Earnings, Occupations and Labour Market Experience in Australia; 1997-2005

Michael Dobbie and Craig MacMillan, Macquarie University

Abstract

This paper examines the relative importance of different types of labour market experience in the determination of earnings across occupations. Specifically, the paper estimates the returns to general experience, firm tenure and occupational tenure for each occupation within the Australian Standard Classification of Occupations (ASCO) in 1997 and 2005. The paper finds that there is an important role for each form of labour market experience. General experience tends to dominate the other forms of labour market experience, both statistically and numerically. While not as important as general experience, wages nevertheless rise with firm tenure in most occupations. Occupational tenure is only important in a small subset of occupations, mainly for Professionals and Tradespeople. There is also evidence that the return to occupational tenure increased significantly for Tradespeople and for Intermediate Transport and Production Workers between 1997 and 2005.

JEL Classification: J300; J310; J420

1. Introduction

Becker's (1964) theory of human capital proposed that workers acquire two types of skill as a result of their labour market experience; general skills that are portable between employers and firm-specific skills that are not transferable between employers.

These two components of labour market experience are captured in earnings equations by; general labour market experience, usually measured by age adjusted for years of schooling; and experience within a specific firm measured by firm tenure. There exists an extensive empirical literature supporting the importance of both these forms of experience, see Preston (1997) for a detailed survey of the literature with an Australia focus.

Some economists have suggested that occupation-specific and industry-specific skills acquired while working in an occupation and/or an industry, measured

by occupational tenure and industry tenure respectively, should also be included in earnings functions in order to get a better measure of the importance of more general and portable skills in determining a worker's earnings. Shaw (1984) was one of the first to argue that investment in occupation-specific skills is an important determinant of earnings. She found that investment in occupation-specific skills dominated the standard general experience variable as a proxy for the stock of general human capital. Lazear and Oyer (2004) used panel data and found that occupational influences completely dominated the influence of the firm in the determination of earnings for Swedish workers between 1984 and 1990. Kwon and Meyersson Milgrom (2010) used the same Swedish survey – but for a different period, 1986-1989, and with a different methodology – and found that the return to firm tenure was 'essentially negligible', while the return to occupational tenure was substantial although both were dominated by the return to general experience. In a recent paper for Australia, Dobbie and MacMillan (2011) found evidence that while the return to general experience dominates returns to firm tenure and occupational tenure, all three forms of experience play an important role in determining earnings for both males and females. Indeed, this later paper found that failure to include a measure of occupational tenure in an earnings function will result in serious misspecification.

Studies focusing on the role of industry tenure in generating general human capital include Neal (1995) and Parent (2000). These studies used US panel data and found that the inclusion of industry tenure significantly reduced the contribution of firm tenure in explaining worker earnings. Indeed, they found that industry tenure dominated firm tenure in the earnings equation. Overall, Parent examined white males only and found that returns to general experience dominated returns to either firm or industry tenure while Neal also found this pattern for males but not females.

More recent work by Zangelidis (2008) and Kambourov and Manovski (2009) has employed a four way classification of labour market experience, allowing them to test for the importance of general experience, firm, occupational and industry tenure on earnings. Kambourov and Manovskii (2009) examined US panel data over the period 1981-1992 and found substantial returns to occupational tenure. In addition, when the occupational variable was included, the returns to both firm tenure and industry tenure were found to be of little importance. Zangelidis (2008) used panel data and looked at the British labour market during the period 1991-2001. He found that the effect of firm tenure was reduced once variables for occupational and industry experience were included. Moreover, the effects of occupational tenure tended to dominate industry tenure. Zangelidis (2008) also found evidence of heterogeneity in the returns to the various kinds of experience across occupations and industries. It should be noted that for both these studies returns to general experience dominated returns to other types of labour market experience. Furthermore, this was true for nearly all model specifications even after controlling for unobserved heterogeneity.

The fact that occupational tenure tends to dominate industry tenure should not come as a surprise. Even narrowly defined industries contain many different jobs. It is hard to believe that, by and large, these jobs involve the formation of human capital that is specific to that industry. For instance an accountant in the mining industry could also use her skills in the manufacturing industry. On the other hand if

an accountant changes occupation and becomes a lawyer, then we would expect there to be a considerable loss of occupation-specific human capital.

This paper extends this literature by estimating log-wage equations for each of the nine ASCO occupational groups. These occupational groups are described in appendix 1. This is a natural extension since there is no a *priori* reason to believe that the returns to the various types of labour market experience should be the same in all occupational groups. Analysis at an aggregated level could in fact mask considerable heterogeneity in the returns to the various kinds of labour market experience across occupations, as was found by Zangelidis (2008) for the British labour market.

Moreover, allowing for heterogeneity in the returns to the various types of labour market experience, across different occupations, is interesting in the Australian context. From the June quarter 1992 until the December quarter 2008 the Australian economy experienced almost continuous expansion, recording 65 out of 66 quarters of positive economic growth until the onset of the Global Financial Crisis. Consequently, over the same period the labour market tightened considerably with the unemployment rate falling steadily from a high of 11 per cent in mid-1992 to a low of 4.1 per cent by mid-2008. This long expansion of the Australian economy was primarily driven by two factors; strong consumption expenditure associated with a housing boom and strong Chinese demand for Australian mineral exports generating a mining boom. As the expansion gathered pace, media commentators, economists, policy makers and politicians began to talk about the emergence of a 'skills shortage' and a resultant 'wages break-out' in those occupations and industries where the shortages were most acute. The current study examines data for the Australian economy at two points in time during this expansion, 1997 and 2005, in order to investigate if the returns to the different types of labour market experience, for different occupational groups, have changed over this period.

