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Abstract

This paper contributes to the literature by separately analysing the signalling (or sheepskin) effects of the enrolment in and the completion of vocational education and training as well as higher education. Moreover, we investigate the persistence of these sheepskin effects over time. We take advantage of the Longitudinal Surveys of Australian Youth, which contains comprehensive information about completed and uncompleted courses and subsequent labour market outcomes. We find that signalling effects form a substantial part of the total return to education but that they vary by type of course. In addition, we show that both course attendance and course completion contribute to the overall signalling effects.

JEL classification: I20, J31
Keywords: Return to education, signalling effects, post-secondary education

1. Introduction

Developed countries typically spend a substantial share of their budget on education with the overarching objective of improving the education level of the population. However, Stiglitz (1975) suggested that educational expenditure (above a certain level) may both increase inequality and decrease net national income if education is used not only to acquire skills but also as a signalling device. In this case, the private returns to education are greater than the social returns and a case can be made for intervention to raise the private cost of education (Riley, 1979).

More specifically, Arrow (1973), Spence (1973) and Stiglitz (1975) argue that education serves as a signal of greater ability or, more generally, of attributes valuable to potential employers (because they contribute to productivity). Employers 'screen' for these signals because the attributes they value in job candidates are not directly observable. As noted by Gibson (2000), in the presence of such signalling effects, generally called sheepskin effects, there are external costs of education because additional education obtained by individuals of a given ability raises the education needed by the more able if they are to signal their greater talents. The existence of sheepskin effects is documented using various datasets in Olneck (1977), Hungerford and Solon (1987), Belman and Heywood (1991), Card and Krueger (1992), Jaeger and Page (1996), Heckman *et al.* (1996) and Park (1999).[1] The first studies in this literature noted significant discontinuities in the returns to years of schooling for the specific years in which diplomas are awarded, which were difficult to reconcile with human capital theory. Using more comprehensive datasets, more recent studies show a wage premium for those possessing a diploma even after controlling for the number of years of education and other relevant variables.

In addition to the sheepskin effect associated with a diploma, Arkes (1999) shows that university attendance in itself is also a valuable signal. He argues that by attending university, a person "displays the motivation to learn and to improve himself, thereby distinguishing himself from someone who only acquires a high school diploma." Many

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[1] This list is not exhaustive. We also note that a few studies cast doubt on the signalling theory. Grubb (1993) discusses these studies, the most well-known being probably the study by Layard and Psacharopoulos (1974).

young people do not attend university however, and we know little about the signalling effects of other post-secondary vocational education and training.

This paper contributes to this literature by separately analysing the signalling effects of the enrolment in and the completion of vocational education and training as well as higher education. To this end, we make use of the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth (LSAY) to obtain the number of years of schooling as well as comprehensive information about all courses started, whether they were completed or not, and the subsequent labour market outcomes. This unique dataset allows us to extend previous research by generalizing Arkes' approach to a wide range of post-school qualifications. Hence, we bring additional insights regarding the extension of the sheepskin effects beyond course completion to course enrolment and we shed light on whether the distortions between social and private returns to education extend beyond the higher education sector. This distinction is particularly relevant since Card (1976) and Riley (1979) suggested that screening is likely to be more important in skilled occupations where productivity is more difficult to observe than in other occupations where productivity is more easily observable. If this is the case then we would expect larger sheepskin effects for university than for VET qualifications.

Another contribution of this paper is to assess the persistence of the signalling effects on wages by estimating wage equations one, two and three years after the last education spell. Our methodology combines the approach suggested by Heckman (1976) to control for self-selection into employment with an inverse probability weighted estimator to deal with the potential selection bias due to attrition in LSAY data. We find evidence of positive sheepskin effects for both enrolling in and completion of VET and university courses with important differences by type of course.

The paper is organized as follows. In the next section we provide a brief description of the LSAY data. Section 3 provides an overview of wages in the first few years following an education spell for both completers and non-completers. Section 4 sets out the economic modelling approach. The results from the modelling exercise are discussed in Section 5. The final section contains some concluding remarks.

