those workers who train, the returns to training are lower for the union covered than for comparable union non-covered workers. Again this offers some support for the wage compression model. It could also simply reflect the idea that union collective agreements trade-off wage growth for training opportunities in Australia.

Further research could explore whether union coverage versus non-union coverage varies by industry and skill level, and then whether any differences found are associated with differences in the incidence of training. Preliminary analysis of descriptive statistics (not reported here) found that some industries (education and public administration) had a much greater proportion of workers covered by a collective agreement than covered by an individual agreement. By contrast, the opposite pattern was found for industries associated with business services, recreation services and the arts. In addition, these descriptive statistics support the view that for the workers in our sample, union-covered tend to be about two years older, have less formal education, to be slightly more concentrated in lower skilled occupations, but to have more general experience, firm tenure and occupational tenure, compared to their non-union covered counterparts. These differences may have implications for training requirements of these workers. However without a more detailed analysis it is not obvious what these different requirements might be. Both data and space limitations mean that this analysis cannot be pursued further in this paper. It will be subject to future research.[15]

In sum, the results reported in this paper offer little support for the predictions of the Becker model. They do offer support for some of the alternative lines of inquiry, although our data do not permit us to say much more than this. We can say that our results do not support the view that unions have an adverse effect on workplace training outcomes. On the contrary our results, which are probably underestimates of the true effect, suggest that unions have a positive impact in this important area. Further research with better data would be invaluable.

15 We would like to thank an anonymous referee for pointing out this potential line of inquiry.

Appendix

Table A1: Descriptive Statistics of the Variables[a]

Variable	*Mean*	*S.D.*	*Variable*	*Mean*	*S.D.*
Age[b]	41.13	10.39	Industry		
Married/de facto	0.82	0.38	Primary	0.01	0.09
Disability	0.13	0.33	Blue collar	0.35	0.48
Country of birth			Wholesale/transp.	0.14	0.34
Australia	0.83	0.38	Retail	0.04	0.19
Other English	0.09	0.29	Hospitality	0.02	0.12
Non-English	0.09	0.28	Business services	0.11	0.31
Changed occupation	0.10	0.30	Government	0.12	0.33
Permanent	0.91	0.28	Education	0.06	0.23
Public sector	0.26	0.44	Health/community	0.03	0.17
Non-profit org.	0.04	0.19	Recreation/other	0.14	0.35
Education			Firm size		
Tertiary	0.37	0.48	< 20	0.11	0.31
Adv. Dip & Dip.	0.11	0.31	20–99	0.14	0.35
Cert. III or IV	0.29	0.45	100–499	0.18	0.39
Year 12	0.13	0.34	500–999	0.09	0.29
Year 11 or below	0.11	0.31	1,000–4,999	0.18	0.38
Work experience[b]	22.29	10.77	≥ 5,000	0.30	0.46
Occupation tenure[b]	10.93	9.37	Region		
Firm tenure[b]	9.25	8.67	Sydney	0.17	0.38
Occupation			Other NSW	0.10	0.30
Manager	0.24	0.43	Melbourne	0.22	0.41
Professional	0.28	0.45	Other VIC	0.05	0.22
Technician/Traders	0.18	0.39	Brisbane	0.11	0.32
Com. & pers. services	0.04	0.19	Other QLD	0.10	0.30
Clerical & admin.	0.08	0.28	Adelaide	0.06	0.23
Sales	0.03	0.18	Other SA	0.02	0.15
Machinery operator	0.10	0.30	Perth	0.07	0.26
Labourer	0.04	0.20	Other WA	0.01	0.11
Unemployment rate[c]	5.35	0.85	TAS	0.03	0.16
External IVs			NT	0.01	0.09
Political activity	0.07	0.25	ACT	0.05	0.22
Dissatisfied with job	0.08	0.27			

a: Proportions unless indicated otherwise.
b: Years
c: per cent

Table A2: Union Effects on Training Incidence and Intensity[a,b,c]