The current study will adopt a three-way classification of labour market experience; general experience, occupational tenure and firm tenure. The reason a four-way classification is not adopted is that the data set used does not provide information on industry experience. This could be viewed as a limitation of the current study, however, as was just noted, in studies that have included measures of both occupational and industry experience, the former has typically dominated the latter (Kambourov and Manovskii, 2009; Zangelidis, 2008). The paper will proceed as follows: The next section will describe the data and methodology of the study; this is followed by a section that will report and discuss the results; a final section will provide some concluding observations.

2. Data and Methodology
Data

The Australia Bureau of Statistics (ABS) has conducted the *Survey of Education and Training Experience (SETE)* every four years since 1989. The data collected provides researchers with a rich source of information, for a large sample of workers. The present research draws on a sub-set of the *SETE* data pertaining to non-casual wage and salary earners. This paper uses data from two waves of the survey – 1997 and 2005.

Methodology

The empirical analysis is conducted by estimating the following log-earnings equation.

$$lnW_{it} = \beta_0 + X_{it}\beta_1 + Exp_{it}\beta_2 + Ten_{it}\beta_3 + Occ_{it}\beta_4 + D_{it}\,\alpha_0 + D_{it}X_{it}\,\alpha_1 + D_{it}Exp_{it}\,\alpha_2 +$$
$$D_{it}Ten_{it}\,\alpha_3 + D_{it}Occ_{it}\,\alpha_4 + \varepsilon_{it} \qquad\qquad (1)$$

Where

lnW_{it} = the log real hourly earnings of employee i in time period t. Nominal wages for 1997 and 2005 are expressed in constant 2001 dollars using the Consumer Price Index to do the adjustment.

X_{it} = a vector of variables including, education, whether the employee is from a non-English speaking background, whether the employee is a union member, industry, region, firm size, public versus private sector, marital status, whether the employee has dependent children under the age of 12, whether any work-related training courses were undertaken in the previous 12 months, time spent on work-related training courses undertaken in previous 12 months.

Exp_{it} = general experience of employee i in time period t measured in years.

Ten_{it} = firm tenure of employee i in time period t measured in years.

Occ_{it} = occupational tenure of employee i in time period t measured in years.

D_{it} = a dummy variable equal to one if the observation comes from 2005 and zero if it comes from 1997.

ε_{it} = a random disturbance term.

Appendix 3 contains a full description of each variable entering (1). Appendix 4 contains the mean and standard deviation of each variable entering (1).

Equation (1) is a Mincer earnings equation that has been augmented to include firm and occupational tenure. The variables that are of interest to the research in this paper are the general experience variable, the firm tenure variable and the occupational tenure variable. For the sake of brevity, only these variables are discussed in detail.

Exp: This is the standard Mincer potential experience variable that in this paper is called general experience. It is defined as Age – (Years in school + 5). It is well known that this measure of potential experience overstates actual experience. This is so since it ignores interruptions to working life, something that will be particularly problematic in the case of females. The data used in this paper does not allow for the construction of a variable for actual experience. As such this paper follows the usual procedure in such cases and employs the Mincer proxy for actual experience. For a more general discussion of these issues see Kidd and Shannon (1997).

The usual interpretation of the coefficient attached to this variable is that it captures the average return to an additional year of general training that accumulates with experience (Topel, 1991). This general training is by definition portable between firms. It is equally valuable across all firms who hire this type of labour. A quadratic of general experience is also entered into the empirical model to capture the possibility of a non-linear relationship between earnings and general experience.

Ten: This variable measures tenure or experience in each worker's current firm. The coefficient attached to this variable is usually interpreted as capturing the average return to an additional year of firm-specific training. This would be lost if employment with the firm were to end (Topel, 1991). A quadratic of firm tenure is also entered into the empirical model to capture the possibility of a non-linear relationship between earnings and firm tenure.

Occ: This variable measures occupational tenure or experience of each worker. The coefficient attached to this variable is interpreted as capturing the average return to an additional year of occupational tenure. In other words, it captures the average return to an additional year accumulating occupation-specific skill. These skills are transportable between firms and as such are viewed as general in nature. A quadratic of occupational tenure is also entered into the empirical model to capture the possibility of a non-linear relationship between earnings and occupational tenure.

The research strategy involves estimating equation (1) separately for each of the nine ASCO occupational groups. The data for 1997 and 2005 are pooled and a fully interactive model is estimated. In other words, the model includes all of the variables previously discussed as well as an additive dummy variable equal to one if the observation comes from 2005 and zero if it comes from 1997. This dummy variable is also interacted with the other variables in the model. This creates a series of interaction terms, some of which allow for intercept shifts between the two years and some of which allow for differing slopes for the two years. This allows us to ascertain if any changes to the returns have taken place over the period 1997 to 2005. This could be useful given that this period of time coincided with a worsening 'skills shortage' in Australia.