2. Data: The Longitudinal Surveys of Australian Youth

The data for this study consist of the 95 and 98 cohorts of the LSAY data (LSAY95 and LSAY98).[2] Both cohorts are nationally representative samples of about 14,000 students who were in grade 9 in 1995 and 1998, respectively.[3] The respondents were surveyed annually from about 14 to 25 or 26 years of age. Information is collected on each course started, and in particular its completion status.[4]

The analysis sample consists of young people who have left school, either before or after completing grade 12, and who were not studying at the time of interview. Three samples are constructed to collect information one, two or three year(s) after these individuals' last education spell. This last spell can be either secondary school, for those who did not participate in post-school education, or tertiary education. This does not mean that these individuals did not re-engage in education later on. Hence, there can be multiple observations for the same individual if he/she re-engages in post-school education after a non-studying period. Although repeated observations from the same individual account for about 10 percent of all observations one year after the last education spell, repeated observations are virtually nonexistent for the samples based on observations two and three years after the last course.[5]

The final sample covers the period from 1997 to 2008. PhD and Master's degree graduates are excluded from the sample given their limited number. Since nominal

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[2] See the user guides for Y95 and Y98 (NCVER 2009a, 2009b) for a complete discussion of the data and further references to technical papers pertaining to the sample design.

[3] Most young people in grade 9 are 14 or 15 years of age, which is the age until which schooling is compulsory.

[4] Prior to 2001 (i.e., wave 7) in LSAY95 and prior to 2002 (i.e., wave 5) in LSAY98, there is not sufficient information (if any) on non-completed courses. To circumvent this problem, we use retrospective questions asked in 2001 in LSAY95 and in 2002 in LSAY98 about previous education spells (since leaving school) and their completion status. This is crucial to this study since without these retrospective questions, we would miss the very first year on the labour market for a substantial number of VET students and early school leavers.

[5] The longer the interruption, the least likely the respondents are to still be in LSAY when leaving education for the second time since young people are only followed up to 26 years of age. Some of them may re-engage in post-school education after leaving the LSAY survey. Moreover, the non-negligible LSAY attrition rates mean that some re-engagements occurring prior to 26 years of age are not captured.

wages are not directly comparable across such an extended period of time, all wages are inflated to 2008 prices using the Australian Bureau of Statistics wage index.[6]

University degrees, and Bachelor's degrees in particular, share many common characteristics in Australia, the UK, US and many countries. One particularity of the Australian system worth mentioning here is that young students go through a selection process based on their academic performance in grades 11 and 12 before they can enter university (see Marks *et al.*, 2001, for details). The Higher Education Contribution Scheme, introduced in 1989, allows students to finance the direct costs of their study (but not their living costs) through a loan from the Australian Government that is then repaid once an individual's income exceeds a minimum threshold.[7]

The Australian VET system is structured around certificates of four different levels and VET diplomas. Certificates provide practical skills with higher certification levels signifying more advanced qualifications. Certificates I and II provide individual basic skills while certificates III and IV are more advanced. Diplomas are generally one- to two-year programs with practical courses and are considered to be of higher level than certificates. Certificates II are generally considered as being the equivalent of grade 12. VET qualifications of all level can be obtained through standard courses (in secondary schools or in technical and further education colleges) or through apprenticeship or traineeship (A/T), although we will only introduce this distinction for certificates III and IV due to the restricted sample sizes for other VET qualifications. VET courses are very accessible and there is usually no requirement in terms of school completion.

LSAY data indicate that in recent years 30 to 35 percent of young people went on to complete a university degree while about 35 to 40 percent acquired a VET qualification. OECD (2010, pp. 67-68) reveals that higher education graduation rates are comparable in the UK, US and Australia, once international students are excluded. This OECD report also shows that data on vocational qualifications is more parsimonious, making

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[6] The wage index increased by 62 percent (in nominal terms) between August 1997 and August 2008 (ABS Series ID A2734023X).