	Training Incidence (Mundlak-Chamberlain Probit)	*Training Intensity (Mundlak-Chamberlain Heckman)*	*Transferable Training Incidence (Mundlak-Chamberlain Probit)*
	Marginal Effect on Probability at Means	*Marginal Effect on Number of Hours*	*Marginal Effect on Probability at Means*
Union	0.043 (0.024)$^{\#}$	11.531 (7.608)	0.083 (0.043)$^{\#}$
Experience[c,d]	–0.087 (0.113)	–40.055 (33.538)	–0.026 (0.215)
Occupation tenure[c,d]	0.005 (0.002)*	0.381 (0.679)	–0.002 (0.004)
Job tenure[c,d]	–0.000 (0.003)	0.288 (0.887)	0.004 (0.006)
Age	0.002 (0.004)	–1.991 (0.953)*	–0.008 (0.006)
Married/de facto	0.059 (0.022)**	5.911 (7.588)	–0.004 (0.041)
Disability	0.013 (0.038)	5.650 (10.710)	0.061 (0.067)
Country of birth (base: *Australia*)			
Other English Speaking	–0.025 (0.030)	–8.705 (8.759)	0.030 (0.056)
Non-English Speaking	–0.031 (0.031)	–5.244 (8.550)	0.126 (0.054)*
Changed occupation	0.055 (0.028)*	14.117 (8.477)$^{\#}$	0.020 (0.049)
Permanent employment	0.128 (0.031)**	17.728 (13.163)	0.084 (0.058)
Public sector	0.120 (0.028)**	6.380 (11.098)	–0.154 (0.048)**
Non-profit organisation	0.056 (0.048)	30.183 (14.645)*	0.013 (0.093)
Education (base: ≤ *Year 11*)			
Tertiary	0.125 (0.038)**	–2.912 (14.346)	0.133 (0.069)*
Adv.dip & dip.	0.125 (0.040)**	7.580 (14.503)	0.194 (0.074)**
Cert. III or IV	0.063 (0.032)$^{\#}$	–0.342 (10.889)	0.140 (0.063)*
Year 12	0.023 (0.036)	–10.965 (11.236)	0.102 (0.071)
Occupation (base: *Clerical/ administrative workers*)			
Manager	0.076 (0.039)$^{\#}$	20.903 (13.242)	0.061 (0.077)
Professional	0.097 (0.037)**	23.723 (13.170)$^{\#}$	0.010 (0.072)
Tech/Trade worker	0.131 (0.038)**	34.772 (14.579)*	–0.015 (0.071)
Community service	0.284 (0.053)**	48.277 (22.797)*	–0.195 (0.086)*
Sales workers	0.049 (0.055)	23.343 (17.161)	–0.195 (0.106)$^{\#}$
Machinery operator	0.005 (0.047)	17.329 (14.137)	0.043 (0.090)
Labourer	0.037 (0.057)	30.448 (17.083)$^{\#}$	–0.120 (0.109)
Industry (base: *Blue collar*)			
Primary	–0.105 (0.089)	–7.745 (32.763)	–0.238 (0.205)
Wholesale/transport	–0.020 (0.028)	11.403 (8.437)	–0.042 (0.053)
Retail	0.002 (0.046)	–16.562 (13.466)	0.136 (0.085)
Hospitality	–0.197 (0.087)*	–12.481 (35.951)	0.176 (0.200)
Business services	0.008 (0.030)	–9.256 (8.468)	0.041 (0.054)
Government	–0.127 (0.039)**	–4.364 (13.298)	–0.030 (0.064)
Education	–0.019 (0.045)	–15.648 (11.977)	0.159 (0.077)*
Health/community	–0.083 (0.051)	–26.325 (15.171)$^{\#}$	0.088 (0.090)
Recreation/other	0.054 (0.028)*	–13.421 (8.658)	–0.013 (0.049)

Firm size (base: *<20*)			
20–99	0.130 (0.037)**	15.184 (16.098)	0.015 (0.077)
100–499	0.136 (0.040)**	11.705 (16.740)	−0.078 (0.079)
500–999	0.136 (0.049)**	20.775 (18.335)	−0.118 (0.094)
1000–4999	0.129 (0.052)*	10.186 (18.454)	−0.007 (0.096)
≥5000	0.152 (0.059)**	20.932 (20.601)	−0.059 (0.105)
Region (base: *Sydney*)			
Other NSW	0.189 (0.064)**	32.574 (20.707)	0.040 (0.099)
Melbourne	0.062 (0.033)#	5.175 (9.812)	0.093 (0.057)
Other VIC	0.123 (0.052)*	26.305 (15.907)#	−0.093 (0.088)
Brisbane	0.016 (0.032)	−4.529 (9.009)	0.050 (0.057)
Other QLD	0.161 (0.055)**	25.159 (18.129)	0.018 (0.088)
Adelaide	0.170 (0.058)**	33.056 (19.117)#	−0.050 (0.095)
Other SA	0.009 (0.069)	29.294 (20.361)	0.067 (0.127)
Perth	−0.048 (0.063)	−53.683 (16.279)**	0.045 (0.101)
Other WA	0.051 (0.088)	−31.326 (23.073)	0.103 (0.144)
TAS	0.103 (0.088)	51.545 (25.120)*	0.038 (0.155)
NT	0.011 (0.131)	−71.251 (27.503)**	0.032 (0.174)
ACT	−0.074 (0.089)	−78.367 (22.282)**	0.212 (0.137)
Unemployment rate in the region	0.006 (0.019)	4.114 (4.922)	0.036 (0.031)
Wave (base: *9 (2009)*)			
10 (2010)	0.044 (0.121)	36.968 (33.808)	0.043 (0.214)
11 (2011)	0.112 (0.233)	72.516 (65.497)	0.100 (0.415)
12 (2012)	0.188 (0.350)	115.479 (98.199)	0.156 (0.621)
13 (2013)	0.263 (0.468)	157.079 (131.820)	0.190 (0.834)
14 (2014)	0.336 (0.585)	187.732 (164.269)	0.117 (1.040)
Sample size	3,966	3,966 (1,455)[e]	1,455
Chi-square (overall)[f]	−2406.74 (0.0000)**	116.80 (0.0002)**	155.96 (0.000)**

Notes: a: Asymptotic standard errors in parentheses. The standard errors for the marginal effects on probability are computed using the delta method. b: Within-group means of the regressors are also included in the estimation to represent heterogeneity, but their coefficient estimates are not reported to save space. c: The models include the level and square terms of these variables. d: Standard errors for the marginal effects of quadratic variables are computed using the delta method. e: The number in parentheses is the number of observations used for the censored regression. f: The chi-square statistic for the overall significance of the model. The p-values are provided in parentheses. #: significant at 10%, *: significant at 5%, **: significant at 1%.

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