It is a common practise in this literature, when using the Mincer proxy for experience, to focus only on males. This is done to minimise the size of the measurement error associated with the use of the Mincer proxy, since typically males have a much higher degree of workforce continuity than females. By contrast the current study uses persons as the unit of analysis. The size of the available samples in some of the occupations means it is not feasible to estimate the model separately for males and females in all occupations. We can report however that we did a robustness check of our findings for persons by running the regressions for males and females separately. As discussed below, our overall conclusions are unaffected by this decision.

Results and Discussion

The results do support the idea of considerable heterogeneity in the returns to the various kinds of labour market experience across different occupations. Table 1 presents the results of the regression exercise. For ease of exposition only the variables of interest are reported. The other covariates that are not reported all have the conventional signs and magnitudes. Full results are available on request. Table 2 presents for 1997, the cumulative returns to 2, 5 and 10 years of general experience, firm tenure and occupational tenure respectively, as well as the associated standard errors. Table 3 presents the cumulative returns for 1997 and 2005 for those cases in which there is evidence of a statistically significant change in the return to experience between the two years. We discuss the results for each type of labour market experience in order.

Table 1 - Log-hourly Earnings Regression Results: 1997-2005

	Managers & Admin	Professionals	Associate Professionals	Tradespersons	Advanced Clerical & Service	Inter Clerical, Sales & Service	Inter Production & Trans	Elem Clerical, Sales & Service	Labourers
Exp	.032 **	.026 **	.023 **	.031 **	.025 **	.026 **	.017 **	.025 **	.015 **
	(4.24)	(6.90)	(5.62)	(9.21)	(3.99)	(10.17)	(4.64)	(5.34)	(3.47)
Exp^2	-.0004 **	-.0004 **	-.0003 **	-.0005 **	-.0004 **	-.0004 **	-.0003 **	-.0004 **	-.0002 **
	(-3.55)	(-6.19)	(-4.32)	(-7.91)	(-3.40)	(-8.89)	(-4.23)	(-4.64)	(-3.23)
Ten	.009 #	.011 **	.009 *	.012 **	.010	.008 **	.009 *	.01 #	.013 *
	(1.80)	(3.63)	(2.37)	(3.35)	(1.60)	(2.88)	(2.21)	(1.70)	(2.08)
Ten^2	-.0002 #	-.0003 **	-.0001	-.0002 *	-.0001	-.0001	-.0001	-.0002	-.0003
	(-1.63)	(-3.12)	(-1.17)	(-2.16)	(-.65)	(-1.59)	(-1.20)	(-1.24)	(-1.42)
Occ	.007	.015 **	.006	.019 **	.010	.007 **	-.004	.007	-.0004
	(1.41)	(4.65)	(1.59)	(4.97)	(1.60)	(2.60)	(-.97)	(1.20)	(-.06)
Occ^2	-.0002	-.0003 **	-.0001	-.0005 **	-.0002	-.0002 *	.0001	-.0001	.00001
	(-1.28)	(-3.55)	(-1.30)	(-5.03)	(-1.33)	(-2.33)	(1.08)	(-.89)	(.07)
D x Exp	-.008	-.009 #	-.01 *	.006	-.012	-.006 #	-.005	.001	-.001
	(-.81)	(-1.79)	(-1.99)	(1.26)	(-1.34)	(-1.93)	(-.94)	(.22)	(-.22)
D x Exp^2	.0001	.0001 *	.0001	-.00008	.0002	.0001 *	.0001	-.00002	.00003
	(.78)	(1.91)	(1.57)	(-.87)	(1.44)	(2.10)	(1.15)	(-.21)	(.30)
D x Ten	-.002	-.001	.0004	-.006	.001	.003	-.006	-.007	-.008
	(-.35)	(-.39)	(.08)	(-1.19)	(.13)	(.80)	(-.94)	(-.93)	(-.92)
D x Ten^2	.00006	.00008	-.00002	.0002	-.00005	-.0001	.0001	.0002	.0002
	(.29)	(.59)	(-.17)	(1.18)	(-.17)	(-.84)	(.81)	(.83)	(.77)
D x Occ	-.004	-.0009	-.005	.010 #	-.004	.0002	.012 #	.003	-.0005
	(-.57)	(-.20)	(-1.00)	(1.80)	(-.46)	(.07)	(1.88)	(.37)	(-.06)
D x Occ^2	.0001	.00001	.0001	-.0002 #	.0001	.00002	-.0004 *	-.0001	-.00007
	(.77)	(.15)	(1.09)	(-1.64)	(.45)	(.19)	(-2.15)	(-.49)	(-.25)
Adj. R- squared	0.3721	0.2506	0.3747	0.5783	0.3279	0.3683	0.3542	0.3332	0.2863
F stat	10.0 **	17.1 **	16.8 **	38.1 **	4.9 **	24.1 **	11.3 **	7.7 **	6.2 **
Obs.	1299	4111	2251	2300	672	3363	1612	1131	1085

Notes: The t- ratios are in parenthesis. **, * and # imply significance at the 1, 5 and 10 per cent significance levels respectively.