[7] See Cobb-Clark and Ribar (2010) for more details about the Australian education system and its recent evolutions.

international comparisons more difficult. The data gathered by the OCED (2010) seem to point toward higher participation rates in the vocational education system in the UK and Australia than in the US.[8]

3. Wages for Completers and Non-Completers

The two left columns of Table 1 present average male hourly wages one year after the last education spell. Average wages are reported separately by type of course for completers and non-completers, as well as for those who did not engage in post-school education.[9] The three right columns present average enrolment and completion premiums. Enrolment premiums are computed as the difference in percentage points between the average wages of non-completers and the average wages of non-participants (presented in the first row of the table). Completion premiums represent the difference (in percentage points) between the average wages of completers and non-completers.

Table 1 Male enrolment and completion premiums, and average hourly wages one year after the last education spell (weighted, in 2008 dollars)

Last course started	Not completed	Completed	All	Enrolment premium	Completion premium	No. of observations
No post-school study	16.32	.	16.32			1,304
Standard error	*0.2*	.	*0.2*			
Certificate I/II	20.47	22.22	21.71	25.4% ***	8.5%	652
Standard error	*0.6*	*0.5*	*0.4*			
Certificate III/IV	19.73	20.07	19.96	20.9% ***	1.7%	233
Standard error	*0.7*	*0.7*	*0.5*			
A/T: Certificate III/IV	23.59	22.06	22.43	44.5% ***	-6.5%	200
Standard error	*1.7*	*0.7*	*0.7*			
Diploma	20.39	20.37	20.38	24.9% ***	-0.1%	360
Standard error	*0.7*	*0.5*	*0.4*			
Bachelor's degree	19.82	22.87	21.98	21.4% ***	15.4% ***	1,263
Standard error	*0.4*	*0.2*	*0.2*			
All	18.02	22.06	19.91			4,166
Standard error	*0.2*	*0.2*	*0.1*			

Note: A/T stands for apprenticeship or traineeship. * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level. Source: LSAY95 and LSAY98.

[8] The OECD used a particular classification specifically designed to make international comparisons, which does not allow a direct comparison with the graduation rates provided in this paper.

[9] Completion rates are about 70 to 75 percent on average. They tend to be higher for females than for males and for university courses than for VET courses. Among VET courses, completions rates are higher for apprenticeships and traineeships than for other VET courses. See Hérault, Zakirova and Buddelmeyer (2010) for more detail.

Table 2 presents enrolment and completion premiums for males two and three years after the last education spell, while Table 3 presents the premiums for females. Tables 1 and 3 reveal large positive and statistically significant enrolment wage premiums one year after the last course for both men and women and for all types of course. That is, wages are higher for those who enrolled in post-school education but did not complete, regardless of the course, than for those who did not participate in post-school education. Tables 2 and 3 show that, for both men and women, wages of non-completers are still higher than those of non-participants two and three years after the last education spell (with only two exceptions),[10] although the premiums tend to decrease over time or lose their significance. The latter may be due to the fact the accumulation of work experience over time reduces the effects of education. Alternatively, this may be a reflection of the substantial attrition as illustrated by the decline in the number of observations between the first and third years following the last education spell. This issue will be dealt with in the empirical estimation.

Table 2 Male enrolment and completion premiums two and three years after the last education spell (weighted)

Number of years since last course	Two			Three		
Last course started	Enrolment premium	Completion premium	No. of obs.	Enrolment premium	Completion premium	No. of obs.
Certificate I/II	20.2% ***	6.7%	455	7.8%	12.5% *	282
Certificate III/IV	6.8%	5.5%	170	8.6%	-4.8%	111
A/T: Certificate III/IV	26.7% ***	2.5%	172	14.9%	8.6%	132
Diploma	15.1% ***	3.0%	306	8.1%	6.4%	206
Bachelor's degree	18.7% ***	15.4% ***	910	19.1% ***	17.1% ***	514
Total			2,995			2,018

Note: A/T stands for apprenticeship or traineeship. * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level. Source: LSAY95 and LSAY98.