Table 2 - Returns to Experience, Firm and Occupational Tenure, 1997

	Experience		Firm Tenure		Occupational Tenure	
2 years	*Return*	*SE*	*Return*	*SE*	*Return*	*SE*
Managers & Admin	0.062 **	0.0154	0.017 #	0.0089	0.013	0.0109
Professionals	0.050 **	0.0063	0.020 **	0.0063	0.028 **	0.0063
Associate Professionals	0.044 **	0.0063	0.017 **	0.0063	0.011 #	0.0063
Tradespersons	0.06 **	0.0063	0.023 **	0.0063	0.036 **	0.0063
Advanced Clerical & Service	0.048 **	0.0126	0.019	0.0126	0.019	0.0126
Intermed Cler Sales & Service	0.050 **	0.0048	0.015 **	0.006	0.013 *	0.0056
Intermed Production & Trans	0.032 **	0.0063	0.017 **	0.0063	-0.007	0.0089
Elementary Cler Sales & Service	0.048 **	0.0089	0.019 #	0.0109	0.013	0.0109
Labourers & related	0.029 **	0.0089	0.024 *	0.0126	-0.0007	0.0126
5 years	*Return*	*SE*	*Return*	*SE*	*Return*	*SE*
Managers & Admin	0.15 **	0.0387	0.04 #	0.0223	0.03	0.0273
Professionals	0.12 **	0.0158	0.047 **	0.0158	0.067 **	0.0158
Associate Professionals	0.107 **	0.0158	0.042 **	0.0158	0.027 #	0.0158
Tradespersons	0.142 **	0.0158	0.055 **	0.0158	0.082 **	0.0158
Advanced Clerical & Service	0.115 **	0.0316	0.047	0.0316	0.045	0.0316
Intermed Cler Sales & Service	0.12 **	0.0122	0.037 **	0.015	0.03 *	0.0141
Intermed Production & Trans	0.077 **	0.0158	0.042 **	0.0158	-0.017	0.0223
Elementary Cler Sales & Service	0.115 **	0.0223	0.045 #	0.0273	0.032	0.0273
Labourers & related	0.07 **	0.0223	0.057 *	0.0316	-0.001	0.0316
10 years	*Return*	*SE*	*Return*	*SE*	*Return*	*SE*
Managers & Admin	0.28 **	0.0774	0.07	0.0447	0.05	0.0547
Professionals	0.22 **	0.0316	0.08 **	0.0316	0.12 **	0.0316
Associate Professionals	0.2 **	0.0316	0.08 **	0.0316	0.05	0.0316
Tradespersons	0.26 **	0.0316	0.1	0.0316	0.14 **	0.0316
Advanced Clerical & Service	0.21 **	0.0632	0.09	0.0632	0.08	0.0632
Intermed Cler Sales & Service	0.22 **	0.0244	0.07 *	0.03	0.05 #	0.0282
Intermed Production & Trans	0.14 **	0.0316	0.08 **	0.0316	-0.03	0.0447
Elementary Cler Sales & Service	0.21 **	0.0447	0.08	0.0547	0.06	0.0547
Labourers & related	0.13 **	0.0447	0.1	0.0632	-0.003	0.0632

Notes: **, * and # indicate significance at 1, 5 and 10 per cent respectively. Return refers to the cumulative return. The cumulative returns are calculated using the coefficient estimates in table 1. The cumulative returns to general experience are calculated as $b_{exp}X + b_{exp2}X^2$, where b_{exp} and b_{exp2} are the regression coefficients for general experience and general experience squared. The standard errors for the cumulative returns to general experience are calculated using the usual formula for the variance of a linear combination of random variables. Similar calculations are used to obtain the returns and standard errors for firm tenure and occupational tenure.

Table 3 - Changes in Returns Between 1997 and 2005

	Experience			Occupational Tenure		
2 years	*1997*	*2005*	*Change*	*1997*	*2005*	*Change*
Professionals	0.050 **	0.033 **	-0.017			
Associate Professionals	0.044 **	0.025 **	-0.019			
Tradespersons				0.036 **	0.055 **	+0.019
Intermed Cler Sales & Service	0.050 **	0.038 **	-0.012			
Intermed Production & Trans				-0.007	0.014	+0.021
5 years	*1997*	*2005*	*Change*	*1997*	*2005*	*Change*
Professionals	0.12 **	0.077 **	-0.043			
Associate Professionals	0.107 **	0.06 **	-0.047			
Tradespersons				0.082 **	0.127 **	+0.045
Intermed Cler Sales & Service	0.12 **	0.092 **	-0.028			
Intermed Production & Trans				-0.017	0.032	+0.049
10 years	*1997*	*2005*	*Change*	*1997*	*2005*	*Change*
Professionals	0.22 **	0.14 **	-0.08			
Associate Professionals	0.2 **	0.11 **	-0.09			
Tradespersons				0.14 **	0.22 **	+0.08
Intermed Cler Sales & Service	0.22 **	0.17 **	-0.05			
Intermed Production & Trans				-0.03	0.05	+0.08

Notes: **, * and # indicate significance at 1, 5 and 10 per cent respectively. This table presents the cumulative returns for cases in which there is a statistically significant difference in the returns between 1997 and 2005.

General Experience

It can be seen from table 1 that the coefficients attached to the general experience variables are correctly signed and always statistically significant at the one per cent significance level. From table 2 it can be seen that in 1997 the cumulative return to five years of experience ranges from seven per cent for Labourers to 15 per cent for Managers. In all cases it is evident that general experience dominates the other forms of labour market experience, both numerically and statistically.

However, as was pointed out in the methodology section when discussing the use of potential experience to proxy actual experience, it is likely that potential experience will overstate the amount of actual experience, thereby biasing the estimates. Other papers mentioned in the introduction have also had to use potential experience due to data limitations. These papers include Neal (1995), Parent (2000) and Kambourov and Manovskii (2009). Of particular interest is Parent (2000) because he used two US data sets, the National Longitudinal Survey of Youth (NLSY) and the Panel Study of Income Dynamics (PSID). The NLSY allowed for the construction of an actual experience measure from participant responses to questions on employment history. By contrast, the PSID only allowed for a potential experience measure to be used. Importantly, Parent finds that general experience dominants other types of experience for both data sets and this pattern of results is not sensitive to model specification.

It should be pointed out that Parent restricts his analysis to males and this accordingly reduces the potential measurement problems associated with using the Mincer proxy. However, as already mentioned sample size restrictions have led us to

conduct the analysis for persons. As a robustness check we have run the regressions separately for males and females for each occupation. The results of this exercise are reported in appendix 2. For both males and females the finding that the return to general experience tends to dominate the other forms of experience continues to hold. Appendix 2 indicates that there are only three instances where this is not the case. The return to general experience is not significant for female Labourers and Tradespersons, nor is it significant for male Advanced Clerical and Service workers. In all three cases it is likely that this is due to the limited size of the sample involved. The regressions for female Labourers and Tradespersons are based on 345 and 177 observations respectively. The regression for male Advanced Clerical and Service workers was based on only 90 observations.

When looking at the changes in the returns to general experience over time, we find that in the case of Professionals, Associate Professionals and Intermediate Clerical, Sales and Service Workers, the evidence suggests a reduction in the return to general experience between the years 1997 and 2005. This can be seen by looking at the interactions between the year dummy and the general experience variables. The relevant interactions have been highlighted in grey in table 1 in order to make this easy to see. In table 3 we report the returns to general experience for these three occupations in 1997 and 2005, as well as the change in the return between 1997 and 2005. We illustrate using the case of the five year returns for these three occupations. From table 3 it can be seen that the five year returns for these occupations in 1997 were 12, 10.7 and 12 per cent respectively. Once we take into account the changes in the slope coefficients implied by the statistically significant interactions in table 1, it can be shown that identical workers in 2005 were receiving 7.7, 6 and 9.2 per cent respectively in these three occupations.[1]

Firm Tenure

It is apparent from tables 1 and 2 that firm tenure, while not as important as general experience, nevertheless makes an important contribution to explaining the variation in earnings for many occupations. Indeed, the only occupation for which there is no evidence of a firm tenure effect at conventional significance levels is Advanced Clerical, Sales and Service Workers. For Managers and Elementary Clerical, Sales and Service workers, there is a tenure effect that is just significant at the 10 per cent significance level. For all other occupations the effect of firm tenure is significant at five per cent or greater. From table 2 the magnitude of the effect ranges from 1.5 per cent to 2.4 per cent for two years, 3.7 per cent to 5.7 per cent for five years and seven per cent to eight per cent for 10 years of firm tenure. The magnitude of these returns therefore tends to be less than half that of the returns to general experience. There

---

[1] For example, in table 1 the coefficients on general experience and general experience squared for Professionals are 0.026 and -0.0004 respectively. The interactions between the year dummy and the general experience variables for Professionals are statistically significant and equal to -0.009 and 0.0001 respectively. The coefficients for general experience and general experience squared, in 2005, are then equal to (0.026 - 0.009) = 0.017 and (-0.0004 + 0.0001) = -0.0003 respectively. These numbers (0.017 and -0.0003) are then used to calculate the returns to general experience for Professionals in 2005. The same method is used to calculate the changed cumulative returns between 1997 and 2005 in the other relevant cases.

appears to be less heterogeneity in the return to firm tenure across occupations than in the case of general experience. The interactions between the year dummy and the firm tenure measures are never statistically significant and therefore suggest that there has been no change in the return to firm tenure over the period covered in this study.

Occupational Tenure

From table 1 it can be seen that there are four occupations; Professionals, Tradespeople, Intermediate Clerical, Sales and Service Workers; and Intermediate Transport and Production Workers (the latter only for 2005) in which occupational tenure is rewarded. From table 2 it can be seen that it is only for Professionals and Tradespersons that the returns at 2, 5 and 10 years are consistently significant at the one per cent significance level. The returns range from 2.8 per cent to 3.6 per cent for two years, 6.7 per cent to 8.2 per cent for five years, and 12 per cent to 14 per cent for 10 years of occupational tenure in these two occupational groups respectively. As such, for these occupations, occupational tenure is numerically more important than job tenure, and about half as important as general experience. It is clear that the returns to occupational tenure are the most heterogeneous of all three forms of labour market experience.

There are two occupations for which there was a statistically significant change in the return to occupational tenure over the period 1997 to 2005. These occupations are Tradespersons and Intermediate Transport and Production Workers. The relevant interactions have been highlighted in table 1 with grey. In table 3 the returns for 1997 and 2005 are presented as well as the changes in the returns over this period. It can be seen for instance that for both of these occupations, workers with 10 years experience enjoyed an estimated eight per cent higher return in 2005 compared to 1997. Whether these changes are related to the 'skill shortage' discussed in the introduction to this paper cannot be determined with the data used in this paper. Further investigation of this issue will be the subject of future research.