For males, Tables 1 and 2 also show that one year after the end of the last education spell, only male completers of a Bachelor's degree or a certificate level I or II in apprenticeship or traineeship enjoy wages that are significantly higher than non-completers. For other courses, the difference between wages of completers and non-completers is not

[10] These two exceptions only concern the third year after the last education spell. For males, it concerns non-apprenticeship certificates I or II and for females, certificates I or II in apprenticeship or traineeship.

statistically significant and is even negative in some cases. Table 3 reveals similar results for females. The difference is that, for females, the only VET qualification associated with a significant completion premium is a certificate I or II in apprenticeship or traineeship.

Table 3 Female enrolment and completion premiums one, two and three years after the last education spell (weighted)

Number of years since last course	One			Two			Three		
Last course started	Enrolment premium	Completion prem.	No. of obs.	Enrolment premium	Completion prem.	No. of obs.	Enrolment premium	Completion prem.	No. of obs.
Cert. I/II	16.8% ***	6.3%	491	7.5% *	5.4%	367	-0.7%	10.0% **	234
Cert.III/IV	27.4% ***	-3.0%	383	13.7% ***	-1.0%	268	5.1%	2.4%	175
A/T: Cert.III/IV	33.0% ***	-9.1%	165	18.0% **	0.2%	133	9.4%	-5.8%	83
Diploma	23.5% ***	4.1%	467	17.4% ***	-2.1%	319	14.9% ***	-1.0%	204
Bachelor's degree	26.0% ***	18.4% ***	1,864	22.6% ***	16.4% ***	1,308	19.6% ***	18.1% ***	777
Total			4,832			3,263			2,158

Note: A/T stands for apprenticeship or traineeship. * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level. Source: LSAY95 and LSAY98.

The overall pattern is that, with the exception of Bachelor's degrees, enrolment effects appear larger than completion effects. However, these descriptive statistics do not tell us if this holds once other factors such as age or years of schooling are controlled for.

4. Estimation Strategy: A Heckman Model with Inverse Probability Weighting

The aim is to estimate the sheepskin effects of the enrolment in and the completion of vocational education and training as well as higher education in the first few years after the last education spell. To this end, a wage equation is specified following previous studies on sheepskin effects and estimated on hourly wage rates observed one, two and three years after finishing the last post-school education spell in order to assess the persistence of the wage effects. In addition, we follow the Heckman approach to control for selection into employment and we use an inverse probability weighted estimator to control for sample attrition.

A well-known problem when estimating wage equations is that wages are only observed for the individuals who are working, which is problematic if working is systematically correlated with unobservable characteristics. Although, this is likely to less of an issue

here than in studies based on the general population given that the employment rates stand at nearly 90 percent or above in all our three samples. The well-established approach developed by Heckman (1976) is designed to address the incidental truncation of wages. The Heckman model is based on a selection equation and a wage equation. We assume the following employment (or selection) equation:

$$Emp^*_{it} = \alpha_e Edu_i + \alpha_{ec} Edu_i Complete_i + \alpha_x X_{it} + \alpha_z Z_i + \mu_{it} \qquad t = 1,2,3 \qquad (1)$$

$$where\ \mu \sim N(0,1)$$

The wage rate, w_{it}, is observed if Emp^*_{it} is positive. X_{it}, is a set of observable characteristics[11] and Z_i is a vector containing the instrumental variables, deemed to influence employment probabilities but not wages. We selected two widely used instruments in this context, one dummy variable indicating whether the individual is in a couple relationship and another dummy variable indicating whether the individual has any children. These two dummies are interacted with gender to allow for differential effects on employment probabilities. The assumption is that the presence of children and the relationship status affect labour market participation but should not have any direct impact on wage rates.[12]

The specification of the wage function draws on previous studies attempting to identify sheepskin effects (Jaeger and Page, 1996; Arkes, 1999 and Gibson, 2000). The natural logarithm of the gross hourly wage (w_{it}) for each individual i is expressed as:

$$ln(w_{it}) = \beta_e Edu_i + \beta_{ec} Edu_i Complete_i + \beta_x X_{it} + \varepsilon_{it} \qquad t = 1,2,3 \qquad (2)$$

$$where\ \varepsilon \sim N(0,\sigma)\ and\ corr(\mu,\varepsilon) = \rho$$

where t denotes the number of years since the last education spell and X_{it}, is a set of observable characteristics, including separate indicators of the number of years spent in

[11] Variables included in X_i are discussed below.