Limitations of this paper

The present study has two limitations that should be mentioned. Firstly, the data set used did not permit a measure of industry experience to be included in the estimated earnings equations and given that some recent studies have found significant returns to industry tenure, the tenure coefficients estimated here should be regarded with a measure of caution (Neal, 1995; Parent, 2000). Secondly, the cross-sectional nature of the data set did not allow this study to control for potential endogeneity bias due to the effects of unobserved ability on job-matches and occupation-matches (Zangelidis, 2008). Endogeneity bias is best dealt with using longitudinal data so the results reported here should be viewed with a degree of caution.

3. Conclusion

In recent years there has emerged an international literature attempting to assess the relative importance of general experience, firm tenure, occupational tenure and industry tenure in explaining wages. This literature points towards a potentially important role for each of these forms of labour market experience. The research reported in this

paper extends this literature by examining the role of general experience, firm and occupational tenure at the occupational level. This is a natural extension since there is no a priori reason to believe that the various forms of labour market experience would be equally valuable in all occupations. In addition, this paper has assessed the extent to which the returns to the various forms of labour market experience may have changed over the period 1997 to 2005. The paper finds that general experience is the most important form of labour market experience in all occupations. Firm tenure is found to also contribute positively to wages in most occupations. By contrast occupational tenure only seems to generate a return in a subset of occupations, especially Professionals and Tradespeople. In addition, the research reported in this paper shows that for Tradespeople and Intermediate Production and Transport workers, the return to occupational tenure increased between 1997 and 2005.

Appendix

Appendix 1 - The Australian Standard Classification of Occupations, Second Edition

Major Groups	Occupations	Skill Level	Description of skill level required for entry into this occupation #
1	Managers and Administrators	ASCO I	Bachelor degree or higher or at least five years relevant experience
2	Professionals	ASCO I	
3	Associate Professionals	ASCO II	AQF Diploma or Advanced Diploma or at least 3 years relevant experience
4	Tradespersons and Related Workers	ASCO III	AQF Certificate III or IV or at least three years relevant experience
5	Advanced Clerical and Service Workers	ASCO III	
6	Intermediate Clerical, Sales and Service Workers	ASCO IV	AQF Certificate II or at least one year relevant experience
7	Intermediate Production and Transport Workers	ASCO IV	
8	Elementary Clerical, Sales and Service Workers	ASCO V	Completion of compulsory secondary school or AQF Certificate I
9	Labourers and Related Workers	ASCO V	

Source: ABS, Australian Standard Classification of Occupations, Second Edition, 1997, ABS Cat. No. 1220.0.
Note that this is a simplified description. For more detail consult ABS Cat. No. 1220.0.

Appendix 2 - Returns to Experience, Firm and Occupational Tenure, by Gender, 1997

	Experience		Firm Tenure		Occupational Tenure	
2 years	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
Managers & Admin	0.050 **	0.134 **	0.013	0.036 *	0.024 *	-0.024
Professionals	0.066 **	0.031 **	0.028 **	0.015 *	0.023 **	0.032 **
Associate Professionals	0.039 **	0.061 **	0.013 *	0.019	0.017 **	0.001
Tradespersons	0.062 **	0.034	0.019 **	0.036	0.038 *	0.007
Advanced Clerical & Service	0.068	0.054 **	-0.016	0.025 *	-0.019	0.019
Intermed Cler Sales & Service	0.044 **	0.059 **	0.002	0.03 **	0.028 **	0.001
Intermed Production & Trans	0.032 **	0.055 **	0.0136 *	0.034 #	-0.005	0.005
Elementary Cler Sales & Service	0.058 **	0.046 **	0.036 *	0.015	0.021	0.005
Labourers & related	0.031 **	0.021	0.032 **	0.003	0.0003	0.002
5 years	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
Managers & Admin	0.12 **	0.32 **	0.03	0.085 #	0.057 *	-0.057
Professionals	0.157 **	0.075 *	0.065 **	0.035 *	0.055 **	0.075 **
Associate Professionals	0.095 **	0.145 **	0.032 *	0.047	0.04 *	0.004
Tradespersons	0.147 **	0.075	0.045 **	0.087	0.087 #	0.0175
Advanced Clerical & Service	0.167	0.127 **	-0.02	0.06 *	-0.045	0.045 #
Intermed Cler Sales & Service	0.107 **	0.14 ***	0.006	0.007 **	0.065 **	0.004
Intermed Production & Trans	0.077 **	0.013 **	0.032 *	0.082 #	-0.012	0.012
Elementary Cler Sales & Service	0.137 **	0.11 **	0.085 *	0.035	0.05	0.012
Labourers & related	0.075 **	0.052	0.077 *	0.007	0.001	0.002
10 years	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*
Managers & Admin	0.23 **	0.59 **	0.05	0.15	0.1 #	-0.01
Professionals	0.29 **	0.14 **	0.11 **	0.06 #	0.1 **	0.13 **
Associate Professionals	0.18 **	0.26 **	0.06 #	0.09	0.07 *	0.01
Tradespersons	0.27 **	0.13	0.08 **	0.16	0.15	0.03
Advanced Clerical & Service	0.32	0.23 **	-0.01	0.11 *	-0.08	0.08
Intermed Cler Sales & Service	0.2 **	0.25 **	0.015	0.12 **	0.11 **	0.01
Intermed Production & Trans	0.14 **	0.23 **	0.06 #	0.15	-0.02	0.02
Elementary Cler Sales & Service	0.25 **	0.20 **	0.15 *	0.06	0.09	0.02
Labourers & related	0.14 **	0.1	0.14 *	0.01	0.005	-0.01

Notes: **, * and # indicate significance at 1, 5 and 10 per cent respectively. Return refers to the cumulative return. The cumulative returns are calculated using the coefficient estimates in table 1. The cumulative returns to general experience are calculated as $b_{exp}X + b_{exp2}X^2$, where b_{exp} and b_{exp2} are the regression coefficients for general experience and general experience squared. The standard errors (not reported) for the cumulative returns to general experience are calculated using the usual formula for the variance of a linear combination of random variables. Similar calculations are used to obtain the returns and standard errors for occupational tenure.

Appendix 3 - Variable Definitions

Dependant variable is real log-hourly wages	
EXPER =	Age – (years of schooling + 5)
TENUREC =	years of tenure with current firm
OCCTENC =	cumulative years of tenure in current occupation
TRAIN =	a dummy variable equal to 1 if some training undertaken in previous 12 months, zero otherwise
TRAINTIME =	time spent on all training courses undertaken in previous 12 months, in hours
CHILD =	dummy equal to 1 if has dependent child under 12 years of age, zero otherwise
MARSTAT =	a dummy variable equal to 1 if married and zero otherwise
BNESC =	a dummy variable equal to 1 if born in a non-English speaking country, zero otherwise
UNION =	a dummy equal to 1 if a union member, zero otherwise
PUBLIC =	a dummy equal to 1 if employed in the public sector, zero otherwise
MANAGER =	dummy variable equal to 1 if ASCO occupation is 'Managers and administrators', zero otherwise
PROF =	dummy variable equal to 1 if ASCO occupation is 'Professionals', zero otherwise
APROF =	dummy variable equal to 1 if ASCO occupation is 'Associate professionals', zero otherwise
TRAD =	dummy variable equal to 1 if ASCO occupation is 'Tradespersons and related workers', zero otherwise
ADVCLER =	dummy variable equal to 1 if ASCO occupation is 'Advanced clerical and service workers', zero otherwise
INTCLER =	dummy variable equal to 1 if ASCO occupation is 'Intermediate clerical, sales and service workers', zero otherwise
INTPRODT =	dummy variable equal to 1 if ASCO occupation is 'Intermediate production and transport and workers', zero otherwise
ELCLER =	dummy variable equal to 1 if ASCO occupation is 'Elementary clerical, sales and service workers', zero otherwise
LAB =	dummy variable equal to 1 if ASCO occupation is 'Labourers and related workers', zero otherwise
TERT =	dummy variable equal to 1 if highest educational level is a bachelors degree, postgraduate degree, graduate diploma or graduate certificate, zero otherwise
ADVDIP =	dummy variable equal to 1 if highest educational level is a diploma or advanced diploma, zero otherwise
ADVCERT =	dummy variable equal to 1 if highest educational level is certificate III or IV, zero otherwise
BASCERT =	dummy equal to 1 if highest educational level is certificate I or II, zero otherwise
YEAR12 =	dummy variable equal to 1 if year 12 is highest educational level, zero otherwise
EARL =	dummy variable equal to 1 if left school prior to year 12, zero otherwise
SMALL =	dummy variable equal to 1 if 19 or fewer employees at workplace, zero otherwise
LARGE =	dummy variable equal to 1 if 100 or more employees at workplace, zero otherwise
MEDIUM =	dummy equal to 1 if 20 to 99 employees at workplace, zero otherwise
D =	a dummy variable equal to 1 if the observation comes from 2005, zero if the observation comes from 1997
Industry Dummies =	one digit ANZIC
State Dummies =	state and territory