[12] It can be argued that the presence of children and the relationship status may affect the level of efforts in a given job. For example, everything else being equal, singles without children may be inclined to work longer hours. However, this should have a limited impact on hourly wages, at least in the short term. In the long run, the level of efforts may affect career paths and thus hourly wages but this study focuses on the start of the career.

the VET and higher education systems.[13] The vectors of dummy variables Edu_i and $Complete_i$ indicate the type of the last course and the associated completion status respectively. The effect of course completion on wages, $\hat{\beta}_{ec}$, is estimated by interacting completion status with the type of course ($Edu_i Complete_i$) whereas $\hat{\beta}_e$ identifies the enrolment premium. If the error terms of equations (1) and (2) are correlated, that is if $\rho \neq 0$, ordinary least squares estimates are biased but the Heckman approach provides consistent and asymptotically efficient estimates. Equations (1) and (2) are estimated simultaneously following Greene (2003, pp.782-787).

This approach allows us to evaluate the size and significance of the separate effects of enrolling and completion on wages for various types of courses. If it is the case that, as argued by Arkes (1999), both enrolment and completion convey a valuable signal to potential employers, we would expect both effects to be positive and significant. Moreover, we expect these effects to vary in size and significance by type of course if, as suggested by Card (1976) and Riley (1979), screening is more important in skilled occupations than in other occupations.

Sample attrition is a potential concern given that the attrition in our sample is substantial and is unlikely to be random.[14] The concern is that the unobserved determinants of attrition may be correlated with the unobserved wage determinants, thus introducing a bias in the estimates. To correct for this potential bias, we adopt the inverse probability weighted (IPW) estimator described in Wooldridge (2002a, p. 588-589, and 2002b).[15] This approach has the double advantage that it extends to nonlinear models and it does not require exclusion restrictions.[16] The IPW estimator is implemented in two steps.

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[13] Other variables included in X_i are discussed below.

[14] In both LSAY95 and LSAY98, about two thirds of the respondents have already dropped out of the survey by wave 10.

[15] Contoyannis *et al.* (2004) provide an application of this approach to a categorical indicator of self-assessed health using the British Household Panel Survey. The following description of the approach draws on their work as well as on Wooldridge (2002a, 2002b)

[16] As explained by Contoyannis *et al.* (2004), this approach requires "variables that predict attrition and that are correlated with the outcome of interest [(w_{it})] but which are deliberately excluded from the structural model (i.e. equation (1)). This contrasts with the selection on unobservables approach which seeks 'instruments' that are correlated with attrition but independent of the error term in (1)". The same

First, we estimate a probit model for appearing in the survey at time t, IN^*_{it}, based on all first-wave respondents, conditional on a set of observable characteristics (M_i):

$$IN^*_{it} = \gamma_m M_i + \eta_{it} \qquad t = 1,2,3 \tag{3}$$

$$where\ \eta \sim N(0,1)$$

Individual i is observed at time t if IN^*_{it} is positive.[17]

Second, the objective function of the Heckman model described above is weighted by the inverse of the fitted probabilities derived from the probit model. This approach is based on the ignorability of selection assumption, also called 'selection on observables', and assumes that attrition can be treated as ignorable non-response, conditional on M_i. Wooldridge (2002b) shows that the procedure produces conservative estimates of the standard errors in the sense that they are larger than they would be, had we adjusted them to account for the use of fitted rather than true probabilities. Hence, we follow Contoyannis *et al.* (2004) and do not adjust the standard errors.

M_i is a strict subset of X_i, the set of observable characteristics used in equation (1). The constraint is that the variables contained in M_i must all be observed in wave one for all respondents (and, possibly, be subject to minimal changes over time). M_i contains the type of secondary school (catholic, independent or public), the socio-economic status of the parents, and dummies indicating rural and regional areas, indigenous status, and English- and non-English migrants. These variables are subsequently excluded from X_i, in both equations (1) and (2). The remaining variables in X_i contain separate indicators of the number of years spent in the VET and higher education systems and sets of dummy variables indicating the field of study (four broad categories), age (four categories) and dummy variables indicating school completion status, paid work undertaken while at

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argument is developed by Fitzgerald *et al.* (1998) and Wooldridge (2002b) and meets the argument made by Winship and Radbill (1994) about weighted multivariate analyses.