Appendix 4 - Means and Standard Deviations

	Man	Prof	AProf	Trad	AdvC	InCler	InProd	ElCler	Lab
LOG REAL HRLY WAGE	3.17	3.09	2.94	2.73	2.84	2.76	2.75	2.62	2.64
	(.40)	(.35)	(.36)	(.42)	(.30)	(.30)	(.34)	(.34)	(.33)
EXPER	27.7	24.3	23.7	19.9	22.8	23.1	25.4	21.3	24.26
	(9.6)	(10.8)	(11.2)	(12.4)	(12.2)	(12.2)	(12.2)	(13.4)	(12.9)
TENUREC	9.46	8.5	8.9	7.24	7.13	7.17	8.17	6.85	7.27
	(9.1)	(8.8)	(9.1)	(8.2)	(7.5)	(7.6)	(8.6)	(8.4)	(8.0)
OCCTENC	8.28	12.0	9.28	12.2	10.46	8.39	10.9	8.21	8.77
	(8.2)	(10.5)	(9.3)	(10.7)	(10.0)	(8.5)	(9.9)	(8.4)	(9.0)
TRAIN	0.7	0.76	0.65	0.45	0.58	0.59	0.42	0.45	0.33
	(.45)	(.42)	(.47)	(.49)	(.49)	(.49)	(.49)	(.49)	(.47)
TRAINTIME	27.9	29.9	30.3	24.4	21.3	21.0	14.6	16.85	12.14
	(48.6)	(58.1)	(69.3)	(83.9)	(67.9)	(48.8)	(53.4)	(64.8)	(56.5)
CHILD	0.42	0.35	0.34	0.32	0.24	0.29	0.34	0.23	0.29
	(.49)	(.47)	(.47)	(.46)	(.43)	(.45)	(.47)	(.42)	(.45)
MARSTAT	0.78	0.70	0.68	0.61	0.64	0.64	0.70	0.54	0.63
	(.41)	(.45)	(.42)	(.48)	(.47)	(.47)	(.45)	(.49)	(.48)
BNESC	0.11	0.14	0.09	0.10	0.10	0.11	0.15	0.12	0.21
	(.31)	(.34)	(.29)	(.30)	(.31)	(.31)	(.36)	(.33)	(.40)
MALE	0.72	0.47	0.60	0.92	0.13	0.32	0.88	0.43	0.68
	(.44)	(.49)	(.48)	(.26)	(.34)	(.47)	(.32)	(.49)	(.46)
UNION	0.20	0.40	0.31	0.37	0.20	0.28	0.52	0.35	0.45
	(.40)	(.49)	(.46)	(.48)	(.40)	(.45)	(.49)	(.47)	(.49)
PUBLIC	0.29	0.49	0.33	0.13	0.23	0.31	0.11	0.18	0.14
	(.45)	(.50)	(.47)	(.33)	(.42)	(.46)	(.31)	(.38)	(.35)
TERT	0.41	0.69	0.19	0.02	0.09	0.09	0.01	0.06	0.01
	(.49)	(.45)	(.39)	(.14)	(.25)	(.29)	(.13)	(.25)	(.12)
ADVDIP	0.13	0.14	0.16	0.04	0.12	0.10	0.02	0.06	0.02
	(.34)	(.34)	(.37)	(.21)	(.33)	(.31)	(.16)	(.25)	(.16)
ADVCERT	0.11	0.04	0.19	0.49	0.07	0.14	0.16	0.10	0.12
	(.32)	(.20)	(.39)	(.50)	(.26)	(.35)	(.37)	(.31)	(.32)
BASCERT	0.04	0.02	0.07	0.07	0.17	0.09	0.07	0.07	0.05
	(.19)	(.15)	(.25)	(.25)	(.38)	(.29)	(.26)	(.26)	(.23)
YEAR12	0.13	0.05	0.18	0.11	0.24	0.22	0.13	0.23	0.15
	(.33)	(.22)	(.39)	(.32)	(.42)	(.41)	(.34)	(.42)	(.36)
EARL	0.18	0.06	0.21	0.27	0.31	0.36	0.61	0.48	0.35
	(.34)	(.37)	(.42)	(.40)	(.32)	(.31)	(.41)	(.39)	(.40)
SMALL	0.30	0.23	0.39	0.46	0.39	0.35	0.29	0.42	0.31
	(.40)	(.39)	(.44)	(.41)	(.44)	(.48)	(.46)	(.47)	(.45)
LARGE	0.41	0.44	0.32	0.27	0.35	0.35	0.39	0.30	0.38
	(.49)	(.49)	(.47)	(.44)	(.47)	(.47)	(.48)	(.45)	(.48)
MEDIUM	0.29	0.33	0.29	0.27	0.26	0.30	0.32	0.28	0.31
	(.45)	(.47)	(.45)	(.44)	(.44)	(.45)	(.46)	(.45)	(.46)
D	0.55	0.55	0.55	0.46	0.50	0.54	0.46	0.56	0.51
	(.49)	(.49)	(.49)	(.49)	(.50)	(.49)	(.49)	(.49)	(.49)
State and Territory Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Standard deviations in parenthesis.

References

Australian Bureau of Statistics (ABS) (1997), *Australian Standard Classification of Occupations*, Second Edition, 1997, ABS Cat. No. 1220.0. Canberra.

Australian Bureau of Statistics (ABS) (1997 and 2005), S*urvey of Education and Training Experience*, Cat. No. 6278.0. Canberra.

Becker, G.S. (1964), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Educatio*n, New York: Columbia University Press.

Dobbie, M. and MacMillan, C. (2011), 'Returns to Firm and Occupational Tenure: Evidence from Australia 1997-2005', mimeo, Macquarie University.

Kambourov, G. and Manovskii, I. (2009), 'Occupational Specificity of Human Capital', *International Economic Review*, 50(1), 63-115.

Kidd, M. and Shannon, M. (1997), 'Imputation of Female Labour Market Experience: Some Evidence on the Zabalza and Arrufat Method', *Economic Record*, 73, 136-145.

Kwon, I. and Meyersson Milgrom, E. (2010), 'Specificity of Human Capital and Promotions', mimeo, Stanford University.

Lazear, E.P. and Oyer, P. (2004), 'Internal and External Labor Markets: A Personnel Economics Approach', *Labour Economics*, 11, 527-554.

Neal, D. (1995), 'Human Capital: Evidence from Displaced Workers', *Journal of Labor Economics*, 13(4), 653-677.

Parent, D. (2000), 'Industry-Specific Capital and the Wage Profile: Evidence from the National Longitudinal Survey of Youth and the Panel Study of Income Dynamics', *Journal of Labor Economics*, 18(2), 306-323.

Preston, A. (1997), 'Where are we now with Human Capital Theory?', *Economic Record*, 73(220), 51-78.

Shaw, K. (1984), 'A Formulation of the Earnings Function Using the Concept of Occupational Investment', *The Journal of Human Resources*, 19, 319-340.

Topel, R. (1991), 'Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority', *Journal of Political Economy*, 99, 145-176.

Zangelidis, A. (2008), 'Occupational and Industry Specificity of Human Capital in the British Labour Market', *Scottish Journal of Political Economy*, 55(4), 420-443.