[17] In our case, attrition is defined in a slightly unusual way since t does not indicate a specific wave, but the number of years since the last education spell. Suppose $t = 1$, the individuals subject to attrition are all the individuals not observed one year after the last education spell. This group consists of individuals who dropped out of LSAY before they could be surveyed after having been a non-student for one year. Dropouts also include partial respondents.

school, and number of gaps in post-school studies. A gap is defined as a non-studying period of at least a year in between two education spells.

As it is possible to have multiple observations for the same individuals, the model is subject to a clustering method in order to obtain robust standard errors. Since the aim is to estimate sheepskin effects (as opposed to a human capital model), no control is made for ability. As discussed by Arkes (1999, pp. 134-135), part of the credential effects is that they signal higher ability.

5. Results: The Estimated Sheepskin Effects in the Returns to Education

Tables 4 and 5 present the wage effects of post-school education enrolling and completion as well as the effects of school completion and the number of years of university and VET for males and females respectively.[18,19] The three sets of estimates in each table correspond to the results based on wages one, two and three years after the last education spell. Regarding education level, the reference group is made of school completers who did not participate in post-school education. The coefficients can be interpreted as the premiums attached to various post-school choices in comparison to no post-school education.[20]

The results show that, after controlling for the positive effects of the number of years of post-school education, only the completion premiums attached to university qualifications are consistently significant across the years for both males and females. These results are consistent with Card (1976) and Riley (1979) who suggest that

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[18] Only one wage equation was estimated but the interaction of all education variables with gender provide different coefficient estimates for males and females.

[19] To limit the size of the tables and to facilitate comparisons, coefficients associated with the other explanatory variables are omitted. Likewise, the coefficient estimates from the selection equation are not presented. However, the results of the tests for the joint significance of the instruments used in the selection equation are reported at the bottom Table 4. The complete set of coefficient estimates is available from the authors upon request.

[20] Wald tests reported at the bottom of Tables 4 reveal that ρ, the correlation between the unobserved determinants of wages and employment outcomes, is not statistically significant. In this context, ordinary least squares and Heckman provide similar estimates. The weak evidence in support of a selection bias may stem from the relatively large employment rates among young people (at above 86 percent), which should limit the impact of any potential bias due to selection into employment. See Hérault, Zakirova and Buddelmeyer (2010) for more detail on employment rates in the few years following the last education spell.

screening is likely to be more important in skilled occupations where productivity is more difficult to observe than in other occupations where productivity is more easily observable. Indeed, the technical skills acquired by VET students may be more easily assessed by potential employers, for example via a short trial, than the rather more general skills of university students.

More specifically, the completion premiums for Bachelor's degrees tend to increase over time from about 8 percent for both males and females in the first year after completion to about 12 percent for males and 13 percent for males in the third year.[21] These results are not in contradiction with the screening model hypothesis. Indeed, credentials must be correlated with productivity otherwise employers learn from experience and adjust.

By contrast, the completion premiums attached to VET courses are imprecisely estimated and show no clear pattern. In addition to the fact that screening may be less important for VET, VET courses show a great diversity so that a finer distinction may be required to identify significant wage effects.[22]

Turning to the enrolment premiums, Tables 4 and 5 show positive and statistically significant premiums in the first year following the last course, regardless of the type of course. These premiums then tend to decrease over time so that they are smaller (with lower significance levels) in the third year after the course than in the first year, with only two exceptions. First, the enrolment premiums for Bachelor's degrees show no sign of decline over time for females and are clearly on the rise for males. Second, enrolment premiums are slightly increasing between the first and third year after a diploma for females. These results emphasise the importance of accounting for enrolment, as well as completion, effects when estimating sheepskin effects, whether the focus is on the higher education or the VET sector. In both cases, the restriction of the sheepskin effects to a completion premium would lead to an underestimation of the overall effects.

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[21] The exact effect on wages in terms of percentage changes is actually the exponential of the coefficient minus one ($exp(\beta)-1$). However, the coefficients provide a good approximation of this value as long as they remain relatively small.

[22] Using more detailed information on the type of course, while controlling for individual characteristics, would require substantially larger samples.

Table 4 Selected coefficient estimates of the (log) wage equation (males)

Number of years after last course	One		Two		Three	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
Completion premiums by course level						
Certificate I/II	0.002	0.06	0.009	0.22	0.053	1.15
Certificate III/IV	-0.085 *	-1.73	0.031	0.66	-0.013	-0.16
Certificate III/IV (A/T)	-0.020	-0.25	0.012	0.18	0.095	0.69
Diploma	0.014	0.39	0.061	1.54	0.084	1.61
Bachelor's degree	0.081 ***	3.30	0.104 ***	3.77	0.118 ***	3.16
Enrolment premiums by course level (ref. is no post-school study)						
Certificate I/II	0.106 ***	3.02	0.105 **	2.53	0.057	1.18
Certificate III/IV	0.165 ***	3.41	0.046	1.01	0.051	0.60
Certificate III/IV (A/T)	0.179 **	2.41	0.118 *	1.89	0.044	0.31
Diploma	0.074 **	2.04	0.036	0.96	0.038	0.81
Bachelor's degree	0.079 **	2.55	0.152 ***	4.55	0.136 ***	3.31
Number of years of VET	0.035 ***	4.42	0.045 ***	5.28	0.029 ***	2.62
Number of years of university	0.020 **	2.57	0.007	0.74	0.026 **	2.10
School non-completer	-0.075 ***	-4.51	-0.030 *	-1.65	-0.001	-0.05
Number of observations	10,346		6,828		4,487	
Lambda	0.008	0.00	-0.028	0.00	-0.012	
Wald test of indep. eqns. and p-value	0.60	0.44	2.30	0.13	0.05	0.82
Instruments in selection equation						
Chi-square test and p-value	286.4 ***	0.00	340.5 ***	0.00	283.1 ***	0.00

Table 5 Selected coefficient estimates of the (log) wage equation (females)

Number of years after last course	One		Two		Three	
	Coef.	z-value	Coef.	z-value	Coef.	z-value
Completion premiums by course level						
Certificate I/II	0.022	0.78	0.011	0.31	0.044	1.12
Certificate III/IV	0.011	0.31	0.006	0.16	0.009	0.20
Certificate III/IV (A/T)	-0.124 **	-2.34	-0.023	-0.35	-0.120	-1.26
Diploma	0.018	0.68	0.020	0.59	-0.048	-1.16
Bachelor's degree	0.078 ***	3.58	0.067 **	2.51	0.129 ***	3.65
Enrolment premiums by course level (ref. is no post-school study)						
Certificate I/II	0.088 ***	2.82	0.088 **	2.32	0.019	0.44
Certificate III/IV	0.073 **	2.14	0.069 *	1.84	0.040	0.80
Certificate III/IV (A/T)	0.219 ***	4.07	0.112 *	1.69	0.137	1.38
Diploma	0.088 ***	2.90	0.067 *	1.90	0.113 **	2.49
Bachelor's degree	0.086 ***	3.35	0.125 ***	4.19	0.093 **	2.34
Number of years of VET	0.007	0.99	0.009	0.98	0.008	0.81
Number of years of university	0.015 **	2.42	0.025 ***	3.27	0.021 *	1.91
School non-completer	-0.099 ***	-7.67	-0.054 ***	-3.25	-0.024	-1.23

For VET courses, the results show the same pattern for both males and females: with only a few exceptions, enrolment effects are positive and significant in the first two years after the course, and remain positive but not significant in the third year. This is in sharp contrast with completion effects, which are not statistically significant (or even negative).

A possible explanation is that potential employers screen for particular modules, corresponding to the specific skills they are interested in, and not necessarily for the completion of the entire course. In turn, this may explain the few negative completion effects found for some VET courses in that course completion may indicate in some cases that students are undecided regarding the skills (or modules) they need to effectively signal their productivity.[23]

By contrast, enrolment and completion effects are quite similar in magnitude for Bachelor's degrees. Rejoining the argument made by Arkes (1999), it seems that university attendance is as strong a signal as course completion. Compared to Arkes (1999), we find lower completion effects but higher enrolment effects. In the Australian context, a possible explanation is that young students go through a selection process based on their academic performance in grades 11 and 12 before they can enter university (see Marks *et al.*, 2001, for details).

The job-specific diploma hypothesis advanced by Mehtaa and Villarreal (2008) is not sufficient to explain the observed difference in wages. These authors argue that "large returns to diplomas might arise if particular diplomas are necessary for obtaining particular jobs, and the wages paid by these jobs are shielded from competition." This hypothesis could only explain part of our results, at best, since we find evidence of positive signalling effects for both course enrolment and completion.

6. Conclusion

Stiglitz (1975) and Riley (1979) argue that there may be overinvestment in education if education serves to provide information, or signals, as well as skills since this would lead to a misalignment of private and social returns to education. Several empirical studies have provided evidence of such signalling (or sheepskin) effects by showing wage premiums for those possessing a diploma even after controlling for the number of years of education. However, very little is known about the separate signalling (or sheepskin)

[23] LSAY data do not allow us to investigate further the issue of module completion.

effects of the enrolment in and the completion of post-secondary education, particularly for the vocational education and training sector.

This paper makes use of a unique dataset, the 1995 and 1998 cohorts of the Longitudinal Surveys of Australian Youth (LSAY), to examine the sheepskin effects of various types of post-school qualifications, explicitly distinguishing enrolment and completion effects. The distinction between various types of post-school qualifications is particularly relevant since Card (1976) and Riley (1979) suggested that screening is likely to be more important in skilled occupations than in other occupations. The distinction between enrolment and completion effects, initially suggested by Arkes (1999), is crucial if we are to provide accurate estimates of the overall sheepskin effects.

The wage equations are specified following previous studies on sheepskin effects (Jaeger and Page, 1996; Arkes, 1999 and Gibson, 2000) and are estimated on wages observed one, two and three years after the last education spell in order to assess the persistence of the effects. We follow the approach suggested by Heckman (1976) to account for the fact that wages are only observed for young people who are working and we use an inverse probability weighted estimator to deal with the potential selection bias due to attrition in LSAY data.

Consistent with other studies, we find that sheepskin effects form a substantial part of the total return to education and that they vary by type of course. We show that both course attendance and course completion contribute to the overall signalling effects in the higher education sector, as suggested by Arkes (1999). By contrast, completion has virtually no signalling effect for vocational education and training (VET) courses. For the VET sector, sheepskin effects arise from enrolment (or attendance) rather than completion. These results emphasise the importance of accounting for enrolment, as well as completion, effects when estimating sheepskin effects, whether the focus is on the higher education or the VET sector.

The evidence regarding the persistence over time of the signalling effects is mixed. The evidence is not conclusive for VET courses as signalling effects are imprecisely estimated in the second and third years after this type of course. For Bachelor's degrees, there is no sign of decline in the signalling effects over time for females, while there is

evidence of an increasing trend for males. This evidence does not contradict the screening model hypothesis. For this model to be valid, credentials must be correlated with productivity otherwise employers soon or later realize that they are not screening for the right signals and adjust their behaviour as a consequence.

Our results support the view that there is a misalignment of private and social returns to education due to the existence of sheepskin effects for the enrolment in, and to a lesser extent for the completion of, post-school education. In this context, the level of investment in post-school education is not expected to be socially optimal and a case can be made for intervention to raise the private cost of education. Indeed, Vella and Karmel (1999) show that the educational expansion in Australia appears to have moved all individuals up the educational ladder without altering their relative position, which means that this expansion did not result in a better occupational distribution.

Another contribution of this paper is to show that the misalignment of private and social returns to education is likely to be less acute for VET than for higher education, perhaps because the technical skills acquired by VET students are more easily observed by potential employers than the rather more general skills of university students. This implies that the potential for overinvestment in education is greater in the higher education than in the VET sector.

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